



ISSN 2148 - 2896

J C E R

Journal of
Computer and
Education
Research

2024 October
Volume 12 Issue 24





Editor-in-Chief

Prof. Dr. Tamer KUTLUCA

Editorial Board

Prof.Dr. Dzintra ILISKO <i>Daugavpils University, Latvia</i>	Prof.Dr. Osman BİRGİN <i>Uşak University, Turkey</i>
Prof.Dr. Gülay EKİCİ <i>Gazi University, Turkey</i>	Prof.Dr. Pedro TADEU <i>Polytechnic of Guarda, Portugal</i>
Prof.Dr. Jose Maria Fernandez BATANERO <i>University of Sevilla, Spain</i>	Assoc. Prof.Dr. Gökhan DAĞHAN <i>Hacettepe University, Turkey</i>
Prof.Dr. S.Sadi SEFEROĞLU <i>Hacettepe University, Turkey</i>	Assoc. Prof.Dr. Fakhra AZIZ <i>Lahore College for Women University, Pakistan</i>
Prof.Dr. Orhan KARAMUSTAFAOĞLU <i>Amasya University, Turkey</i>	Prof.Dr. Burçin GÖKKURT <i>Bartın University, Turkey</i>
Assoc. Prof.Dr. Özcan ÖZYURT <i>Karadeniz Technical University, Turkey</i>	Assoc. Prof.Dr. Hasan BAKIRCI <i>Van Yüzüncü Yıl University, Turkey</i>
Assoc. Prof.Dr. Özkan SAPSAĞLAM <i>Yıldız Technical University, Turkey</i>	Assist.Prof.Dr. Michal SIMENA <i>Mendel University, Czech Republic</i>

Publication Language

Turkish or English

Language Editor

Assist.Prof.Dr. Volkan MUTLU

Recep Tayyip Erdoğan University, Turkey

Contact

jcer.editor.in.chief@gmail.com

Phone : +90412 241 1000 Internal: 8881

Web Site

<http://dergipark.org.tr/jcer>

About

Journal of Computer and Education Research (J CER) (e-ISSN 2148-2896) is an international refereed (double blind peer reviewed) journal. J CER started its publication life in 2013. J CER is accepted to the ULAKBIM TR Index which is Turkey's the most prestigious journal index.

DOI Number: 10.18009/jcer

Abstracting/Indexing



Responsibility

The responsibility lies with the authors of articles



From the Editor

Dear JCER reader,

In the present issue, there are 19 research articles, 3 review articles and one teaching practice. 14 of these studies are in English as whole articles and the others are Turkish.

Our authors present in this issue are composed of researchers working in different universities and institutions. These are alphabetically; *Alanya Alaaddin Keykubat University, Bartın University, Bursa Uludağ University, Çanakkale Onsekiz Mart University, Çukurova University, Dicle University, Dokuz Eylül University, Erzurum Technical University, Fırat University, Harran University, Eskişehir Osmangazi University, Gazi University, Hacettepe University, İstanbul Health and Technology University, Kırıkkale University, Malatya Turgut Özal University, Medipol University, National Defence University, Nevşehir Hacı Bektaş Veli University, Sakarya University, Sivas Cumhuriyet University, Tokat Gaziosmanpaşa University, Van Yüzüncü Yıl University, Yıldız Technical University.* Besides, there are also teachers working in the *Ministry of National Education in Turkey and Indonesia.*

Many thanks to the authors who have shared their studies with us as well as to the referees who have made contributions with their valuable ideas. We would like to thank *Prof.Dr. Dzintra Ilisko, Prof.Dr. Osman Birgin, Prof.Dr. Pedro Tadeu, Prof.Dr. S. Sadi Seferoğlu, Prof.Dr. Gökhan Dağhan, Prof.Dr. Gülay Ekici, Assoc.Prof.Dr. Fakhra Aziz, Prof.Dr. Orhan Karamustafaoglu, Prof.Dr. Burçin Gök Kurt, Assist. Prof.Dr. Michal Simane, Prof.Dr. José María Fernández Batanero, Assoc.Prof.Dr. Özkan Sapsağlam, Assoc.Prof.Dr. Özcan Özyurt, and Assoc Prof.Dr. Hasan Bakırcı* who are the editors of Volume 12 Issue 24.

We look forward to seeing you in the March issue of the Journal of Computer and Education Research (JCER) in 2025.

Editor-in-Chief
Prof.Dr. Tamer KUTLUCA
jcer.editor.in.chief@gmail.com

Journal of Computer and Education Research (JCER)

<http://dergipark.org.tr/jcer>



CONTENTS

Research Articles

Dr. Savaş VARLIK

- Hope Has Augmented Reality Applications in Science Education Improved Academic Achievement? An Experimental Study* 319-341
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1425840>

Ayşe ÖZCINAR, Prof.Dr. Fatih YILMAZ

- Visuals in Elementary School First Grade Life Studies Textbooks: A Study on Root Values and Academician Perspectives* 342-369
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1438666>

Berk DÜNDAR, Prof.Dr. Melek Gülşah ŞAHİN

- The Examination Affecting ICT Self-Efficacy and Online Information Practices via Structural Equation Modeling: PISA 2022 Türkiye Sample* 370-382
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1455199>

Dr.Mine SAYIN KILIÇ, Assist.Prof.Dr. Özge ERDURAN TEKİN, Assist.Prof.Dr. Berra KEÇECİ

- Self-Regulation and Psychological Resilience as Predictors of the Academic Self-Efficacy of University Students* 403-421
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1448525>

Güler SHAIKH, Assoc.Prof.Dr. Semra KIRANLI GÜNGÖR

- Bibliometric Analysis of Studies between 2010-2023 on Leadership in the Field of Educational Sciences* 422-445
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1461156>

Büşra ASLANGÖZ, Assoc.Prof.Dr. Özgecan KIRIK

- Bilimin Doğasını Öğretmede Bilim Haberleri Kullanmanın Etkileri* 446-475
The Effects of Using Science News in Teaching the Nature of Science
Research Article/Publication Language: Turkish <https://doi.org/10.18009/jcer.1479639>

Seda ÖZTÜRK, Assoc.Prof.Dr. Ahmet Turan ORHAN

- Sınıf Öğretmenlerinin Çevre Eğitime Yönelik Görüşler* 476-504
Classroom Teachers' Views on Environmental Education
Research Article/Publication Language: Turkish <https://doi.org/10.18009/jcer.1464325>

Assoc.Prof.Dr. Çetin TAN, Assoc.Prof.Dr. Aysel KIZILKAYA, Neşe YAĞMURLU

- The Relationship between Bullying, Organizational Silence and Sports Behaviors of Secondary School Students* 505-522
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1458744>

- Gülşah SALTİK AYHANÖZ, Assist.Prof.Dr. Solmaz Damla GEDİK ALTUN**
Investigation of Gifted Students' Errors Related to Height and Diagonal Concepts in Geometry Teaching 523-548
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1470685>
- Müjgan BEKDAŞ, Assoc.Prof.Dr. Sami BASKIN**
Teacher-Related Demotivating Factors Reducing Students' L2 Learning Motivation 549-567
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1482025>
- Assoc.Prof.Dr. Selim ASAN, Edanur YAĞAN**
Investigation of Candidate Teachers' Early Teacher Identity with Public Personnel Selection Examination Anxiety Levels 568-581
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1486352>
- Hanif Noer ROFIO, Galuh Mafela Mutiara SUJAK**
CodelessML: A Beginner's Web Application for Getting Started with Machine Learning 582-599
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1506864>
- Dr. Mehmet İhsan YURTYAPAN, Prof.Dr. Gül KALELİ YILMAZ**
Tahmin- Gözlem- Açıklama Öğretim Yönteminin Matematik Eğitimine Entegre Edilmesinde Alternatif Bir Bakış: Teknoloji Destekli Tahmin-Gözlem-Açıklama-Değerlendirme 638-665
An Alternative Perspective on Integrating the Prediction-Observation-Explanation Teaching Method into Mathematics Education: Technology-Supported Prediction-Observation-Explanation-Evaluation
Research Article/Publication Language: Turkish <https://doi.org/10.18009/jcer.1504515>
- Şafak YILDIZ, Prof.Dr. Rıdvan EZENTAS**
Ortaöğretim Öğrencilerinin Geometrik Kavramlara İlişkin Bilgi Oluşturma Süreçlerinin APOS Teorisi Çerçevesinde İncelenmesi 666-688
Examination of Secondary School Students' Knowledge Construction Processes Related to Geometric Concepts within the Framework of APOS Theory
Research Article/Publication Language: Turkish <https://doi.org/10.18009/jcer.1512998>
- Satı Aygül İBAS, Assoc.Prof.Dr. Melike TURAL SÖNMEZ**
Ortaöğretim Öğrencilerinin Geometrik Kavramlara İlişkin Bilgi Oluşturma Süreçlerinin APOS Teorisi Çerçevesinde İncelenmesi 689-717
Examination of Secondary School Students' Knowledge Construction Processes Related to Geometric Concepts within the Framework of APOS Theory
Research Article/Publication Language: Turkish <https://doi.org/10.18009/jcer.1514066>
- Assoc.Prof.Dr. Aysel ARSLAN, Hilal ÇETİN**
Türkiye'de Harmanlanmış Öğrenme Alanında Yapılan Çalışmalar: Bir Doküman İncelemesi 718-737
Studies on Blended Learning in Turkey: A Document Review
Research Article/Publication Language: Turkish <https://doi.org/10.18009/jcer.1518675>
- Assoc.Prof.Dr. İsmail Fırat ALTAY, Dr. Tarık YÜTÜK**
Understanding Stance of English Language Teachers' Cooperation with Parents and School Administrators in Classroom Management 738-753
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1519825>



Assoc.Prof.Dr. Seçil TÜMEN AKYILDIZ

Podcasting as a Tool for Developing Oral Proficiency and Self-regulated Learning Strategies: Insights from Turkish EFL Learners 754-779
Research Article/Publication Language: English <https://doi.org/10.18009/jcer.1521030>

Mehmet BİÇER, Assoc.Prof.Dr. Fatma Firdevs ADAM

Duygusal Şantaj İle İlgili Yapılmış Çalışmaların Bibliyometrik Analizi 800-822
Bibliometric Analysis of Studies on Emotional Blackmail
Research Article/Publication Language: Turkish <https://doi.org/10.18009/jcer.1528256>

Review Article

Dündar KERÇİN, Assoc.Prof.Dr. Mehmet Şirin DEMİR

An Integrative and Interdisciplinary Assessment of Environmental, Ecological and Eco-Literacy..... 383-402
Review Article/Publication Language: English <https://doi.org/10.18009/jcer.1458854>

Assist.Prof.Dr. Rusen MEYLANI

Artificial Intelligence in the Education of Teachers: A Qualitative Synthesis of the Cutting-Edge Research Literature 600-637
Review Article/Publication Language: English <https://doi.org/10.18009/jcer.1477709>

Research Assist. Aysu KARADEMİR, Assoc.Prof.Dr. Derya GİRĞİN

Eğitimde Araştırma ve Uygulamanın Buluşması: Tasarım Tabanlı Araştırmaya Kuramsal Bir Bakış 780-799
Integration of Research and Practice in Education: A Theoretical Perspective on Design Based Research
Research Article/Publication Language: Turkish <https://doi.org/10.18009/jcer.1522744>

Teaching Practice

İsmail KÖŞE, Alevna AKSOY, Selva TOPAL, Necmiye Hilal EKMEKÇİ, Assist.Prof.Dr. Özlem ASLAN BAĞCI

Investigation of the Materials Used by Teachers for Early Literacy Skills of Hearing Impaired Children in Preschool Period 823-848
Okul Öncesi Dönemde İşitme Yetersizliği Olan Çocukların Erken Okuryazarlık Becerilerinin Geliştirilmesinde Kullanılan Materyallerin İncelenmesi
Review Article/Publication Language: Turkish <https://doi.org/10.18009/jcer.1530667>

Research Article

Hope Has Augmented Reality Applications in Science Education Improved Academic Achievement? An Experimental Study

Savaş VARLIK^{1,*} 

¹ Ministry of National Education, Ankara, Turkey savasvarlik@yahoo.com


* Corresponding Author: savasvarlik@yahoo.com

Article Info

Received: 25 January 2024

Accepted: 17 May 2024

Keywords: Science education, augmented reality, achievement, experimental research

 10.18009/jcer.1425840

Publication Language: English

Abstract

This research was conducted using the random pretest-posttest control group pattern of real experimental design, which is a subset of experimental research designs in the field of quantitative research. The study group consisted of students aged thirteen and fourteen in the eighth grades of private secondary schools affiliated with the Ministry of National Education in Turkey. Twenty students were selected for the experimental group, and twenty students were selected for the control group in an unbiased manner. However, in order to form homogeneous groups, the past academic records of the students of both experimental and control groups were examined before the students were randomly selected. Then, the random selection phase was started. An achievement test was developed for both the control and experimental groups to be used in the research. Additionally, augmented reality flashcards developed by FenAR related to solid, gas, and liquid pressures were used in the experimental group. The collected data were analyzed using the SPSS 25 package program. At the beginning of the study, it was determined that students' academic achievements were similar. Significant achievement was obtained in the experimental group, where augmented reality was used, compared to the class taught with a constructivist approach. Augmented reality, used as an educational tool, provided students with the opportunity to make abstract concepts more concrete and visually experience them. It can be concluded that especially complex science topics, when taught with augmented reality, become more understandable through 3D modeling and interactive simulations.



To cite this article: Varlık, S. (2024). Has augmented reality applications in science education improved academic achievement? An experimental study. *Journal of Computer and Education Research*, 12 (24), 319-341. <https://doi.org/10.18009/jcer.1425840>

Introduction

Science education is a type of education that involves exploring intriguing and stimulating elements in the environment (Kırbaçlar, 2018) and aims to impart essential skills necessary for individuals to sustain their lives (Balbağ et al., 2016). Science plays a significant role in every aspect of our lives (Çepni, 2016) because it enables people to understand phenomena (Kılıç & Moralar, 2015), use scientific methods and state-of-the-art technology

(Özdemir & Sarıkaya, 2012), establish relationships (Kırıkkaya & Şentürk, 2018), analyze problems (Ayvaci, 2021), and develop critical skills essential for education and daily life, such as creative and reflective thinking abilities (Gün & Atasoy, 2017). It even involves observing natural events within a specific order and system (Sadi & Harman, 2022) and making inferences about unobservable situations based on these observations (Çepni, 2016). Science is also considered as scientific knowledge accumulation that helps individuals better understand their socio-cultural environments (Akinoğlu & Tandoğan, 2007). Furthermore, this discipline is highly interactive with advanced technology (Aydoğdu & Kesercioğlu, 2005) and establishes significant connections among various scientific fields (Can et al., 2016).

Over the last few years, one of the prominent research trends in educational technologies, including science education, is the use of augmented reality applications (Aktamış et al., 2013). The impact of these applications on the learning process is increasingly gaining attention (Lee, 2020). Studies show that augmented reality applications have a greater impact on learning achievement compared to traditional face-to-face learning (Yoon et al., 2017). However, the role of augmented reality applications in education is not limited to achievement alone (Turan & Atila, 2021). It has been reported that these applications increase students' motivation (Önal & Önal, 2021), and satisfaction (Gün & Atasoy, 2017). The effects of augmented reality applications in education go beyond student performance (Huang et al., 2016). These applications provide students with a personalized learning environment (Ibanez et al., 2016), allowing them to learn information at their own pace (Kırıkkaya & Başgöl, 2019). This enables students to learn more effectively (Aktepe & Aktepe, 2009) while enhancing their imagination (Akçayır & Akçayır, 2017) and creativity (Chin & Wang, 2021).

Research Problem

Changes in the fields of science, industry, and technology have influenced the needs of individuals and society (Pendit et al., 2015), reflecting on educational programs and teaching-learning approaches (Karagözlü, 2021). In Turkey, science education has been revised at various periods to adapt to these changing needs (Balbağ et al., 2016). In 2005, a constructivist approach was adopted, and the "Science and Technology Course Curriculum" was implemented (Aydoğdu & Kesercioğlu, 2005). Some parts of this program were updated in 2008 (Çepni, 2016). Later, starting from the academic year 2013-2014, it was implemented in 5th grades (Sadi & Harman, 2022). Subsequently, it was expanded to middle school levels,

emphasizing research-based and inquiry-oriented approaches (Balbağ et al., 2016). With the latest "Science Education Course Curriculum" published in 2018, research and inquiry-based learning were encouraged (Ayvaci, 2021). However, looking at international exams, Turkey's scores in the field of science education are below the world average (Organization for Economic Co-Operation and Development [OECD], 2016). Particularly, according to the results of the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA), Turkey's performance in science education has remained below the desired level (Gürten et al., 2019). However, as a positive note, recent TIMSS and PISA exams show an improvement in Turkey's performance, albeit partially (Yahsi & Kirkic, 2020). Particularly, according to the 2019 TIMSS results, Turkey rose to the 15th place in the field of science education (OECD, 2019). This can be considered a sign of progress in science education in Turkey (Özerbaş & Safi, 2022). However, there is still work to be done in science education. To improve success in science education, adjustments are expected not only in the curriculum (Çepni, 2016) but also in socioeconomic factors (Gürten et al., 2019), teacher qualifications (Özerbaş & Safi, 2022), and the format of exams (Balbağ et al., 2016). Furthermore, learning methods and instructional technologies should be effectively utilized to enable more students to develop advanced skills such as problem-solving, hypothesis formulation, analysis, and the use of scientific processes (Çoban et al., 2016). Instructional technology involves adapting technology to the teaching process, considering specific or existing curriculum (Arıcı et al., 2019). Through instructional technology, various technologies can be used by determining the achievements based on the targeted field (Gnidovec et al., 2020). Instructional technologies assist in systematically planning the process by designing, developing, implementing, and evaluating instructional materials suitable for the instruction, aiming for effectiveness within the set goals (Carmigniani et al., 2011). One of the technologies starting to be used in education is augmented reality. Augmented reality is an environment supported by both real and virtual objects (Furht, 2011). Nowadays, augmented reality applications can also be used with mobile devices and tablets (Bernarduzzi et al., 2021). Thus, students have the opportunity to interact without disconnecting from the real world, making them more willing to learn (Craig, 2013). The significant contributions of augmented reality in education include the safe simulation of dangerous experiments (Makransky et al., 2019), resolving conceptual misconceptions (Rabbi et al., 2015), and increasing the durability of learning (Wei et al.,

2015). Additionally, this technology increases interest in the class (Hassapopoulou, 2018), encourages student participation (Ke & Hsu, 2015), and supports collaborative learning (Cai et al., 2017). For all these reasons, the importance of augmented reality applications in education is increasingly emphasized (Singhal et al., 2012). When the relevant literature was scanned, it was found that dozens of studies on augmented reality had been conducted. Alkhamisi et al., (2013) "the rise of augmented reality", Arvanitis et al., (2011) "A prototype mobile augmented reality system for science education", Bower et al., (2014) "augmented reality in education" Crawford, (2007) "learning to teach science as an inquiry in difficult and somersaulting practice", Hwang et al., (2016) "an educational game based on augmented reality". However, most of these studies aim to provide theoretical knowledge about augmented reality. The number of studies conducted in real classroom environments and real learning settings concerning augmented reality in science education is quite limited. Therefore, it can be considered an undeniable fact that studies focusing on how to increase success in science education should be emphasized. Augmented reality applications, can embody abstract concepts and make learning more meaningful by presenting course materials to students with hand-held and interactive three-dimensional models. Providing a visual experience to students, it can attract the attention of students and make the learning process more interesting. It can also increase the interaction and participation of students. On the other hand, it can offer students the opportunity to learn at their own pace and according to their needs. It can even turn theoretical knowledge into practical application by providing students with hands-on learning experiences. For these reasons, it can be assumed that the results of such research will guide teachers, decision-makers, program development specialists, and those responsible for preparing lesson tools and materials. For this reason, such a study is planned.

The Aim and Research Questions of the Study

This study aims to determine the impact of augmented reality applications on academic achievement in science education. In line with this objective, the following hypotheses were investigated:

H₁= The pre-test scores of students in the pressure unit taught with augmented reality are equal to the population means of their academic achievement ($\mu_1=\mu_2$).

H₂= The post-test scores of students in the pressure unit taught with augmented reality differ from the population means of their academic achievement ($\mu_1\neq\mu_2$).

H₃= In the pressure unit taught with augmented reality, students' academic achievement scores vary based on the interaction between experimental-control groups and pre-test-post-test ($\mu_1 \neq \mu_2$).

Method

Study's Design and Philosophy

This research was conducted using the random pretest-posttest control group pattern of real experimental design, which is a subset of experimental research designs in the field of quantitative research. The main feature of real experimental patterns is that the subjects to be selected to the experimental and control groups are randomly assigned, and the changes that will occur in the dependent variable by interfering with the subjects in the experimental group allow comparison in terms of experimental and control groups. The fundamental characteristic of this design involves the random selection of subjects for both the experimental and control groups (Cohen et al., 2018), allowing for the comparison of changes in the dependent variable resulting from interventions applied to the experimental group (Creswell & Guetterman, 2019) in relation to the control group (Field, 2018). The research was conducted within the framework of realism philosophy and radical structural paradigm. The radical structural paradigm is the paradigm that facilitates the understanding of models and methods in science (Gunbayi & Sorm, 2020). The research design is presented in Table 1.

Table 1. Pretest-posttest control group model of the study

Group	N	Choice	Pretest	Process	Posttest
Experimental Group	20	Random	Application of the Achievement Test to Students Before the Start of Teaching	Subjecting Students to Teaching	The Application of the Achievement Test to the Students After the Completion of the Teaching
Control Group	20	Random			

In the pretest-posttest control group design, there are two groups: the experimental group, formed through unbiased assignment, and the control group. Both groups undergo pretest and posttest measurements (Denscombe, 2020). While augmented reality-related procedures are applied to the experimental group, constructivist approach-related procedures are applied to the control group. In this model, both the experimental and control groups are subjected to a pretest before the procedures begin. After the procedures are completed, both groups undergo a posttest. Subsequently, pretest and posttest scores are compared across the groups.

Research Group

The study group of this research consists of students aged thirteen to fourteen, studying in the eighth grade of official secondary schools affiliated with the Ministry of National Education in Turkey. From these students, 20 students were selected for the experimental group and 20 students for the control group in an unbiased manner. However, in order to form homogeneous groups, the past academic records of the students of both experimental and control groups were examined before the students were randomly selected (Johnson & Christensen, 2020). Then, the random selection phase was started. The teacher of the control group is a teacher with twenty-two years of educational experience. The teacher of the experimental group is an expert teacher with fourteen years of educational experience.

Data Collection Tools

Achievement Test

For the research, an achievement test was developed for both the control and experimental groups. The achievement test items were selected from the "Pressure" unit in the 8th-grade science curriculum, which states that students "explore variables affecting solid pressure, predict variables affecting liquid pressure and test their predictions, and provide examples of the pressure properties of solids, liquids, and gases in everyday life and technological applications." The number of achievements in the relevant curriculum is indicated as three, and the lesson time is approximately ten hours. The teaching process in the control group related to these achievements lasted about 4-6 hours, while the teaching process in the experimental group lasted about 3-5 hours. Five expert science teachers were involved in ensuring the content validity of the achievement test. The teachers prepared a total of twenty-five multiple-choice questions within the scope of "LGS and TIMSS" questions, including acquisition and new generation questions. As a result of the Lawshe technique to check whether the content validity was achieved, the "Content Validity Index" was calculated as .848. In other words, four questions that were decided to be inappropriate among the prepared questions were removed from the research at the Lawshe technique stage. The remaining twenty-one questions were grouped under the titles of solid, liquid and gas pressure. Item difficulty and item discrimination indices were calculated for the items. The results of the analysis are given in Table 2.

Table 2. Achievement test item analysis results

Items	Pjx	Rjx	Items	Pjx	Rjx	Items	Pjx	Rjx
1	,851	,121	8	,421	,133	15	,652	,092
2	,532	,570	9	,500	,491	16	,481	,310
3	,501	,454	10	,321	,070	17	,484	,531
4	,582	,512	11	,213	,101	18	,636	,472
5	,531	,590	12	,454	,423	19	,631	,573
6	,772	,172	13	,482	,407	20	,501	,434
7	,531	,570	14	,487	,431	21	,481	,538

Notes: *pjx*: Item Difficulty Index, *rjx*: Item Distinctiveness Indexes. Achievement Test Overall Item Difficulty Index: .520 Achievement Test Overall Item Discrimination Index: .487, Item 1 and item 6 in solid pressure, item 8, item 10 and item 11 in liquid pressure, and item 15 in gas pressure were removed from the achievement test due to low item difficulty or item discrimination.

When the results of the achievement test item analysis are analyzed in Table 2, the first question on solid pressure, questions eight, ten and eleven on liquid pressure, and the fifteenth question on gas pressure were removed from the achievement test. Questions of item difficulty “.50>” and the item distinctiveness index “.40>” were selected from specific questions. Two expert science teachers were asked to help with the content validity of the remaining fifteen questions and Kappa analysis was performed. The evaluations of the two experts were subjected to Kappa analysis, resulting in an inter-coder reliability coefficient [$\kappa=.863$ $t=6.153$ $p=.000$], indicating a significantly high inter-coder reliability level (Landis & Koach, 1977). Although the item difficulty and item distinctiveness index of the questions were selected from certain questions, Cronbach's alpha reliability calculations were performed for tetrachoric factor analysis and internal consistency analysis to ensure the structural validity of the questions. The KMO value for tetrachoric factor analysis was found to be .856, indicating the suitability of the test questions for tetrachoric factor analysis (Johnson & Christensen, 2020). The achievement test questions were grouped under three factors: “Solid Pressure $\lambda=17.147$, Liquid Pressure $\lambda=16.203$, Gas Pressure $\lambda=21.845$.” The explained total variance ratio of these three factors was 55.195%. Upon examining the factor load values for the achievement test, it was found that two questions related to solid pressure, three questions related to liquid pressure, and one question related to gas pressure had factor load values below .300. The other factor load values were .428 and above (Tabachnick & Fidel, 2013). Confirmatory factor analysis model fit results and reference values are given in Table 3.

Table 3. Model fit results and reference values

Model Fit Criterion	Good Fit	Acceptable Compliance	Model Result
X ² Fit Test	,05 < p ≤ 1	,01 < p ≤ ,05	,079
CMIN / SD	X ² /sd ≤ 3	X ² /sd ≤ 5	3,128
Comparative Fit Indices			
CFI	,97 ≤ CFI	,95 ≤ CFI	,983
RMSEA	RMSEA ≤ 0,05	RMSEA ≤ 0,08	,002
Absolute Concordance Indices			
GFI	,90 ≤ GFI	,85 ≤ GFI	,991
Residual-based Cohesion Indices			
RMR	0 < RMR ≤ ,05	0 < RMR ≤ ,08	,002

Source: Keth, 2019; Kline, 2016

When the model fit values of the study were calculated, the CMIN/DF value was 3.128, the p-value was .079, the GFI value was .991, the CFI value was .983, and the RMSEA value was .002. The reliability of Cronbach's Alpha value was .925. These values indicated that the developed achievement test was valid and reliable (Collier, 2020). At the first stage of the research, the success test was determined as twenty-one questions, as a result of the validity analysis, the "Pressure of Solids" was applied as five questions, the "Pressure of Liquids" as four questions, and the "Pressure of Gases" as six questions.

Augmented Reality Flashcards and Applications

Applications Made in the Control Group

After the eighth-grade students who were selected impartially in the experimental group were determined, daily plans were created by the lesson teacher. The methods and techniques to be applied have been written in the section narration, question and answer, and role-playing. The section on tools and equipment to be used, eighth-grade science textbooks, YouTube pressure videos, presentations, etc. It is written. Activities related to solids, liquids, and gases have been carried out. Measurement and evaluation activities were carried out at each stage of the subject presentations using the question-and-answer method.

Applications Made in the Experimental Group

The eighth-grade students who were selected impartially in the experimental group were asked to bring tablets or mobile phones for the installation of the augmented reality application.



Figure 1. Augmented reality flashcards and applications

Following the completion of this stage, the students in the experimental group were subjected to a pre-test exam together with the students in the control group to measure the initial levels. The teacher who will enter the classes after the exam stage has prepared daily plans. Group study is written in the method and technical part of the lesson plans, and augmented reality is written in the tools and equipment part. It is stated that mathematical links will not be entered in the explanations section, Pascal will be given as the unit of pressure. Then, solid, liquid, and gas experiments were started with FenAR augmented reality applications. The teacher of the lesson used the augmented reality application together with the students at every stage of the lesson. Measurements and evaluations were made at every stage of the application.

Analysis of Data

SPSS 25, AMOS 23 and JAMOVI 2.4.2 software package was utilized for the data analysis in this study. The kurtosis and skewness reference value for the achievement test data was set at ± 1.96 (Wagner, 2015). The normality analysis results of the achievement test are given in Table 4.

Table 4. Achievement test normality distribution analysis results

Group	Skewness	Kurtosis
Control Group	,017	-,493
Experimental Group	,027	,004

Note: The standard error of the skewness coefficient of the experimental and control groups was .374 and the standard error of the kurtosis coefficient was .733.

The kurtosis and skewness values of the achievement test data fell within these limits, indicating a normal distribution of the data (Denscombe, 2020). In the study, paired samples t-tests and independent samples t-tests were performed for pretest-posttest scores of the achievement test (Stockemer, 2019), and two-way ANOVA was conducted to analyze the differences in pretest-posttest and control-experimental group achievement test scores (George & Mallery, 2019). Independent samples t-test was calculated to compare the pretest and posttest scores obtained from two independent groups (Field, 2018). A paired samples t-test is used to determine differences between two different conditions or times on the same participants or items (Wagner, 2015), while two-way ANOVA is employed for situations involving two categorical independent variables and one continuous dependent variable (Denis, 2019). Cohen's d effect size was also calculated in the study. The reference intervals were based on ".05 small, .15 medium and .25 large" effect size. *Internal validity* indicates that the change in the independent variable in the experiment is caused by the independent variable. One of the biggest factors that could threaten the internal validity of this study was selection error. In order not to fall into the selection error, the students' past academic records were examined before they were selected and the formation of a homogeneous group was ensured. Then, the students were randomly determined by the random pretest-posttest control group pattern, which is the sub-pattern of the real experimental pattern. External validity is the ability of the experimental result to be generalized to events and contexts other than the subjects used in the experiment. To the extent that the subjects used in the experiment represent the universe in which the results of the experiment will be generalized, the external validity of the experiment will be ensured at that rate. Throughout the research, strict adherence to internal validity (Finch et al., 2016), indicating that the

observed changes in the dependent variable are indeed due to the independent variable, and external validity (Johnson & Christensen, 2020), indicating that the results can be generalized to contexts beyond the participants used in the study, was maintained.

Findings

The analyses of the academic achievement pretest-posttest scores of the students of the pressure unit processed with augmented reality are given in Table 5.

Table 5. Independent samples t-test analysis results

Test	Group	N	\bar{X}	SD	t	p	Cohen's d
Pre-test	Control Group	20	59,33	11,42	,572	,571	,181
	Experimental Group	20	57,33	10,68			
Post-test	Control Group	20	59,99	11,64	4,023	,001***	1,27
	Experimental Group	20	74,33	10,87			

Notes: * $p < .05$; ** $p < .01$; *** $p < .001$ Pretest $H_0: \mu_{\text{Control Group}} = \mu_{\text{Experimental Group}}$, Pretest Levene's $F_{(1,38)} = .178$ $p = .676$, Posttest $H_0: \mu_{\text{Control Group}} = \mu_{\text{Experimental Group}}$, Posttest Levene's $F_{(1,38)} = .117$ $p = .734$

Upon examining the independent samples t-test results in Table 5, it was found that the pretest scores for the control group were 59.33 ± 11.42 , and for the experimental group, they were 57.33 ± 10.68 . According to the independent samples t-test based on pretest results, there was no significant difference between the scores of the control group and the experimental group [$t = 0.572$, $p = 0.571$]. This finding indicates that the pretest scores for both the control and experimental groups were homogeneous. In light of this result, the hypothesis " $H_1 =$ There is no significant difference between the pretest scores of the students in the pressure unit taught with augmented reality ($\mu_1 = \mu_2$)" is supported. The posttest scores for the control group were found to be 59.99 ± 11.64 , and for the experimental group, they were 74.33 ± 10.87 . According to the independent samples t-test based on posttest results, there was a significant difference between the scores of the control group and the experimental group [$t = 4.023$, $p = .001$]. This finding indicates that the posttest scores for the control and experimental groups were heterogeneous. In light of this result, the hypothesis " $H_2 =$ There is a significant difference between the posttest scores of the students in the pressure unit taught with augmented reality ($\mu_1 \neq \mu_2$)" is supported. Cohen's d value allows expressing the average difference between the two groups in terms of standard deviation units. This measurement is used to assess the magnitude of the difference between groups (Cohen et al., 2018). In this analysis, it can be stated that the effect size in the post-test is higher in the experimental group. The paired samples t-test analysis results for the comparison of achievement test pretest and posttest scores are given in Table 6.

Table 6. Associated samples t-test analysis results

Test	N	X̄	SD	t	p	Cohen's d
Pre-test	40	58,33	10,96	5,653	,001***	,726
Post-test	40	67,17	13,28			

Notes: * $p < .05$; ** $p < .01$; *** $p < .001$

When the paired samples t-test analysis results for the comparison of achievement test pretest and posttest scores are examined in Table 6, the arithmetic mean of the pretest and posttest scores of the experimental and control groups was 58.33 ± 10.96 and the arithmetic mean of the posttest scores was 67.17 ± 13.28 . The t-test for the comparison of the averages was significant in favor of the experimental group [$t = 5.653$, $p = .001$]. The difference between the posttest and pretest scores of both the experimental and control groups was calculated as 8.833. Cohen's d effect size value was found to be .726. This value showed that the effect size between pretest and posttest scores was high. In the study, the achievement test was analyzed under three factors based on the grouping of pressure of solids, liquids and gases. The results of the independent samples t-test analysis of the comparison of these factors between the experimental and control groups are given in Table 7.

Table 7. Independent samples t-test analysis results for the comparison of the achievement test on the pressure of solids, liquids and gases with the experimental and control groups

Test	Group	N	X̄	SD	t	p	Cohen's d
Solid Pressure	Control Group	40	20,33	6,40	2,244	,028*	,501
	Experimental Group	40	23,50	6,22			
Liquid Pressure	Control Group	40	18,50	5,34	3,148	,002***	,704
	Experimental Group	40	22,00	4,58			
Gas Pressure	Control Group	40	20,50	5,92	,111	,912	,024
	Experimental Group	40	20,33	7,39			

Notes: * $p < .05$; ** $p < .01$; *** $p < .001$ Solid Pressure $H_a \mu$ Control Group $\neq \mu$ Experimental Group, Solid Pressure Levene's $F_{(1-78)} = .438$ $p = .510$. Liquid Pressure $H_a \mu$ Control Group $\neq \mu$ Experimental Group, Liquid Pressure Levene's $F_{(1-78)} = .779$ $p = .380$. Gas Pressure $H_a \mu$ Control Group $\neq \mu$ Experimental Group, Gas Pressure Levene's $F_{(1-78)} = 1.183$ $p = .280$.

When the results of the independent samples t test analysis are analyzed in Table 7; the arithmetic mean and standard deviation values of the solid pressure achievement test were $20,33 \pm 6,40$ in the control group and $23,50 \pm 6,22$ in the experimental group; the arithmetic mean and standard deviation values of the gas pressure achievement test were $18,50 \pm 5,34$ in the control group and $22,00 \pm 4,58$ in the experimental group; the arithmetic mean and standard deviation values of the gas pressure achievement test were $20,50 \pm 5,92$ in the control group and $20,33 \pm 7,39$ in the experimental group. The t-test values for the significant difference between the averages were calculated for solid pressure [$t = 2,244$, $p = .028$], liquid pressure [$t = 3,148$, $p = .002$] and gas pressure [$t = .111$, $p = .912$]. The significant difference shows

an increase in favor of the experimental group in solid pressure and liquid pressure. However, in gas pressure, the achievement test scores of both the experimental group and the control group were close to each other. Cohen's d effect size values were high in solid and liquid pressure. The analyses related to the interaction between the experimental-control group and pretest-posttest for students' academic achievement scores in the pressure unit taught with augmented reality are presented in Table 8.

Table 8. Results of two-way analysis of variance

Variables	Sum of Squares	df	Mean Square	F	p	η^2
Group	761	1	761	6,100	,016*	,058
Test	1561	1	1561	12,520	,001***	,119
Group * Test	1334	1	1334	10,700	,002***	,102
Residuals	9473	76	125			

Notes: * $p < .05$; ** $p < .01$; *** $p < .001$ Levene's $F_{(3-76)} = .162$ $p = .922$

Upon examining the results of the two-way analysis of variance in Table 8, it was found that both the experimental and control groups (group) significantly influenced the achievement test [$F_{(1,76)} = 6.100$, $p = .016$]. The pretest and posttest group (test) significantly influenced the achievement test [$F_{(1,76)} = 12.520$, $p = .016$]. Furthermore, both the group and test variables together significantly influenced the achievement test [$F_{(1,76)} = 10.700$, $p = .002$]. Since variance homogeneity was ensured in the model, the Tukey test was used for multiple comparisons. According to the results of the Tukey test regarding significant differences, a significant increase was observed in favor of the experimental group students. In light of this result, the hypothesis " $H_3 =$ In the pressure unit taught with augmented reality, students' academic achievement scores vary based on the interaction between experimental-control groups and pre-test-post-test ($\mu_1 \neq \mu_2$)" is supported. Eta squared (η^2) is a statistical measure obtained from the analysis of variance (ANOVA) and indicates what percentage of the variance in the dependent variable (outcome measurement) is explained by the independent variable (differences between groups) (Creswell & Guetterman, 2019). According to eta squared values, the group*test interaction has a medium-sized effect. A medium-sized effect indicates that the interaction between the group and test factors is significant and contributes to explaining the achievement test results. This information can assist educators and researchers in examining this interaction in more detail and better understanding student performance. The analysis findings demonstrated a significant effect of both the experimental and control groups on the achievement test scores. This suggests that the intervention (experimental group) positively impacted achievement. The result that the

experimental group students performed better than the control group emphasizes the effectiveness of the intervention. Additionally, a significant difference was found between the pretest and posttest groups, indicating that achievement test results changed over time, and students' learning processes progressed. This difference between the pretest and posttest results could suggest that students' performance improved or changed as they were exposed to the intervention. It might also imply that the intervention's effect increased over time and could indicate potential long-term effects. Overall, the results show that the experimental group students had higher achievement test scores than the control group, and there was also a significant difference between the pretest and posttest scores. These findings suggest the effectiveness of the intervention, positively influencing students' achievements. Graphs representing the pretest and posttest scores are provided in Figure 2.

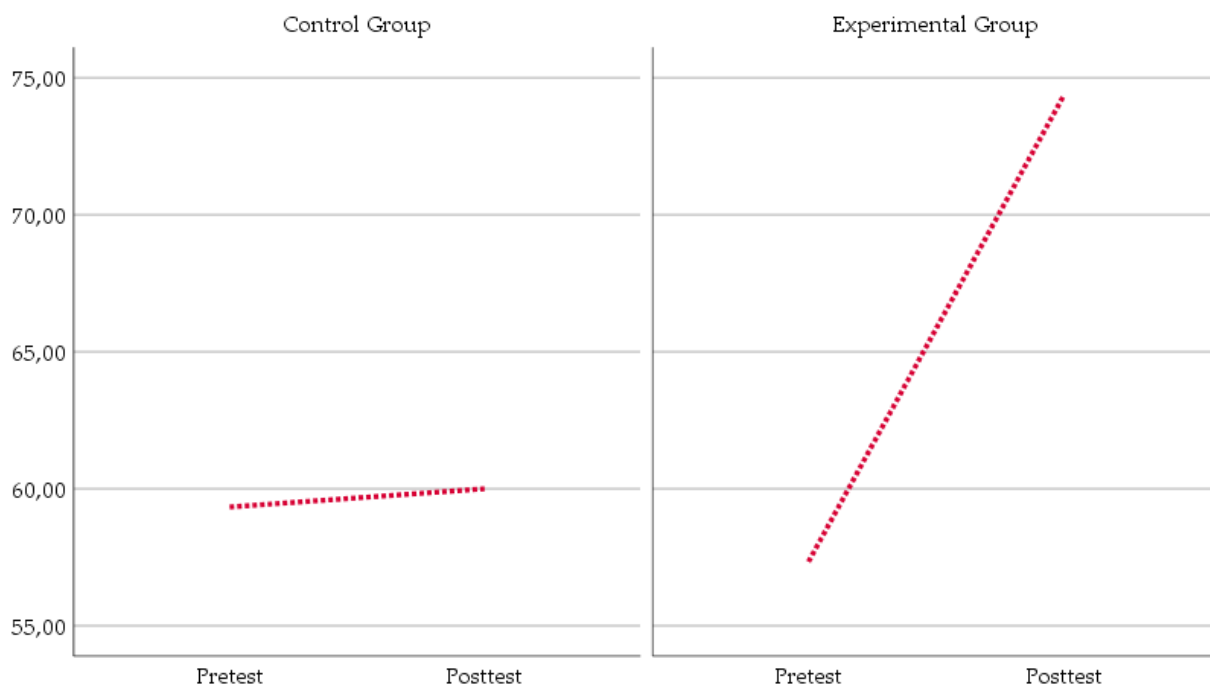


Figure 2. Graph of achievement test, pretest, and posttest scores

Upon examining the graph representing the pretest and posttest scores in Figure 2, a significant increase in achievement test scores was not observed among students in the control group who received instruction through the constructivist approach. However, students in the experimental group, who received instruction using augmented reality, demonstrated a noticeable increase in their achievement test scores.

Discussion, Conclusion and Recommendations

The pretest scores of students in the pressure unit taught with augmented reality are distributed homogeneously. This situation indicates that students' pretest scores are very

similar to each other, and there is no significant score difference among different student groups. The participants selected for the study are eighth-grade students in middle school. To ensure that the pre-academic achievement levels of these students are close to each other, their academic records were thoroughly examined, and students with similar achievement levels were included in the study. Upon the analysis of pretest scores, no significant difference was detected in students' scores. In fact, students in the experimental group even had slightly lower achievement scores compared to students in the control group. The lessons with the structured approach were continued with these students, and the pressure unit was taught using augmented reality with the experimental group. This situation completely captivated students' attention, motivation, and desire to learn. Students eagerly installed augmented reality applications on their tablets and smartphones, and observing flashcards in four dimensions further enhanced their interest in the lessons. Since the pressure unit had a limited number of achievements and lessons, the augmented reality applications for students were also brief. However, students in the experimental group constantly expressed their desire for augmented reality applications to continue. After the lessons were completed, the posttest was administered, and it was found that the academic achievement posttest scores of students in the pressure unit taught with augmented reality were distributed heterogeneously. While no significant improvement was observed in the posttests of the control group, a remarkable increase was observed in the posttests of the experimental group. Moreover, students in the experimental group did not exhibit undesirable behaviors; furthermore, they arrived at the classroom minutes before the lessons began. This situation suggests that the use of augmented reality applications in science lessons could make learning more effective and increase students' achievements (Makransky et al., 2019). However, the potential to enhance achievement can vary based on the design of the application, its usage, and how well it meets the needs of the students (Chiang et al., 2014). Augmented reality in science, especially in the context of education and laboratory studies, is an exciting technological development (Küçük et al., 2016). Augmented reality can offer students the opportunity to conduct laboratory experiments in a virtual environment (Radu, 2014). For example, chemistry students can observe chemical reactions or biology students can examine intracellular processes (Lu & Liu, 2015). This can facilitate learning in schools where laboratory access is limited or situations where it is difficult for students to repeat experiments (Squire & Jan, 2007). In biology classes, it can provide opportunities for

students to better understand the internal structure or functioning of living organisms (Almasseri & AIHojailan, 2019). For instance, students can view the internal organs or cells of an organism in 3D. Augmented reality can also allow science students to observe and study stars, planets, and other celestial bodies (Sommerauer & Müller, 2014). Using smartphones or tablets, students can recognize celestial objects (Alhalabi, 2016). In physics classes, it can offer various experiments to help students better understand physical principles (Hsiao et al., 2012). For example, virtual experiments can be conducted on electrical circuits or mechanical movements. Augmented reality can help students work more effectively in geographical areas. They can examine layers virtually and have a better understanding of geological formations (Lin et al., 2015). These statements align with the research findings. Augmented reality in science is a powerful technology that can enhance learning and achievement (Gün & Atasoy, 2017). Augmented reality is defined as a technology that enriches the real world with virtual elements (Turan et al., 2018). When used in science education, it can help students understand experimental studies more effectively (Singh et al., 2019), visualize experiments, and learn complex concepts better (Jamali et al., 2015).

In the pressure unit taught with augmented reality, students' academic achievement scores vary based on the interaction of experimental-control groups and pretest-posttest. Based on the experimental results in the pressure unit taught with augmented reality, it was observed that the experimental group outperformed the control group. This result indicates that augmented reality technology enhances the learning experience and deepens students' understanding of the pressure topic (Moro et al., 2017). There could be several possible reasons for the experimental group's superior performance. Firstly, augmented reality can help students understand abstract or complex concepts more visually and interactively (Estapa & Nadolny, 2015). This technology can concretize pressure-related concepts and make learning more engaging by demonstrating how they work in the real world (Laine et al., 2016). Additionally, one reason behind the success of the experimental group might be that the pressure unit taught with augmented reality provided a learning environment that better suited students' learning styles and needs (Thees et al., 2020). This technology enables students to learn at their own pace and have more interactive experiences (Martin-Gonzalez et al., 2016), while also allowing teachers to provide more personalized education (Graham et al., 2013). In conclusion, the experimental group's performance in the pressure unit taught

with augmented reality emphasizes the potential of this technology in education. However, it is important to remember that these results require further research and analysis because various factors could affect student achievement. The experimental results in the pressure unit taught with augmented reality indicate that the experimental group outperformed the control group. These results suggest that a constructivist approach is less effective compared to the education approach supported by augmented reality technology. One reason behind the experimental group's higher achievement might be that augmented reality provided students with a more interactive and visual learning experience (Lai et al., 2019). This technology concretized abstract concepts and allowed students to visually experience pressure-related concepts (Arvanitis et al., 2011). The control group, lacking this visual experience, might have lagged in achievement. However, it should be noted that the difference in achievement could be attributed to other factors as well. For instance, variables such as the number of students in the experimental and control groups, the profile of students in each group, and the teacher's level of experience could influence the results. Therefore, further research and analysis may be necessary to fully understand the reasons for the control group's lower achievement. These findings can help educators think about how to use innovative technologies like augmented reality more effectively to enhance learning experiences (Mystakidis et al., 2022), improve student achievement (Yen et al., 2013), and consider how to use innovative technologies like augmented reality more effectively (Yu et al., 2022).

The use of augmented reality in science education has been found to significantly improve students' post-test scores in the experimental group, while there has been no significant improvement in the class taught using the constructivist approach. It can be inferred that augmented reality-based lessons provide experimental group students with a more effective, visual, and engaging learning experience and offer teachers better tools to explain complexity and abstract concepts. This technology aids in a better understanding of science concepts and enables students to explore topics more deeply. The pressure unit taught with augmented reality positively influenced students' academic achievements in comparison to the constructivist approach. A significant difference emerged between the experimental and control groups. However, we can say that for augmented reality to contribute to success, it must be well-designed and used for educational goals.

The use of augmented reality in science education holds great potential in the fields of learning, research, and application. Augmented reality can be employed to visualize complex concepts and processes. It offers students the opportunity to explore molecular structures, cellular functions, or physical phenomena in greater depth. Augmented reality can enhance real-world laboratory experiences for students. They can conduct experiments and observe results using virtual objects. Providing interactive augmented reality applications to students for exploring scientific subjects can encourage self-paced learning. Particularly, when explaining complex molecular structures or physical phenomena, visual understanding can be provided to students through 3D modeling and animations. Additionally, science textbooks can be designed to be compatible with augmented reality.

Ethical Committee Permission Information

Name of the board that carries out ethical assessment: Çukurova University Social and Humanities Scientific Research and Publication Ethics Board

The date and number of the ethical assessment decision: 01.06.2023 -10

Author Contribution Statement

Savaş VARLIK: *Conceptualization, literature review, data curation, methodology, implementation, data analysis, original draft, language editing, organization, and writing.*

References

- Akçayır, M., & Akçayır, G. (2017). Advantages and challenges associated with augmented reality for education: A systematic review of the literature. *Educational Research Review*, 20, 1-11. <https://doi.org/10.1016/j.edurev.2016.11.002>
- Akinoğlu, O., & Tandoğan, R. Ö. (2007). The effects of problem-based active learning in science education on students' academic achievement, attitude and concept learning. *Eurasia Journal of Mathematics, Science and Technology Education*, 3(1), 71-81.
- Aktamış, H., & Arıcı, V. A. (2013). Sanal gerçeklik programlarının astronomi konularının öğretiminde kullanılmasının akademik başarı ve kalıcılığa etkisi. *Mersin Üniversitesi Eğitim Fakültesi Dergisi*, 9(2), 58-70.
- Aktepe, V., & Aktepe, L. (2009). Fen ve teknoloji öğretiminde kullanılan öğretim yöntemlerine ilişkin öğrenci görüşleri: Kırşehir BİLSEM örneği. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, 10(1), 69-80.
- Alhalabi, W. (2016). Virtual reality systems enhance students' achievements in engineering education. *Behavior & Information Technology*, 35(11), 919-925.
- Alkhamisi, A. O., Arabia, S., & Monowar, M. M. (2013). Rise of augmented reality: Current and future application areas. *International journal of internet and distributed systems*, 1, 25-34. <http://doi.org/10.4236/ijids.2013.14005>

- Almasseri, M., & AlHojailan, M. I. (2019). How flipped learning based on the cognitive theory of multimedia learning affects students' academic achievements. *Journal of Computer Assisted Learning*, 35(6), 769-781. <http://doi.org/10.1111/jcal.12386>
- Arıcı, F., Yıldırım, P., Çalıklar, Ş., & Yılmaz, R. M. (2019). Research trends in the use of augmented reality in science education: Content and bibliometric mapping analysis. *Computers & Education*, 142. <https://doi.org/10.1016/j.compedu.2019.103647>
- Arvanitis, T. N., Williams, D. D., Knight, J. F., Baber, C., Gargalakos, M., Sotiriou, S., & Bogner, F. X. (2011). A human factors study of technology acceptance of a prototype mobile augmented reality system for science education. *Advanced Science Letters*, 4(11-12), 3342-3352. <https://doi.org/10.1166/asl.2011.2044>
- Aydoğdu, M. & Kesercioğlu, T. (2005) (Eds.). *İlköğretimde fen ve teknoloji öğretimi*. Anı Yayın.
- Ayvacı, H. Ş. (2021) (Ed.). *Fen öğretiminde model ve modelleme*. Pegem Akademi.
- Balbağ, M. Z., Leblebiciler, K., Karaer, G., Sarıkahya, E., & Erkan, Ö. (2016). Türkiye'de fen eğitimi ve öğretimi sorunları. *Eğitim ve Öğretim Araştırmaları Dergisi*, 5(3), 12-23.
- Bernarduzzi, L. F., Bernardi, E. M., Ferrari, A., Garbarino, M. C., & Vai, A. (2021). Augmented reality application for handheld devices. *Science & Education*, 30, 755-773.
- Bower, M., Howe, C., McCredie, N., Robinson, A., & Grover, D. (2014). Augmented reality in education-cases, places and potentials. *Educational Media International*, 51(1), 1-15.
- Cai, S., Chiang, F.-K., Sun, Y., Lin, C., & Lee, J. J. (2017). Applications of augmented reality based natural interactive learning in magnetic field instruction. *Interactive Learning Environments*, 25(6), 778-791. <http://doi.org/10.1080/10494820.2016.1181094>
- Can, B., Savran-Gencer, A., Yıldırım, C., & Bahtiyar, A. (2016). *Fen öğretiminde probleme dayalı öğrenme*. Pegem Akademi.
- Carmigniani, J., Furht, B., Anisetti, M., Ceravolo, P., Damiani, E., & Ivkovic, M. (2011). Augmented reality technologies, systems and applications. *Multimedia Tools*, 51, 341-377. <http://doi.org/10.1007/s11042-010-0660-6>
- Çepni, S. (2016) (Ed.). *Kuramdan uygulamaya fen ve teknoloji öğretimi*. Pegem Akademi.
- Chiang, T. H. C., Yang, S. J. H., & Hwang, G. (2014). Students' online interactive patterns in augmented reality-based inquiry activities. *Computers and Education*, 78, 97-108.
- Chin, K. Y., & Wang, C. S. (2021). Effects of augmented reality technology in a mobile touring system on university students' learning performance and interest. *Australasian Journal of Educational Technology*, 37(1), 27-42. <https://doi.org/10.14742/ajet.5841>
- Çoban, G. Ü., Akpınar, E., Baran, B., Sağlam, M. K., Özcan, E., & Kahyaoğlu, Y. (2016). The evaluation of "technological pedagogical content knowledge-based argumentation practices" training for science teachers. *Education & Science*, 41(188), 1-33.
- Cohen, L., Manion, L. & Morrison, K. (2018). *Research methods in education*. Routledge.
- Collier, J.E. (2020). *Applied structural equation modeling using AMOS basic to advanced techniques*. Routledge.
- Craig, A. B. (2013). *Understanding augmented reality: Concepts and applications*. Morgan Kaufma
- Crawford, A. B. (2007). Learning to teach science as inquiry in the rough and tumble of practice. *Journal of Research in Science Teaching*, 44(4), 613-642.

- Creswell, J. W., & Guetterman, T. C. (2019). *Educational research planning, conducting and evaluating quantitative and qualitative research*. Pearson.
- Denis, D. J. (2019). *SPSS data analysis for univariate, bivariate, and multivariate statistics*. Wiley.
- Denscombe, M. (2020). *Research proposals a practical guide*. Mc Graw Hill.
- Estapa, A., & Nadolny, L. (2015). The effect of an augmented reality enhanced mathematics lesson on student achievement and motivation. *Journal of STEM Education*, 16(3), 40-48.
- Field, A. (2018). *Discovering statistics using IBM SPSS Statistics*. Sage.
- Finch, W.H., Immekus, J.C.& French, B.F. (2016). *Applied psychometrics using SPSS and AMOS*. Information Age Publishing.
- Furht B. (2011). *Handbook of augmented reality*. Springer
- George, D. & Mallery, P. (2019). *IBM SPSS statistics 25 step by step a simple guide and reference*. Routledge.
- Gnidovec, T., Zemlja, M., Dolenc, A., & Torkar, G. (2020). Using augmented reality and the structure–behavior–function model to teach lower secondary school students about the human circulatory system. *Journal of Science Education and Technology*, 29(6), 774-784.
- Graham, M., M. Zook., & A. Boulton (2013). Augmented Reality in the Urban Environment: contested content and the duplicity of code. *Transactions of the Institute of British Geographers*, 38(3), 464-479.
- Gün, E., & Atasoy, B. (2017). The effects of augmented reality on elementary school students' spatial ability and academic achievement. *Education and Science*, 42(191), 31-51.
- Gunbayi, I. & Sorm, S. (2020). *Social paradigms in guiding management, social development and social*. Pegem Akademi
- Gürten, E., Demirkaya, A. S., & Doğan, N. (2019). Uzmanların PISA ve TIMSS sınavlarının eğitim politika ve programlarına etkisine ilişkin görüşleri. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi*, 52, 287-319.
- Hassapopoulou, M. (2018). From distracted to distributed attention: expanded learning through social media, augmented reality, remixing, and activist geocaching. *Digital Humanities Quarterly*, 12(2), 1-31.
- Hsiao, K., Chen, N., & Huang, S.Y. (2012). Learning while exercising for science education in augmented reality among adolescents. *Interactive Learning Environments*, 20(4), 331-349.
- Huang, T. C., Chen, C. C., & Chou, Y. W. (2016). Animating eco-education: To see, feel, and discover in an augmented reality-based experiential learning environment. *Computers & Education*, 96, 72-82. <http://doi.org/10.1016/j.compedu.2016.02.008>
- Hwang, G.J., Wu, P.H., Chen, C.C., & Tu, N.T. (2016). Effects of an augmented reality based educational game on students' learning achievements and attitudes in real-world observations. *Interactive Learning Environments*, 24(8), 1895-1906.
- Ibanez, M. B., Di Serio, A., Villaran, D., & Kloos, C. D. (2016). Support for augmented reality simulation systems: The effects of scaffolding on learning outcomes and behavior patterns. *IEEE Transactions on Learning Technologies*, 9(1), 46-56.

- Jamali, S. S., Shiratuddin, M. F., Wong, K. W., & Oskam, C. L. (2015). Utilizing mobile-augmented reality for learning human anatomy. *Procedia, Social and Behavioral Sciences*, 197, 659-668. <https://doi.org/10.1016/j.sbspro.2015.07.054>
- Johnson, R.B. & Christensen, L. (2020). *Educational research quantitative, qualitative, and mixed approaches*. Sage.
- Karagözlü, D. (2021). Creating a Sustainable Education Environment with Augmented Reality Technology. *Sustainability*, 13(11), 5851. <http://doi.org/10.3390/su13115851>
- Ke, F., & Hsu, Y.C. (2015). Mobile augmented-reality artifact creation as a component of mobile computer-supported collaborative learning. *The Internet and Higher Education*, 26, 33-41. <http://doi.org/10.1016/j.iheduc.2015.04.003>
- Keth, T.Z. (2019). *Multiple regression and beyond an introduction to multiple regression and structural equation modeling*. Routledge.
- Kılıç, İ., & Moralar, A. (2015). Fen eğitiminde probleme dayalı öğrenme yaklaşımının akademik başarı ve motivasyona etkisi. *Pegem Eğitim ve Öğretim Dergisi*, 5(5), 625-636
- Kırbaçlar, F. G. (2018). *İşbirlikli öğrenme ortamlarında fen öğretimi: Kuramdan uygulamaya*. Çağlayan Kitabevi.
- Kırıkkaya, E. B., & Başgül, M. Ş. (2019). The effect of the use of augmented reality applications on the academic success and motivation of 7th grade students. *Journal of Baltic Science Education*, 18(3), 362-378. <http://doi.org/10.33225/jbse/19.18.362>
- Kırıkkaya, E. B., & Şentürk, M. (2018). The impact of using augmented reality technology in the solar system and beyond unit on the academic achievement of the students. *Kastamonu Education Journal*, 26(1), 181-189. <https://doi.org/10.24106/kefdergi.375861>
- Kline, R.B. (2016). *Principles and practice of structural equation modeling*. The Guilford Press.
- Küçük, S., Kapakin, S., & Göktaş, Y. (2016). Learning anatomy via mobile augmented reality: Effects on achievement and cognitive load: Learning anatomy. *Anatomical Sciences Education*, 9(5), 411-421. <https://doi.org/10.1002/ase.1603>
- Lai, A. F., Chen, C. H., & Lee, G. Y. (2019). An augmented reality-based learning approach to enhancing students' science reading performances from the perspective of the cognitive load theory. *British Journal of Educational Technology*, 50(1), 232-247.
- Laine, T. H., Nygren, E., Dirin, A., & Suk, H.-J. (2016). Science spots AR: A platform for science learning games with augmented reality. *Educational Technology Research and Development*, 64(3), 507-531. <http://doi.org/10.1007/s11423-015-9419-0>
- Landis, J. R. & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33(1), 159-174. <https://www.jstor.org/stable/2529310>
- Lee, J. (2020). Problem-based gaming via an augmented reality mobile game and a printed game in foreign language education. *Education and Information Technologies*, 27, 743-771.
- Lin, H. K., Chen, M., & Chang, C. (2015). Assessing the effectiveness of learning solid geometry by using an augmented reality-assisted learning system. *Interactive Learning Environments*, 23(6), 799-810. <http://doi.org/10.1080/10494820.2013.817435>
- Lu, S., & Liu, Y. (2015). Integrating augmented reality technology to enhance children's learning in marine education. *Environmental Education Research*, 21(4), 525-541.

- Makransky, G., Terkildsen, T. S., & Mayer, R. E. (2019). Adding immersive virtual reality to a science lab simulation causes more presence but less learning. *Learning and Instruction*, 60, 225-236. <http://doi.org/10.1016/j.learninstruc.2017.12.007>
- Martin-Gonzalez, A., Chi-Poot, A., & Uc-Cetina, V. (2016). Usability evaluation of an augmented reality system for teaching Euclidean vectors. *Innovations in Education and Teaching International*, 53(6), 627-636. <http://doi.org/10.1080/14703297.2015.1108856>
- Moro, C., Stromberga, Z., Raikos, A., & Stirling, A. (2017). The effectiveness of virtual and augmented reality in health sciences and medical anatomy. *Anatomical Sciences Education*, 10(6), 549-559. <http://doi.org/10.1002/ase.1696>
- Mystakidis, S., Christopoulos, A., & Pellas, N. (2022). A systematic mapping review of augmented reality applications to support STEM learning in higher education. *Education and Information Technologies*, 27(2), 1883-1927.
- OECD (2016). *PISA 2015 Assessment and analytical framework: science, reading, mathematics and financial literacy*. PISA, OECD Publishing.
- OECD (2019). *PISA 2018 Assessment and analytical framework*. OECD Publishing
- Önal, N. T., & Önal, N. (2021). The effect of augmented reality on the astronomy achievement and interest level of gifted students. *Education and Information Technologies*, 26, 4573-4599. <https://doi.org/10.1007/s10639-021-10474-7>
- Özdemir, E. B., & Sarıkaya, M. (2012). The investigation of the effect of problem based learning to the academic achievement and the permanence of knowledge of prospective science teacher: The problem of the boiler stone. *Procedia-Social and Behavioral Sciences*, 46, 4317-4322. <http://doi.org/10.1016/j.sbspro.2012.06.247>
- Özerbaş, M. A., & Safi, B. N. (2022). TIMSS ve PISA'DA başarılı olan ülkeler ve Türk öğretmen yetiştirme sistemlerinin karşılaştırmalı olarak incelenmesi. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, 23(2), 1960-1992.
- Pendit, U. C., Zaibon, S. B., & Bakar, J. A. A. (2015). Conceptual model of mobile augmented reality for cultural heritage site towards enjoyable informal learning aspect. *Jurnal Teknologi*, 77(29), 123-129.
- Rabbi, I., Ullah, S., & Alam, A. (2015). Marker based tracking in augmented reality applications using artoolkit: A case study. *The Journal of Engineering & Applied Sciences*, 34(1), 15-35.
- Radu, I. (2014). Augmented reality in education: A meta-review and cross-media analysis. *Personal and Ubiquitous Computing*, 18(6), 1533-1543.
- Sadi, Ö., & Harman, G. (2022). *İlkokulda uygulamalı fen öğretimi*. Nobel Yayıncılık.
- Singh, G., Mantri, A., Sharma, O., Dutta, R., & Kaur, R. (2019). Evaluating the impact of the augmented reality learning environment on electronics laboratory skills of engineering students. *Computer Applications in Engineering Education*, 27(6), 1361-1375.
- Singhal, S., Bagga, S., Goyal, P., & Saxena, V. (2012). Augmented chemistry: Interactive education system. *International Journal of Computer Applications*, 49(15), 1-5.
- Sommerauer, P., & Müller, O. (2014). Augmented reality in informal learning environments: A field experiment in a mathematics exhibition. *Computers and Education*, 79, 59-68.

- Squire, K. D., & Jan, M. (2007). Mad city mystery: developing scientific argumentation skills with a place-based augmented reality game on handheld computers. *Journal of Science Education and Technology*, 16(1), 5–29. <https://doi.org/10.1007/s10956-006-9037-z>
- Stockemer, D. (2019). *Quantitative methods for the social sciences a practical introduction with examples in SPSS and STATA*. Springer.
- Tabachnick, B. G. & Fidell, L.S. (2013). *Using multivariate statistics*. Pearson.
- Thees, M., Kapp, S., Strzys, M. P., Beil, F., Lukowicz, P., & Kuhn, J. (2020). Effects of augmented reality on learning and cognitive load in university physics laboratory courses. *Computers in Human Behavior*, 108, 106316.
- Turan, Z., & Atila, G. (2021). Augmented reality technology in science education for students with specific learning difficulties: Its effect on students' learning and views. *Research in Science & Technological Education*, 39(4), 506-524.
- Turan, Z., Meral, E., & Şahin, I. F. (2018). The impact of mobile augmented reality in geography education: Achievements, cognitive loads and views of university students. *Journal of Geography in Higher Education*, 42(3), 427-441.
- Wagner, W.E. (2015). *Using IBM SPSS statistics for research methods and social science statistics*. Sage.
- Wei, X., Weng, D., Liu, Y., & Wang, Y. (2015). Teaching based on augmented reality for a technical creative design course. *Computers & Education*, 81, 221-234.
- Yahsi, Ö., & Kirkic, K. A. (2020). PISA ve TIMMS uygulamalarının okullara olan etkisinin okul yönetici görüşlerine göre incelenmesi: İzmir örneği. *Eğitim ve İnsani Bilimler Dergisi: Teori ve Uygulama*, 11(22), 323-347.
- Yen, J.C., Tsai, C.H., & Wu, M. (2013). Augmented reality in the higher education: Students' science concept learning and academic achievement in astronomy. *Procedia, Social and Behavioral Sciences*, 103, 165-173. <https://doi.org/10.1016/j.sbspro.2013.10.322>
- Yoon, S., Anderson, E., Lin, J., & Elinich, K. (2017). How augmented reality enables conceptual understanding of challenging science content. *Educational Technology & Society*, 20(1), 156-168.
- Yu, J., Denham, A. R., & Searight, E. (2022). A systematic review of augmented reality game-based learning in STEM education. *Educational Technology Research and Development*, 70(4), 1169-1194. <http://doi.org/10.1007/s11423-022-10122-y>

Research Article

Visuals in elementary School First Grade Life Studies Textbooks: A Study on Root Values and Academician Perspectives

Ayşe ÖZÇINAR^{1,*}  Fatih YILMAZ² 

¹ Harran University, Faculty of Education, Şanlıurfa, Turkey ayseozcinar@harran.edu.tr

² Dicle University, Faculty of Education, Diyarbakır, Turkey fatih.yilmaz@dicle.edu.tr


* Corresponding Author: ayseozcinar@harran.edu.tr

Article Info

Received: 26 February 2024

Accepted: 10 June 2024

Keywords: Values education, root value, life studies, feldman art criticism

 10.18009/jcer.1438666

Publication Language: English

Abstract

This study assesses the representation of core values in the visuals of a first-grade Life Studies textbook, based on the opinions of academicians. Employing basic qualitative research methods, including Feldman Art Criticism, Pedagogical Criticism, and a Semi-structured Root Values and Visual Analysis form developed by the researcher with expert advice, it examines 16 visuals for their expression of ten core values as defined by the Board of Education and Instruction. Descriptive analysis was utilized to evaluate the frequency and adequacy of these visuals in conveying the values. The findings reveal that love, respect, and responsibility are the most frequently depicted values, whereas honesty, justice, and patience are the least represented. The study concludes that visuals most effectively embody the values of benevolence and honesty, and recommends incorporating more visuals that depict honesty, justice, and patience in future editions of the textbook.



To cite this article: Özçınar, A. & Yılmaz, F. (2024). Visuals in elementary school first grade life studies textbooks: A study on root values and academician perspectives. *Journal of Computer and Education Research*, 12 (24), 342-369.
<https://doi.org/10.18009/jcer.1438666>

Introduction

Values, cultural and historical heritage that comes from the depths of history, is the greatest treasure of the nation. It is an element that enables societies to create a common feeling and thought among them by separating them from being a mass or a mob. Values are very effective in influencing people's perspectives on the world, developing and changing human perceptions. Value prepares a suitable environment for the processing of social rules and enables individuals to make choices according to a consistent set of characteristics within themselves, taking into account social expectations (Sağlam, 2020).

The Ministry of National Education (MoNE) stated that value education should be included in the implicit programme within all units, not as a different unit, and that values should be covered implicitly and spirally in all units of the book. When the 2019 curriculum

is examined, it is seen that the title of values has changed and classified as root values. The root values included in the curriculum are as follows: "justice, friendship, honesty, self-control, patience, respect, love, responsibility, patriotism, helpfulness. These values will come to life both on their own and together with related values." (MoNE, 2019).

Lickona (1996) states that value education "involves a planned effort to cultivate the virtues required to be a good person". If education is a planned and deliberate effort to change desired behaviour, educational materials are considered to be important in the formation of these changes. Textbooks are the main educational materials used by the Ministry of National Education every year and therefore they are considered very important. Textbooks contribute to the renewal process in individuals and society (Özkan, 2010). The Life Studies textbook is the first lesson and textbook that the child meets to combine practice and theory. For primary school first, second and third grade students, the Life Studies course is an important course that aims to raise good individuals by providing important knowledge, skills and values, centring on the individual and creating content (Kaymakçı, 2016). According to Demir (2018), the Life Studies course is the first course that helps to complete the social development of the individual. The visuals of the textbook of the Life Studies course, which is the first course, are as important as the book itself. Teaching tools and textbooks are needed for teaching. Tools and equipment are one of the basic elements affecting the quality of education (Gülener, 2010). It is thought that book visuals are important in terms of making primary school first grade students realise and remind root values. When the time factor is kept constant, people remember 10% of what they read and 30% of what they see (Kaya, 2006).

Visuals, it is seen in the studies that the effect on the mind is more than the texts for children who do not know how to read and write completely. A child who has just learnt to read will read mechanically. In the mechanical reading stage, the context and meaning formation are not sufficiently developed (Baştuğ, 2021). Visual texts can be more permanent for children at this age. In the published textbook, it is also important how much and how the root values are included through visuals. In order to answer these questions, the visuals in the Life Studies's textbook should be analysed. For this reason, in this study, the reflection of the core values in the curriculum of the Ministry of National Education's Life Studies curriculum on the visuals in the textbook was analysed with the Feldman Art Criticism (Pedagogical Criticism) model.

The Feldman Art Criticism model constitutes a more objective approach to interpret artworks. According to Feldman (cited in Mercin & Alakuş, 2005), there are four steps to interpret a work of art. These steps include description, analysis, interpretation and judgement. Description is the so-called pre-structural elements in the work. It is the process of describing the objects seen one after the other. The superficial appearance of the work is explained. What is the theme of the work? What happened in the picture? What do you see? Answers are sought to questions such as. Analysing is the stage of in-depth examination by establishing the relationship between art principles and art forms. At this stage, This can be lead to the analyzing stage; how is the colour? Do warm or cold colours seem more dominant? How did the artist create balance in his/her art? (Daşdağ, 2010). The interpretation stage is a stage in which contemporary and historical meanings of symbols are used for interpretation to facilitate the understanding of the painting. At this stage, answers are sought to questions such as: What does the artist want to tell in his/her work? What elements did the artist use in this work? The judgement stage is the part where the reason for the work is questioned. It is the part where it is stated as a clear content why it is famous, why it is beautiful or valuable (Mercin & Alakuş, 2005).

When the literature is examined, it is seen that studies on Life Studies course and values education have been addressed by various researchers. In this context, Demir (2018), Erbaş (2020), Güzel (2013), and Kale (2015) conducted important studies. However, it is noteworthy that there are few studies examining the effect of visuals on values. In particular, Özkan (2017) analysed the texts and visuals in primary school 3rd grade Life Studies textbooks in terms of values education and found that the value of 'Love' was represented the most and the value of 'Hospitality' was represented the least. Similarly, Hatay Uçar (2019) analysed the Life Studies textbook in terms of values education in terms of visuals and text and stated that the values were mostly reflected through texts. Tokmak and Aktaş (2022) emphasised the importance of visuals in values education in 5th grade social studies textbooks and stated that visuals should effectively convey the targeted values and have an important effect on the perception and understanding of these values by students and teachers. As stated in the literature, perception and understanding of visuals play an important role in values education. In this context, visuals should be used effectively in educational materials and the targeted values should be transferred to students correctly.

In line with that reason, the aim of this study is to interpret and analyse the reflection of the root values on the visuals in the Life Studies textbook, which contains mostly visuals. Based on this main objective, the following sub-objectives were sought to be answered:

How Do the Visuals in the Primary School First Grade Life Studies Textbook Reflect the Root Values?

How is the Frequency of Use of Root Values in the Visuals in the Primary School First Grade Life Studies Textbook?

These sub-objectives aim to evaluate how effectively root values are represented and communicated through the visuals in the first-grade Life Studies textbook.

Method

Qualitative research method was adopted in the study. The visuals that were thought to reflect the root value in the Ministry of National Education Life Studies textbook were selected by the researcher and the field expert. The selected images were classified according to Feldman Art Criticism model (Pedagogical Criticism). After the classifications were made by the researcher, academicians from various universities in Turkey were asked to interpret the visuals and the documents obtained from the interpretations were analysed by document analysis method.

Research Design

The research design is basic qualitative research, which is one of the qualitative research models. Qualitative research can be defined as a qualitative process followed to reveal events and perceptions in their natural environment in a holistic and realistic way by using data collection methods such as interview, observation and document analysis (Yıldırım, 2013). In basic qualitative research, the researcher decides the situations to be observed, the questions to be asked or the relevant documents without going beyond the theoretical framework. While analysing the data, he/she separates and categorises the repeated data and the data related to the study subject from the other data. In the findings section, the themes created according to the data are given meaning with participant comments (Merriam, 2013).

In this study, the use of basic qualitative research method was preferred because, as Merriam (2013) states, it provides an in-depth and detailed understanding. According to Merriam, qualitative research offers meaning and interpretation, contextual depth and rich

descriptions. The purpose of this study is to understand how the visuals in the first grade Life Studies textbook reflect the root values and the impact of this reflection on students. Qualitative research makes it possible to analyse phenomena in their natural settings and to provide detailed descriptions to explain in detail how and how often the visuals reflect the core values. Therefore, Merriam's (2013) basic qualitative research methodology is the most appropriate approach for this study.

Data Collection

Feldman Art Criticism model was used in the research. This model is based on the determination of the visual, the determination of perfection, and the determination of the perception of the accuracy of the structure of the visual. Feldman Art Criticism classification had many dimensions. One of them is pedagogical criticism, which is often used in art education. According to this method, criticism consists of four steps. In each step, different questions are asked and a judgement is reached after the work of art is first analysed superficially and then in depth (Şahin & Yağcı, 2012). Since the aim of this study was to analyse the visuals of the first grade Life Studies textbook, Feldman Art Criticism (Pedagogical Criticism) model was considered to be appropriate. The Root Values and Visual Analysis form (Annex 1) prepared by the researcher were evaluated by the field expert and finalised.

Although observation and interview are the first techniques that come to mind at the beginning of qualitative research data collection techniques, document analysis technique can be used to evaluate the documents related to the research in studies where observation and interview techniques are not appropriate. Document analysis involves the analysis of written and visual materials related to the targeted subject in the research. Analysing written and visual documents is important in terms of obtaining richer and more comprehensive results as it enables collecting information about phenomena or events from different sources, examining and synthesising different perspectives and methods (Baş & Akturan, 2013). The document of this study is the primary school first grade Life Studies textbook, which was accepted as a textbook by the Board of Education for five years starting from the 2019-2020 academic year.

The textbook that constitutes the research document was obtained from a school in Şanlıurfa province, which was used as a textbook in the 2020-2021 academic year. While

examining the textbook, only the visuals were focused on and other sections were not taken into consideration.

The semi-structured open-ended form containing the visuals used in the study was created by the researchers to include seven visuals from each of the six units, totalling 42 visuals. These images were sent to two different field experts to determine the images with high representation power. The images were classified by taking the opinions of the field experts, and 16 images that were thought to be appropriate to be analysed in terms of root values were determined.

The Root Values and Image Analysis Form, which includes Feldman's art criticism and pedagogical criticism stages, was prepared using the 16 selected images. The Root Values and Visual Analysis Form was officially sent to academics working in ten different universities in Turkey. These universities are Trabzon University, Karadeniz Technical University, Kütahya Dumlupınar University, Pamukkale University, İnönü University, Hatay Mustafa Kemal University, Çukurova University, Atatürk University, Gazi University and Harran University. Twenty-four academics were sent e-mails and analyses were made on the data of seven academics who returned.

Analysing the Data

Descriptive analysis was used to analyse the data obtained in this study. During the descriptive analysis, the data collected are summarised and interpreted according to predetermined themes. Researchers can also include the views of the participants in the data obtained through interviews and observations. The aim here is to summarise, organise and interpret the form results (Yıldırım & Şimşek, 2011). In this study, the descriptive analysis technique is employed to systematically examine and interpret the visuals in the first-grade Life Studies textbook, focusing on the representation of root values. According to Patton (2002), Merriam (2013), and Yıldırım & Şimşek (2011), descriptive analysis is ideal for providing a structured and clear summary of data, which is essential for understanding complex content. This technique involves collecting visuals, coding them based on the root values they depict, categorizing these values, and analyzing their frequency. The findings are then interpreted to determine the adequacy and effectiveness of the visuals in conveying root values, providing valuable insights for value education. In descriptive analysis, analyses are made within the framework of certain themes. In this context, the themes in our study consist of ten root values determined by the Board of Education. The data in our study

consist of the themes of respect, love, patience, honesty, friendship, justice, self-control, responsibility, patriotism and benevolence. Sixteen visuals were first described and divided into their elements. Each visual was evaluated in terms of colour, texture, brightness and figure of the elements starting from 1 and associated with the root values. In the evaluation part, which is the last step of Feldman's pedagogical criticism, the success of this visual in reflecting the values in the textbook and the suitability of the visual for the book were evaluated.

When analysing the data, the questions were divided according to the sixteen images selected from the Life Studies textbook. Then, all answers given for these visuals were categorised according to the visual number. The answers written on the forms were categorised by word frequency analysis according to the root values in the Life Studies textbook. Firstly, the frequency of root values in the Life Studies textbook was analysed. As a result of this analysis, the frequency of the root values in the textbook was determined. Then, the reflection status and adequacy of these values were evaluated by analysing the answers in the form. This process continued until the words were repeated in the same category.

Reliability and Validity in Basic Qualitative Research

In order to ensure the validity and reliability of the research, two different field experts, one of whom is an art educator and the other from the field of basic education, were consulted while selecting the visuals from the Life Studies textbook. In the second stage, in order to determine the appropriateness of the model to be used in the analysis, the opinions of a visual media expert and two art educators were taken and the visuals with consensus were selected. While creating a form suitable for the Feldman Art Criticism model to be used in the analysis, a preliminary application was made with the opinion of an expert who had previously conducted academic studies on the Feldman Art Criticism Model. In order to test the text and visual harmony, the clarity and adequacy of the questions, and their suitability for the theoretical part, and necessary revisions were made on the form in accordance with the feedback. The academics who had the opportunity to fill in the forms face-to-face were first interviewed and the subject and context were mentioned, and then the forms were given. The interviews were conducted in an impartial manner. In order to increase the sensitivity of the reliability of the form, disagreement in at least one item was considered as disagreement. Eight of the 10 academics agreed on eight items and two disagreed on two items. In the calculation of the reliability of the research, the reliability formula proposed by

Miles and Huberman (2015) is used. In this formula, Reliability = Agreement / (Agreement + Disagreement). If the result of the reliability calculation is above 70%, the research is considered reliable (Miles & Huberman, 2015). The reliability of the research was calculated as 80% so the research was considered reliable.

Participants Involved in the Research

The participants were numbered with abbreviations such as P1, P2, P3, and the data obtained were organised within the framework of root values, the results were defined and supported by direct quotations of the participants.

Finding

In this section, it is tried to analyse the data obtained in line with the research question and sub-questions of the research. In addition to this, the views of the participants who participated in the research were also included and the data were explained. Since the visuals in the first grade Life Studies textbook reflect more than one value, the selected visual samples include more than one value.

How Do the Visuals in the Primary School First Grade Life Studies Textbook Reflect the Root Values?

In this part of the study, the findings related to the aim of how the visuals in the first grade Life Studies textbook reflect the root values are presented. It is seen that all root values (justice, friendship, honesty, love, respect, responsibility, patience, self-control, benevolence, patriotism) are used in the visuals. When the visuals are analysed, it is seen that the root values are tried to be reflected indirectly in the visuals by containing more than one root value. A single value was not reflected in a visual, values were used together. The values most associated with each other are love and respect. When we look at the combination of the answers given by all participants in the research, it is seen that the values of love and respect are used together 56 times. In the root values of respect and love, the root value of respect was used together with the root value of love in all these uses. In a total of 60 interpretations determined by the unanimous interpretation of the participants, which are thought to reflect the value of love, it is seen that the root value of respect is not reflected in the visual. P6 associated the root value of respect with the root value of love in the 1st visual, P3 in the 1st and 3rd visuals, and P2 in the 1st visual.

The other root values that were found to be reflected by associating with each other are responsibility and self-control. Five participants (P1, P2, P3, P5, P6) stated that these two root values were used together to create meaning in the visuals. As a result of the analysis of the answers written by the participants on the form, it is seen that the root values of self-control and responsibility are mostly reflected on Visual 8. For Visual 8, P5 said, "Polluting the environment depicts a bad habit. The visual may be related to the root values of self-control, respect and responsibility."

Image 1.



Image 3.



Image 8.



For visual 8, P3 said: "The value of self-control, one of the root values, is emphasised, and the lack of this value is tried to be visualised. The element of respect was visualised by referring to negativity." Visuals depicting root values such as love, respect, honesty and responsibility were used to depict sociality and the social environment. The values of love, respect, honesty and responsibility, which one can also feel for oneself, were not encountered in the visuals. In the visuals examined, colours were an element used to reflect the root values. It is seen that bright and vivid colours were mostly used to reflect root values such as love, friendship and respect. In visual 15, which all participants thought to contain the root value of love, bright and vivid colours were used in parallel with all the data.

Image 15.



How is the Frequency of Use of Root Values in the Visuals in the Primary School First Grade Life Studies Textbook?

It was tried to answer the sub-problem under this title, "how is the frequency of use of root values in the visuals in the first grade Life Studies textbook ?" The findings regarding the adequacy and frequency of use of the root values in the visuals in the Life Studies's textbook are presented as headings within the framework of the ten root values in the Life Studies's textbook.

How is the Frequency of Use of the Root Value Justice in the Visuals in the Primary School First Grade Life Studies Textbook?

As a result of the analysis of the visuals reflecting the root value of justice in the Life Studies's textbook, it was determined that it was visualised 4 times. P1: 2, 12; P2: 4, 5; P3: 2, P4: 2 stated that the value of justice was visualised in the images numbered 2. P5 used the following expressions in the comment section of the form in visual 4, which he thought reflected the value of justice;

"The excitement of children playing games is felt. There may be root values of justice, friendship, honesty, love, respect, responsibility in the composition. The friendship of the children is understood from the way they laugh and look at their friends while running. Giving rights to boys and girls in the same game represents justice."

Image 4.



P2, on the other hand, about the value of justice and its reflection in the second visual, said, "By sharing the same classroom environment with students with disabilities and students without disabilities, a justice emphasis is made in the direction of equality of opportunity." P4, for the reflection of the root value of justice on the visual "(...) The fact that people with disabilities are also included in formal education shows that root values such as justice, friendship, respect, love and benevolence are being taught. She wrote the following statements. P7 used the following expressions regarding the processing of the value of justice in visual 5;

"Smiling facial expressions create a positive effect. It is seen in the visual that all students are outside and having fun freely. Whoever wants to read his book, whoever wants to play his game, whoever wants to talk to his teacher. The visual may be related to the root values of justice, friendship, honesty, self-control, patience, respect, love, responsibility."

Image 2.



Image 5.



As a result of the analysis of the visuals and the data of the participants regarding the adequacy of the root value of justice, it was seen that the three visuals; 2, 12 and 4 visuals were sufficient to reflect the root value of justice. P4 stated that the visuals were insufficient to reflect the root value of justice and that the visuals should be improved and suggested, "A figure holding a wheelchair should be added to increase the emphasis."

Image 2.



Image 4.



How is the Frequency of Use of the Root Value of Friendship in the Visuals in the Primary School First Grade Life Studies Textbook?

The value of friendship was used a total of 22 times in 7 different visuals in the Life Studies s textbook in association with other values. P1: 2, 9; P2: 5, 6, 7, 9, 10; P3: 2, 5, 9; P4: 2, 4, 5; P5: 4, 9; P5: 1, 5; P7: 2, 3, 4, 5, 9, 10. stated that the value of friendship was included in the visuals. No visuals were found in which the value of friendship was visualised alone. It was observed that the value of friendship was frequently used together with values such as love and respect. P2 used the following expressions for visual 5 in this regard;

"It reminds me of the days I spent in the school garden, it gives me a warm and sincere feeling, children playing games and reading books, in fact, in contrast to the grey cityscape in the background, it seems to emphasise the warm and beautiful aspects of life, here I see values such as love, respect and friendship"

Image 5.



P7 stated that visual 10 has the root value of friendship and love. P7 emphasized that, "In the visual, a child watching a cartoon is illustrated that in the visual, and the value of animal love is tried to be gained through the visual, and the visual contains the root value of friendship and love."

As a result of the analysis of the visuals in which the root value of friendship was reflected, it was seen that the value of friendship, which was used 22 times in 7 different visuals, was sufficient 19 times and insufficient 3 times. P2 found the reflection power of the friendship value tried to be reflected in visual 5 insufficient. He conveyed the following statements;

"The disabled student is far behind. The concept of teacher emphasised here is reading books, not only games but also activities such as reading books and chatting. In order for the concept of friendship to be more emphasised, the disabled student should be brought to the forefront."

How is the Frequency of Use of the Root Value of Honesty in the Visuals in the Primary School First Grade Life Studies Textbook?

The root value of honesty was visualised 3 times as a result of the analysis of the visuals in which the root value was reflected in two different visuals in the first grade Life Studies's textbook. P2: 4; P7: 4,5. stated that the value of honesty was visualised in the visuals. K2 and K7 stated that the value of honesty was emphasised in 4 visuals. K2 stated that the root value of honesty was found in visual 5. It is seen that the root value of honesty is visualised with other root values.

P2 stated, "The composition can be about the root values of friendship, honesty, justice, love, respect, and responsibility." P2 also added that the expression "The power of reflecting the value of honesty in the visuals used was considered sufficient by 2 participants in 3 uses."

How is the Frequency of Use of the Root Value of Self-Control in the Visuals in the Primary School First Grade Life Studies Textbook?

In the first grade Life Studies's textbook, the value of self-control was visualised 14 times in 9 different images. K1:1,4,5; K2: 5, 8, 11; K3,8,14; K4: 8,14; K5:8, K6:8; K7:11,12.

Stated that the value of self-control was visualised in the visuals. P5 "The bad habit of polluting the environment is specified. The visual may be related to the root values of self-control, respect and responsibility." While the root value of self-control was seen as sufficient 12 times in 14 uses, it was seen as insufficient in 2 uses. P2 used the following expressions for the 11th visual:

"It makes me wonder who left the taps on. More precisely, it is a bit disturbing that there is no one in this image. I think it would have been more understandable if there were children playing in the bathroom or if there were mothers/fathers with the children. A single value related to self-control and responsibility must have been tried to be given here."

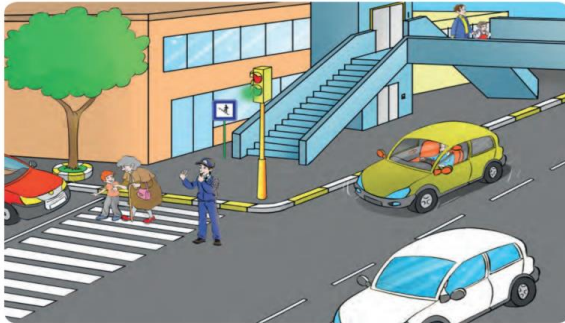
Image 11.



How is the Frequency of Use of the Root Value of Patience in the Visuals in the Primary School First Grade Life Studies Textbook?

In the first grade Life Studies's textbook, the root value of patience was visualised in 9 uses in 7 different visuals. P1: In the 16th visual; P2: In the 4th, 14th, 16th visual; P3: In the 1st, 4th, 14th visual; P5: In the 5th, 12th visual, the root value of patience was visualised. For visual 12, P5 stated that "(...) the visual elements of pedestrians crossing the green light, pedestrians stopping at the red light, cars, traffic police reminded the traffic rules. The visual may be related to the root values of patience, respect, love, responsibility and benevolence."

Image 12.



P3 explained the reflection of the root value of patience with the 14th visual as follows "There are concrete figures and figures of what the root value of patriotism is present, love for the flag is present, respect is present here. demonstrated that there is a commander in the front and soldiers in the back shows that there is self-control, order. Patience is seen in maintaining with order."

Image 14.



Regarding the sufficiency of the root value of patience in the Life Studies's first grade textbook, the participants stated that it was sufficient in 7 different visuals and 9 uses.

How is the Frequency of Use of the Root Value of Respect in the Visuals in the Primary School First Grade Life Studies Textbook?

In the first grade Life Studies's textbook, the root value of respect was visualised 56 times in 16 different visuals. The findings of the participants are presented in a table.

Table 1.

Participant Number	Selected Image Number
P1	1, 2, 3, 5, 6, 8, 9, 12, 13, 15, 16
P2	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15
P3	1, 3, 4, 6, 7, 13, 15, 14
P4	1, 2, 3, 4, 5
P5	1, 3, 6, 7, 10, 15
P6	2, 5, 6, 7, 14, 15
P7	1, 3, 6, 7, 12, 15

P3, for the root value of respect in visual 1: *"A familiar situation is presented for all individuals going to school. It is seen that the value of respect is reinforced by raising the flag with a posture of respect and the value of patriotism is glorified and reinforced by accompanying the anthem that every individual attending the school participates in."*

Image 1.



Image 5.



For the 5th visual, P4 said, "The need for children to participate in physical activities outside the classroom was emphasised. The root values of friendship, self-control, respect, love, responsibility and benevolence were emphasised."

P1, for visual 3: *"In the visual, the student-teacher relationship and greeting each other are emphasised. The importance of giving and receiving greetings and being smiling is tried to be depicted. The visual contains the root values of friendship, respect and love."*

P3 said for visual 15: *"Here, it is intended to reflect the holiday scene. When we look at this visual, it is aimed to emphasise the importance of feasting. Respect is more prominent, love is also present. Responsibility: handing out the candy and can be an example of responsibility. Maintaining*

and teaching customs and traditions and passing them on to future generations is a matter of patriotism."

Image 15.



Image 8.



In the Life Studies first grade textbook, the root value of respect was used for 48 uses of the adequacy of use in visuals. For 8 uses, inadequate should be improved expressions were used. For the 3rd visual, P1 said:

"The fact that the teacher in the visual does not make eye contact with the student gives the impression that it was added to the picture later, and eliminating this will ensure that the visual is included in the books." While P3, for the value of respect reflected in visual 8, said, "The element of respect is also visualised negatively. Instead of presenting the negative to the student, it is necessary to give the positive form of respect. I wish there was a figure picking up the rubbish from the ground."

How is the Frequency of Use of the Root Value of Love in the Visuals in the Primary School First Grade Life Studies Textbook?

In the first grade Life Studies textbook, the root value of love is represented 60 times in 14 different visuals. In line with the answers given to the form, the findings of the participants are presented in a table.

Table 2.

Participant Number	Selected Image Number
P1	1, 5, 6, 7, 9, 13, 14, 15, 16
P2	2, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, 15, 16
P3	2, 5, 6, 7, 10, 15, 16
P4	1, 2, 3, 4, 5
P5	5, 6, 7, 10, 15
P6	2, 4, 5, 6, 7, 9, 12, 13, 14, 15, 16
P7	2, 3, 5, 6, 7, 10, 14, 15, 16

P1 gave the following answer for visual 13, in which the root value of love was used "In the visual, children celebrating the 23 April holiday with joy are visualised. In the visual,

our national holidays and how to use them are introduced. The visual contains the root value of patriotism and love.

Image 13.



Image 9.

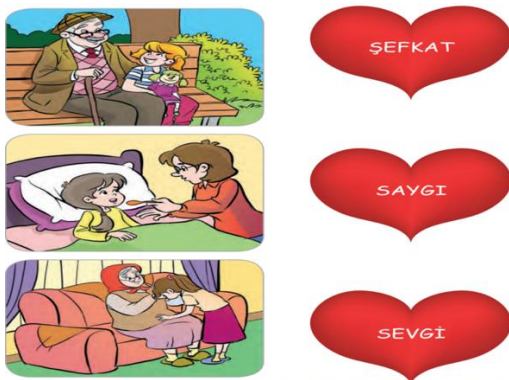


For visual 9, P2 said, "(...) the root value of love may have been emphasised. Two children sharing breakfast together may also have emphasised the importance of breakfast for children." For visual 4, P2 said, "It interprets a happy moment of the students. We see a happy, fun moment at school. There is respect and patience, waiting in line, those in the back support those in the front, and from this, the root value of love is understood.

Regarding the adequacy of the use of the root value of love in the first grade Life Studies s textbook, the participants stated that 53 uses were sufficient and 7 uses were not sufficient and that the visuals should be improved. P2 stated that visuals 7, P3: 3.; P5: 5. 7. and 10. P6: 14.15, 16 were insufficient. P2 wrote the following statement for visual 7:

"The mother feeding the child reminds me of compassion, the old man and the child sitting side by side reminds me of love, and finally the child kissing the old woman's hand reminds me of respect. Root values such as respect, love, responsibility and patience were emphasised. Matching is a successful idea in terms of seeing what children understand these words, but the pairings and visual equivalents were used incorrectly."

Image 7.



P5 said for the 7th visual: "The 1st visual expresses love, the 2nd visual expresses compassion, the 3rd visual expresses respect better, there may be a mistake in the pairings, it is an inadequate visual."

P2 for the 7th visual: "Compassion, respect, love, we already see these in the pictures, and repeating them in the heart causes perceptual confusion and dictation. Here, it should be left to the child's interpretation a little more. The root value of patience is in the image with the mother and the child, and the root value of respect is the respect given by the elder to the younger and the younger to the elder. These pictures should be used one by one and the hearts on the side should not be there. It is an inadequate visual".

P3 used the following expressions for the adequacy of the 3rd visual: "A visual that needs to be improved, although it seems to describe an innocent communication in the picture, the fact that the male adult figure, who is probably the garden guard, is behind the male adult figure, damages the mutual respect situation and causes an overwhelming superiority opening. Instead, a more sincere way of expression in which mutual respect is seriously experienced should be preferred."

Image 3.



Findings on the Sufficiency and Frequency of Use of the Root Value of Responsibility in the Visuals in the First Grade Life Studies Textbook

It was determined that the value of responsibility was used 45 times in 16 different uses in the visuals in the first grade Life Studies's textbook. In line with the answers given to the form, the opinions of the participants are presented in a table.

Table 3.

Participant Number	Selected Image Number
P1	1, 2, 3, 4, 6, 7, 12, 11, 13, 14, 16.
P2	4, 6, 7, 8, 10, 11, 12, 15, 16.
P3	3, 5.
P4	1, 2, 3, 4, 5.
P5	8, 12, 16.
P6	1, 6, 7, 8, 11, 12, 14, 16.
P7	4, 8, 11, 12, 16.

It was observed that the root value of responsibility was reflected in the visuals. P2 used the following expressions about the reflection of the root value of responsibility on the visual number 10: "The visual contains the message that the child who watches the exemplary behaviours of his/her peers will be positively affected by animal love. The visual may be related to the root values of friendship, love, respect and responsibility."

Image 10.

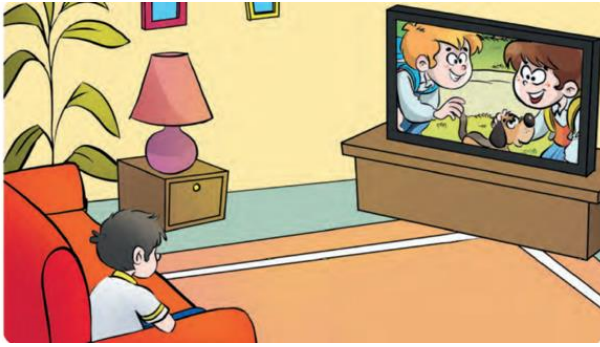


Image 11.



The root value of responsibility was found to be sufficient in 37 uses and insufficient in 8 uses in the visuals in the first grade Life Studies textbook. P1 used the expression "partial changes should be made, not irresponsibility but responsibility awareness should be given with the right example" for the 11th visual. P3 found the 11th visual inadequate and said, "I do not think that a child who sees this picture in the national education book will gain much, it will be more efficient to give the value of responsibility by associating it with positive". P2 made the following statements about the adequacy of the 16th visual.

Image 16.



"In order to leave a good trace in the visual memory of the students, the book may include a poster and visuals supporting the poster, but this is not enough for visual support. There should be other visuals related to recyclable wastes so that the root values of love and respect for nature can be further reinforced."

Findings on the Adequacy and Frequency of Use of the Patriotism Root Value in the Visuals in the First Grade Life Studies Textbook

It is seen that the frequency of use of the root value of patriotism in the visuals in the first grade Life Studies's textbook is reflected in 20 uses in 7 different visuals. The determinations of the participants are presented in a table.

Table 4.

Participant	NumberSelected Image Number
P1	1, 13.
P2	12,14.
P3	5, 12, 13, 14, 15.
P4	1
P5	1,13, 14.
P6	1, 13, 14.
P7	1,13, 14, 16.

When the answers given to the form were analysed, P5 said for the 13th visual: "The root value of patriotism was processed in the visual in which one of the moments of national celebration was conveyed", while P4 said for the 1st visual,

"School is a warm home. This was the first impression for me, the visual was intended to express gratitude and respect for the flag, homeland and the founder of the republic. Root values such as love, respect and patriotism in the National Education Programme were tried to be processed."

Image 1.



It was determined that the root value of patriotism was sufficient in 16 uses and insufficient in 4 uses in the visuals in the first grade Life Studies textbook. For the 1st visual, P1 said "There is stagnation in the visual. In order to eliminate this, the visual can be animated by adding small shapes and flags to the windows. The root value of patriotism is reinforced and these changes need to be made.",

P3: *"Everyone waves the flag in a fair way, there is justice and respect. Patriotism is the most prominent root value, but since the colours of the visual and the background of the wall are the same, the root values to be emphasised are drowned due to the colours of the visual and the expression becomes difficult."*

Findings on the Sufficiency and Frequency of Use of the Root Value of Benevolence in the Visuals in the First Grade Life Studies Textbook

It is seen that the frequency of use of the root value of benevolence in the visuals in the first grade Life Studies's textbook is reflected in 6 different visuals and 16 uses. The determinations of the participants are presented in a table.

Table 5.

Participant Number	Selected Image Number
P1	2, 9, 12.
P2	1, 2.
P3	1, 12.
P4	2,5.
P5	2, 12.
P6	6, 12.
P7	2, 9.

When the answers given to the form were analysed, P2 said for the 12th visual: *"The feeling of goodness and benevolence stands out in the visual. Pedestrians crossing at green light, cars stopping at red light, traffic police reminded the visual elements in traffic rules. The visual may be related to the root values of patience, respect, love, responsibility and benevolence."* He included the following statements.

Image 9.



Image 12.



For the 6th visual, P1 said, "When I look at the visual, I see that the root values of friendship, respect, love and benevolence want to be given". The value of benevolence is adequately reflected in all 16 uses of the visuals in the first grade Life Studies textbook. P7 used the following expressions about the adequacy of reflecting the root value of benevolence in the 9th visual

"In the visual, students who eat and share their food with their friends are depicted. In addition to helpfulness, it is a useful visual that can be emphasised on healthy nutrition and its subject. The visual contains the root value of friendship and helpfulness. It is an image that should be included in primary school first grade books. The topics of benevolence and healthy eating can be easily discussed and discussed through the visual. I found it valuable in terms of harbouring two different first subjects."

Discussion and Conclusion

Children start primary school education with the Life Studies textbook. When we look at the literature, the concept of value is usually conveyed through text and visuals. In this sense, the Life Studies textbook is a book prepared to add value to students (Özkan, 2017). Visuals of textbooks are remembered in students' memories more than texts. Visual intelligence is said to be the first language used by the human brain. For this reason, the quality of the visuals to which the person is exposed also affects the development of visual intelligence (Başaran, 2004). In this context, first grade Life Studies textbook and visuals are important in learning. The permanence of visual learning is more effective than learning by reading or hearing (Arslan & Ergin, 2010).

Since the first grade Life Studies textbook is a textbook that has the responsibility of bringing the student closer to the school environment and introducing the school environment at the beginning of the school years, the pictures in this book are illustrated in accordance with the psychological and artistic stages of the child, which increases the child's

interest in the book (Gürol, 2002). The academicians who responded to the form in the study support this view. The fact that the visuals selected in the study were not suitable for the developmental level in reflecting the root values and the reflection of the root values on the visuals was found to be insufficient supports this view. Gürol's study conducted in 2002, in the same study, found the suitability of the colours to the subject inadequate and argued that the typesetting in the drawings negatively affected the learning and perception of the child in visual education. In our study, although there is no data on the typefaces, it is seen that the colours are used brighter and more balanced compared to Gürol's study conducted in 2002.

It is seen that the textbook with the highest frequency of reflection in terms of the subject of values among the Life Studies textbooks is the third grade Life Studies textbook (Erbaş, 2020). More visuals should be included for first-grade students who are in the concrete operations period. It is thought that this ratio in third-grade textbooks should not be reduced, but the visual density and adequacy of visuals in first-grade textbooks should be increased to create books suitable for students' developmental levels. Learning values is a cognitive process. Individuals have different learning areas. In this context, it is very important that the Ministry of National Education takes into account the areas of intelligence while preparing textbooks. Another study conducted by Erbaş (2020), identified 574 value-expressing contents in the first grade Life Studies textbook and stated that 212 of them were conveyed through visuals. Although 212 visuals give quantitative data, it is thought that the quality of these visuals should be given importance beyond the number of these visuals, since the quality of the visuals was not examined as a result of this research. In this study, for the relevant age group, the opinions of academicians who state that the visuals are insufficient in conveying the value message and that the visuals are insufficient in an artistic sense without aesthetic concerns in reflecting the values are included.

Although there is no study examining only the visuals of the Life Studies textbook in terms of root values, the fact that one of the most common values in the textbooks examined by Doğan and Gülüşen (2011), Kuş, et al. (2013), is the value of responsibility supports the result of this study. However, these studies were analysed only in terms of text or visual harmony with text. Understanding students' responsibilities, especially in primary school, will help them to be more sensitive to themselves and their environment in the future. It can

be predicted that the widespread use of responsibility value in textbooks can help children recognise and assume responsibility.

Özkan (2017), Kuş, et al. (2013) found that honesty, patience, and justice were among the least common values in the textbooks they examined. These results are summarised in the research. The findings of Doğan and Gülüşen (2011) also support the findings of our study. Doğan and Gülüşen (2011) stated that the values of animal love, hospitality and consistency were used more frequently in the textbooks they analyzed. In this study, the value of animal love was not only analyzed in terms of root values, but it was also observed that animal love was tried to be reflected in visuals as a sub-visual message in the root value of love. It is thought that animal love is an important value like other values.

Güzel (2013) included the values of hospitality and peace, while Candan and Ergen (2014) concluded that the most frequently used value in the Life Studies's textbook was the value of love. In their research, they stated that the reason why the value of love is frequently included in the Life Studies's textbook is not related to the developmental periods of this value, but because the value of love is always a meaningful and important value. As a result of our research, it was determined that the root value of love was used together with many concepts such as flag, nation, friend, book, animal in the third grade Life Studies's textbook. Based on the research findings, it was concluded that the root value of love was the most frequently used root value in this study. The value of peace, on the other hand, is not included among the root values in the Life Studies course curriculum.

In a study conducted by Öztürk (2015), it was concluded that students only respect people older than themselves. When the findings obtained in our research are examined, it is seen that the root value of respect is tried to be visualised by aiming to make students respect each other's rights, not only to older people in the case of reflection of the root value of respect in visuals.

The values of justice and honesty are important and meaningful values that should be included in the Life Studies's textbook at least as much as the value of love. Concepts such as justice and honesty, which play an important role in character formation and social dynamics, should be frequently included in this period when the foundations of values are laid. In the research conducted by Hatay Uçar (2019), it was concluded that the root values of honesty, justice and patience were the least included root values and that these root values were only covered in the questions section and not in the visuals. Again, Hatay Uçar (2019)

stated in his research that values are conveyed through texts at most compared to visuals. This result also supports the findings of our research. Frequent inclusion of the root value in textbooks will positively affect students' access to this value. Therefore, it can be thought that this ratio is not sufficient to achieve the aim of students to acquire the value of honesty. The least common values in the textbooks they checked in their studies were honesty, patience or justice. Again, the least common value in this study was honesty, patience or justice.

As a result of the research, in line with the findings obtained from the academicians participating in the research, it was understood that the least used root value was honesty and the most used root value was love. After honesty, the least used values are justice, patience, self-control, benevolence, patriotism, friendship, responsibility and respect.

As a result of the research, it was concluded that the root values of respect and love were generally used together in the visuals. It was concluded that the most successful root value in terms of the adequacy of the reflection of the root values in the visuals was the root value of benevolence and honesty. While the root values of love, respect, friendship, benevolence, patriotism and honesty were adequately reflected in the visuals, the root values of self-control, responsibility, patience and justice were not adequately reflected in the visuals. The reflection status, adequacy and frequency of the visuals in the primary school first grade Life Studies textbook in terms of root values were determined. In accordance with the results obtained from the study, the following suggestions can be made.

1. The committee that prepared the first grade Life Studies's textbook could give more space to the values of honesty, justice and patience. This may be effective in eliminating the deficiency in the visuals in the current textbooks.
2. Research can be conducted on the concept confusion of the root value of love and respect in the visuals in the first grade Life Studies's textbook.
3. In order to improve the Life Studies textbooks, it is recommended to increase the number of graphic designers, illustrators and designers who are experts in the field of visual arts in the committee that prepares the textbooks.
4. While creating the visuals of Life Studies textbooks, it is recommended to organise nationwide projects and competitions for publishing houses, artists and graphic designers to create book visuals.

5. Working with a wider team while creating visuals and producing visuals with more artistic message value in terms of visuals can have a positive effect on students' acquisition of value.

Ethical Committee Permission Information

Name of the board that carries out ethical assessment: Dicle University Social and Humanities Scientific Research and Publication Ethics Board

The date and number of the ethical assessment decision: 25.01.2021 -12346

Author Contribution Statement

Ayşe ÖZÇINAR: *Conceptualization, literature review, data curation, methodology, implementation, data analysis, original draft, language editing, and writing.*

Fatih YILMAZ: *Conceptualization, methodology, implementation, data analysis, original draft, language editing, and writing.*

References

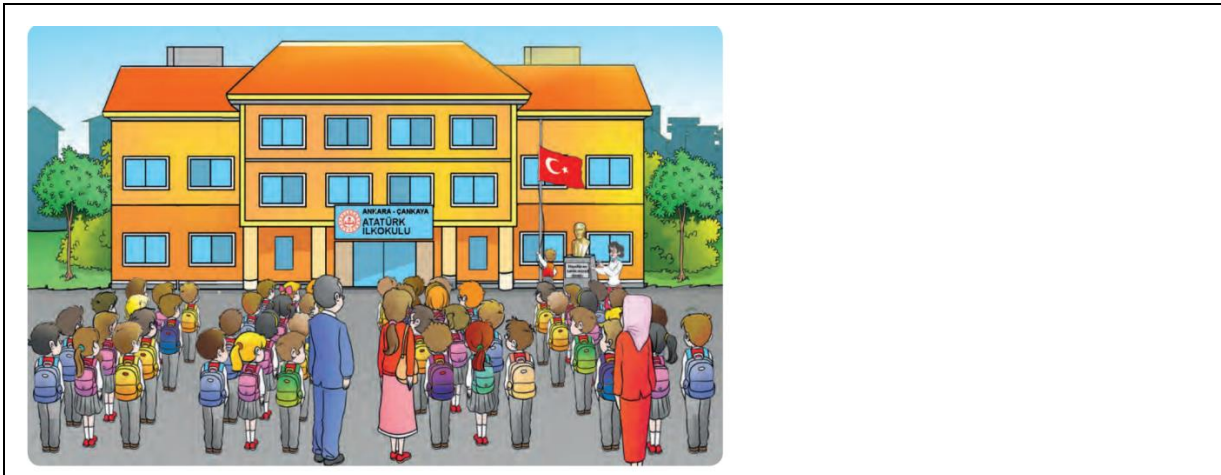
- Alakuş, A. O., & Mercin, L. (2005). Sanat eleştirisi ve pedagojik eleştiri yönteminin incelenmesi. [Analysis of art criticism and pedagogical criticism methods.] *Dicle Üniversitesi Ziya Gökalp Eğitim Fakültesi Dergisi*, 5, 36-46.
- Arslan, M., & Ergin, A. (2010). Effective usage of audiovisual materials in teaching Turkish to foreigners. *Dil Dergisi*, 147, 63-86.
- Baş, Ü., & Akturan, U. (2013). *Nitel araştırma yöntemleri* (3. Baskı). [Qualitative research methods (3rd Edition)]. Seçkin Yayıncılık.
- Başaran, B. I. (2004). Etkili öğrenme ve çoklu zekâ kuramı: bir inceleme. [Effective learning and multiple intelligences theory: a review]. *Ege Eğitim Dergisi*, 5(1).
- Baştuğ, M. (2021). *Akıcı okumayı geliştirmek: kavramlar, uygulamalar, değerlendirmeler*. [Developing fluent reading: concepts, practices, evaluations]. Pegem Akademi.
- Candan, D. G., & Ergen, G. (2014). 3. Sınıf hayat bilgisi ders kitaplarının temel evrensel değerleri içermesi bakımından incelenmesi. [Examination of 3rd grade Life Studies textbooks in terms of containing basic universal values]. *Uşak Üniversitesi Sosyal Bilimler Dergisi*, 7(1).
- Daşdağ, F. E. (2010). Sanat eseri eleştirisine bir örnek: Üçüncü mevki vagon. [An example of art criticism: third-class carriage]. *Elektronik Sosyal Bilimler Dergisi*, 9(33), 378-386.
- Demir, F. (2018). *Değer öğretimi yaklaşımlarına göre hayat bilgisi dersinde değerler eğitimi*. (Yayımlanmamış Doktora Tezi). [Values education in Life Studies's course according to values education approaches. İnönü Üniversitesi, Malatya.
- Doğan, B., & Gülüşen, A. (2014). Türkçe ders kitaplarındaki (6-8) metinlerin değerler bakımından incelenmesi. [Examination of texts in Turkish textbooks (6-8) in terms of values]. *Kilis 7 Aralık Üniversitesi Sosyal Bilimler Dergisi*, 1(2), 75-102.

- Erbaş, A. A. (2020). *Hayat Bilgisi dersi kapsamında değerler eğitimi üzerine bir araştırma: beklentiler, uygulamalar ve öneriler.* (Yayınlanmamış Doktora Tezi). [A research on values education within the scope of Life Studies course: Expectations, practices and suggestions. İstanbul Üniversitesi, İstanbul.
- Gülener, S. (2010). *Hayat Bilgisi dersi öğretim programına ilişkin öğretmen görüşlerinin değerlendirilmesi (Şanlıurfa ili örneği).* (Yayınlanmamış Yüksek Lisans Tezi). [Evaluation of teachers' opinions on the Life Studies course curriculum (Şanlıurfa province example). (Unpublished Master's Thesis)]. Erzincan Üniversitesi, Erzincan.
- Gürol, A. (2002). *İlköğretim 1. Sınıf Hayat Bilgisi ders kitaplarında bulunan resimlerin çocuğun eğitimine etkileri.* (Yayınlanmamış Yüksek Lisans Tezi). [The effects of the pictures in the 1st grade life studies textbooks on the child's education. Gazi Üniversitesi, Ankara.
- Güzel, D. (2013). *3. Sınıf Hayat Bilgisi kitaplarının evrensel değerleri içermesi bakımından incelenmesi.* (Yayınlanmamış Yüksek Lisans Tezi). [3. Grade Life Studies books in terms of universal values. Çanakkale Onsekiz Mart Üniversitesi, Çanakkale.
- Hatay Uçar, F. (2019). *İlkokul Hayat Bilgisi hayat bilgisi ve Sosyal Bilgiler ders kitaplarında değerler eğitimi.* (Yayınlanmamış Yüksek Lisans Tezi). [Values education in primary school Life Studies and social studies textbooks. Mustafa Kemal Üniversitesi, Hatay.
- Kaya, Z. (2006). *Öğretim teknolojileri ve materyal geliştirme.* (2.baskı). [Instructional technologies and material development. (2nd ed.)]. Pegem Yayıncılık.
- Kaymakçı, S. (2016). "Hayat bilgisinde değerler eğitimi" (Ed. Refik Turan ve Kadir Ulusoy). Farklı yönleriyle değerler eğitimi içinde. [Values education in Life Studies" In different aspects of values education]. (s.367-388). Pegem A
- Kuş, Z., Merey, Z., & Karatekin, K. (2013). İlköğretim 4. ve 5. sınıf Sosyal Bilgiler ders kitaplarında yer alan değerler. [Values in 4th and 5th grade Social Studies textbooks]. *Değerler Eğitimi Dergisi*, 11(25), 183-214.
- Lickona, T. (1996). Eleven principles of effective character education. *Journal of Moral Education*, 25(1), 93-100.
- Milli Eğitim Bakanlığı [MEB]. [Ministry of National Education (MoNE)]. (2019). *Hayat Bilgisi dersi öğretim programı (İlkokul 1, 2 ve 3. Sınıflar).* [Life Studies curriculum (Primary school grades 1, 2 and 3)]. Devlet Basımevi.
- Merriam, S. B. (2013). [Nitel araştırma desen ve uygulama için bir rehber. A guide to qualitative research design and implementation]. (Çev. Turan, S.). Nobel Yayıncılık.
- Miles, M. B., & Huberman, A. M. (2015). *Nitel veri analizi.* [Qualitative data analysis]. (Çev. Ed. Akbaba Altun S., ve Ersoy A.). Pegem A.
- Özkan, R. (2010). Türk eğitim sisteminde himayeci değerler: ilköğretim ders kitapları örneği. [Patronizing values in the Turkish education system: An Example of primary school textbooks]. *Uluslararası İnsan Bilimleri Dergisi*, 7(1), 1124-1141.
- Özkan, Z. S. (2017). *Hayat Bilgisi ders kitaplarındaki metin ve görsellerin değerler açısından incelenmesi.* (Yayınlanmamış Yüksek Lisans Tezi). [An analysis of texts and visuals in life studies textbooks in terms of values. Ordu Üniversitesi, Ordu.

- Öztürk, N. (2015). Saygı değerine ilişkin öğrenci görüşleri. [Student opinions on the value of respect]. *Bartın University Journal of Faculty of Education*, 298-305.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Sage Publications.
- Sağlam, H. İ. (2020). *Karakter ve değer eğitimi*. [Character and values education]. Pegem A.
- Şahin, D., & Yağcı, M. M.,(2012, September). *Okullarda sanat eleştirisi öğretiminin önemi*. Sempozyum: 21. Ulusal Eğitim Bilimleri Kongresi, [The Importance of teaching art criticism in schools. Symposium: 21st National Congress of Educational Sciences]. İstanbul.
- Yıldırım, A. & Şimşek, H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri*. [Qualitative research methods in social sciences. (9th Edition)] Seçkin Yayıncılık.

Annex 1.

Görsel1.



Feldman Modeline Göre Görsel 1'in Sanat Eleştirisi.

BETİMLEME: (Görülenlerin tanımlanmasını yapınız. Resimde hangi nesnelere görüyorsunuz, hangi dokular, biçimler, renkler mevcut. Renkler canlı ve parlak mı kullanılmış, yoksa tersine mi? Görsel hakkındaki bilgileri, açık ve somut bir şekilde belirtiniz.)

ÇÖZÜMLEME (ANALİZ): Betimleme bölümünde vermiş olduğumuz cevapların her biri birbiriyle nasıl bir ilişki sergiliyor? Bahsi geçen tasarım unsurları birbiriyle ilişkili olarak nasıl organize edilmiş, nasıl birbirini tamamlıyor, nasıl bir armoni oluşturuyor veya nasıl bir rahatsızlık veriyor bu tasarım bozuklukları nelerdir? Ritim, çeşitlilik, Denge, vurgu, Hareket v.b. yönden ele alınız.

YORUM: Görsele bakarken ne hissediyorsunuz?

Görsele bakarken ne düşünüyorsunuz?

Görselede ne anlatmak istemiş?

Görselede Milli Eğitim programında yer alan hangi değerler verilmek istenmiştir?

YARGI:

Bu görsel ilköğretim 1.sınıf ders kitabında yer almalı mı almamalı mıdır? Nedeniyle yazınız.

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article

The Examination Affecting ICT Self-Efficacy and Online Information Practices via Structural Equation Modeling: PISA 2022 Türkiye Sample

Berk DÜNDAR¹  Melek Gülşah ŞAHİN^{2,*} 

¹ Gazi University, Türkiye, berk.dundar@gazi.edu.tr

² Gazi University, Türkiye, mgulsahsahin@gazi.edu.tr


* Corresponding Author: mgulsahsahin@gazi.edu.tr

Article Info

Received: 19 March 2024

Accepted: 29 May 2024

Keywords: PISA 2022, ICT self-efficacy, online information practices, structural equation modeling

 10.18009/jcer.1455199

Publication Language: English

Abstract

In this study, it is aimed to examine the relationship between ICT self-efficacy perceptions and online information practices in PISA 2022 student questionnaire and ICT related factors. A predictive correlational research design was preferred to examine the variables predicting students' self-efficacy perceptions and online information practices towards information and communication technologies. PISA 2022 Türkiye data was used in the study. Research data was obtained from 8 data collection tools that were indexed by OECD and converted into 6 variables. Structural equation model was established with this data and MLR was used as the estimation method. In the tested structural equation model, the RMSEA value was calculated as .04, SRMR as .02, CFI as .99 and TLI as .96. As a result of the analysis, all path coefficients were significant and the values of the fit indices indicated perfect fit.



To cite this article: DüNDAR, B. & ŞAHİN, M.G. (2024). The examination affecting ICT self-efficacy and online information practices via structural equation modeling: PISA 2022 Türkiye sample. *Journal of Computer and Education Research*, 12 (24), 370-382. <https://doi.org/10.18009/jcer.1455199>

Introduction

Today, information and communication technologies (ICT), which we encounter in almost every aspect of life, are becoming important stakeholders in the education sector. ICT, which refers to electronic tools used in the creation, modification, storage, and sharing of information, includes technologies such as the internet, computers, and telephones, as well as radio, television, audio and video recording devices, and satellites (Peña-López, 2009). These technologies, which affect every aspect of life in some way, create dynamic changes in society, and the effects of these changes on education are increasing daily (Mikre, 2011). While societies that can use ICT effectively in the process of creating and using knowledge develop economically and socially (Erdal, 2012; Miller & Atkinson, 2014), the use of ICT in the learning-teaching process is a requirement for raising individuals who will be a part of

the information society. Technology nowadays plays a vital role in the interaction between society and knowledge (Hernandez, 2017). Since the new members of society are born and grow up in technology, it can be said that the new generation cannot be considered in isolation from ICT. In addition, ICT literacy also appears as a part of 21st century skills, which are referred to as the qualities required in today's business life (Eryılmaz & Uluyol, 2015). For all these reasons, technology is being adapted to the education system every day and teachers are trying to keep up with technological developments through pre-service and in-service training programs (Ekici, et al., 2012). However, although ICT is being incorporated into students' lessons, homework and even their lives, there is no guarantee that these skills will be used in the necessary situations and conditions. According to Sakız (2013), having a skill and being able to exhibit that skill in necessary situations are different concepts and she explains this difference with Bandura's (1997) statement that these skills will not be functional unless individuals have the belief that they can exhibit their skills under appropriate conditions. The concept of belief emphasized in this statement is conceptualized as individuals' self-efficacy. The self-efficacy is related with the principle of mutual determination, one of the social cognitive principles developed by Albert Bandura. According to this principle, individuals' behaviors are affected by their personal characteristics, the environment, and previous behaviors (Öztuczu & Mısırlı, 2023).

Self-efficacy has a direct relationship with people's competencies because people tend to perform actions that they think they can be successful (Tang et al., 2022). In this respect, ICT self-efficacy can be associated with online information-seeking behaviors (Halverson, et al., 2010), which are a product of complex processes such as identifying, scanning, processing, and organizing information with different sources in the internet environment that hosts a wide variety of information, because it is known that there is a positive relationship between individuals' internet self-efficacy and online information practices strategies (Şenyuva, 2017). Bandura (1997) defined one of the four sources of self-efficacy as active mastery experiences. These experiences are considered as the primary source of self-efficacy since they create authentic evidence of a sense of achievement in the individual (Palmer, 2006). Since online information-seeking practices also require active use of ICT, it may be a predictor of ICT self-efficacy in the context of active mastery experiences.

PISA (Programme for International Student Assessment), one of the international study that has an important role in education and is the source of changes in education, also

provides data on ICT. PISA, which assesses the knowledge and skill levels that 15-year-old children will need while to keep up with modern society (OECD, 2023), started to collect data on ICT for the first time in 2000 by using the computer familiarity questionnaire in addition to reading skills, mathematics and science literacy. PISA, where ICT questionnaire implementation were diversified and continued in the following years, played an important role in the dissemination of ICT in the field of educational sciences with the published data (Acar, 2015; Drenoyianni, 2006; Freddano & Diana, 2012; Juhanak et al., 2018; Lennon et al., 2003).

In the literature, ICT self-efficacy and online information- seeking practices have been the subject of different studies. In a study conducted by Hori and Fujii in 2021, the researchers created a structural equation model using PISA 2018 data and found that one of the best predictors of ICT self-efficacy is the frequency of using ICT for school-related activities outside of class hours. In the same study, another variable explaining ICT self-efficacy is the diversity of ICT resources. There are also studies showing the effect of ICT resources on ICT use and online information practices skills, and the effect of ICT for school activities outside of the classroom ICT competence and online information practices skills (Facer et al., 2003; Livingstone & Helsper, 2007). Wong and Yang (2017) found that ICT-mediated feedback improves students' engagement, collaborative knowledge construction behavior and autonomy, while Hatzia Apostolou and Paraskakis (2010) argue that ICT-mediated feedback increases students' engagement and motivation. Martinez-Argüelles et al. (2011) focus on the capacity of ICT to provide personalized feedback, which facilitates learning and increases motivation.

Considering the value of ICT skills in today's world as well as their increasing value day by day, it seems important to reveal the interactions and qualities of the variables that are part of these skills. As a result of the literature review, no study was found that examined the relationships between the variables addressed in this study. In this study, it is aimed to examine the relationship between ICT self-efficacy perceptions and online information practices in PISA 2022 student questionnaire and the variables that explain them. In line with this purpose, the research problem can be stated as "What are the relationships between the variables of ICT self-efficacy, online information practices, ICT resources, use of ICT for school activities outside of the classroom, support or feedback through ICT, and views of regulated ICT use in schools and the fit values of the structural

equation model established with these variables?". The study will also provide suggestions for the development of ICT skills by examining the relationships between these variables.

Method

Study Design

In this study, predictive correlational research design was used to examine the variables predicting students' self-efficacy perceptions and online information practices towards ICT. Predictive correlational research designs aim to reveal the value of the dependent variable by focusing on predictor variables. (Creswell & Guetterman, 2018).

Study Group

The data was consisted of PISA 2022 Türkiye data. In PISA 2022, 7250 students selected by stratified sampling from 15-year-old students studying in Türkiye participated (OECD, 2023; MoNE, 2023).

Data Collection Tools

Research data was collected with 8 different data collection tools. These instruments were explained in Table 1 with their codes and contents in PISA 2022 data set (OECD, 2023).

Table 1. Instructions and sample items of measurement tools

Measurement Tools	Number of Items	Statements
ST250 ST253 ST254 (ICTRES)- ICT resources	11	Instruction Which of the following are in your home? How many digital devices with screens are there in your home? How many of the following [digital devices] are in your home?
		Sample Items Laptop computers or notebooks Educational Software or Apps Internet access
		Instruction This school year, how often did you use digital resources for the following activities?
IC175 (ICTFEED)- Support or feedback via ICT	4	Sample Items Read or listen to feedback sent by my teachers regarding my work and academic results Read or listen to feedback sent by other students on my work Work on drill and practice exercises using an educational software or App
		Instruction This school year, how often did you use digital resources for the following activities?
IC176 (ICTOUT)- Use of ICT for school activities outside of	8	Sample Communicate with my teacher

the classroom	Items	Browse the Internet for schoolwork
		Browse the Internet to follow up lessons
IC179 (ICTREG)- Views of regulated ICT use in school	6	Instruction
		To what extent do you agree or disagree with the following statements?
	Sample Items	Students should not be allowed to bring mobile phones to class. The school should set up filters to prevent students from going on social media. Teachers should monitor what students do on their laptops.
IC180 (ICTINFO)- Students' practices regarding online information	6	Instruction
		To what extent do you agree or disagree with the following statements?
	Sample Items	When searching for information online I compare different sources I discuss the accuracy of online information with my teachers or in class. I try to flag wrong information when I encounter it online.
IC183 (ICTEFFIC)- Self-efficacy in digital competencies	14	Instruction
		To what extent are you able to do the following tasks when using digital resources?
	Sample Items	Collaborate with other students on a group assignment Create a computer program Create a multi-media presentation

Table 1 shows the 8 different data collection tools used in the study. Instruments were coded ST250, ST253 and ST254 measure students' access to ICT resources at home, instrument coded IC175 measures the frequency of receiving support and feedback through ICT, instrument coded IC176 measures the frequency of using ICT for course activities outside school hours, instrument coded IC179 measures students' views on the rules regarding ICT in schools, instrument coded IC180 measures students' behaviors in accessing information online, and instrument coded IC183 measures students' self-efficacy perceptions towards ICT (OECD, 2023).

Data Analysis

Table 1 shows that while the variable coded ICTRES was obtained by using 11 items from the 3 measurement tools coded ST250, ST253 and ST254, the data obtained from each measurement tool were used to calculate the index scores of ICTFEED, ICTOUT, ICTREG, ICTINFO and ICTEFFIC variables. In the analysis of the data, SPSS was used to check the assumptions and Mplus 8.3 package programs were used to test the structural equation

model. Before starting the analysis, missing values were first analyzed. The Analyze Patterns module can be used in the SPSS package program to examine the missing data pattern in missing values (Akbaş & Koğar, 2020). When the missing data pattern was examined in the data set, it was understood that missing values were seen in seven percent of the total participants and three percent of the total data. If the missing data rate is low, the list-based deletion method can be used (Field, 2013) and is considered as a good alternative (Büyüköztürk et al. 2021). In this study, participants with missing data in the data set were excluded from the study. After examining the missing values, extreme values were checked. For the control of outliers, the highest and lowest values were analyzed by calculating the z scores of the data. Data with an absolute value above 3.29 were considered outliers (Tabachnick & Fidell, 2013) and excluded from the data set. After the missing and extreme values were excluded from the analysis, 552 data were deleted, and the analysis continued with 6698 data.

Pearson correlation coefficients were calculated to determine whether there is a multicollinearity problem between variables. Among the calculated values, and the highest correlation coefficient was .62 between ICTOUT and ICTREG variables. According to Tabachnick and Fidell (2013), if the correlation between two variables is .90 and above, there may be a multicollinearity problem, and care should be taken when using variables with a correlation of .70 and above. Since the highest correlation coefficient calculated between the variables considered in the study was .62, it was accepted that there was no multicollinearity problem. In order to ensure the assumption of multivariate normality, univariate normality must first be confirmed (Çokluk et al., 2012). To examine univariate normality, the skewness and kurtosis coefficients of each variable, z statistics calculated by the ratio of kurtosis coefficients to standard errors of kurtosis, and histograms drawn with the normal distribution curve were examined. Although the histograms of all variables did not indicate large deviations from the normal distribution, the kurtosis coefficients of ICTOUT (1.18), ICTREG (2.15), and ICTINFO (1.55) variables being greater than 1, and the z statistics calculated for all variables ranges between 3.4 and 19.8 and these values were being greater than 1.96 were interpreted as the non-normal distribution of the data (Büyüköztürk, 2023). Failure to meet univariate normality was interpreted as a failure to meet the assumption of multivariate normality. For this reason, the robust maximum likelihood (MLR) method (Satorra & Bentler, 1994), known to provide more consistent results in non-normally

distributed data, was preferred as the estimation method. RMSEA, SRMR, CFI and TLI were examined as fit indices. However χ^2/df was not examined because of it has weak logical or statistical foundation (Kline, 2023). Also χ^2 heavily affected by the sample size and it is impossible to maintain the null hypothesis in large samples, and the use of alternative indices is recommended (Smith, 2001).

Findings

The Path diagram for the structural equation model was established in the study was presented in Figure 1.

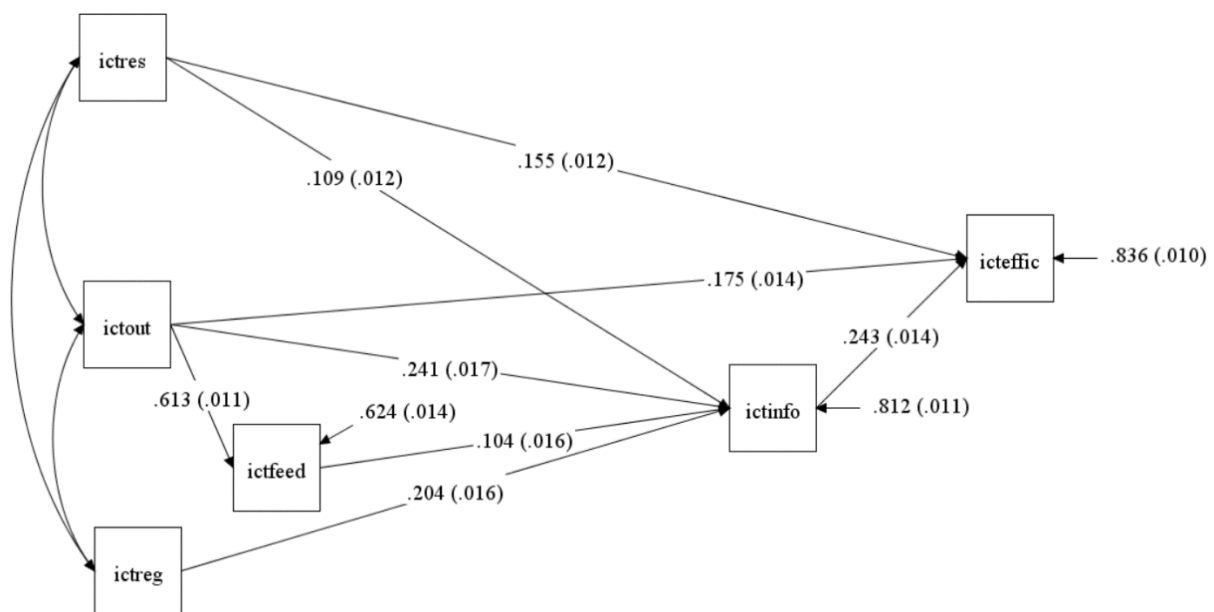


Figure 1. Path diagram

When Figure 1 was analyzed, it was seen that the exogenous variables were ICTRES, ICTOUT, and ICTREG; endogenous variables were ICTFEED, ICTINFO and ICTEFFIC. The explained variance of the ICTFEED variable was .38, the explained variance of the ICTINFO variable was .19 and the explained variance of the ICTEFFIC variable was .16. Path coefficients vary between .104 and .613, and all of them were significant. In examining the effect size between the variables, Kline's (2005) classification of .10, .30 and .50 in absolute value was taken into consideration. When the standardized path coefficients between the variables were examined, the ICTRES variable had a small effect on ICTINFO (.109) and ICTEFFIC (.155) variables. ICTOUT variable had a small effect on ICTEFFIC (.175), a medium effect on ICTINFO (.241) and a large effect on ICTFEED (.613). The ICTREG variable

had a medium effect (.204) on the ICTINFO variable on online information practices. The ICTFEED variable had a small effect (.104) on the ICTINFO variable (.104). Finally, the ICTREG variable had a medium effect (.243) on ICTINFO. The model includes indirect effects as well as direct effects between variables. Table 2 presented the standardized values of direct, indirect and total effects between variables.

Table 2. Values of direct, indirect and total standardized effects between variables

Independent Variables	Dependent Variables								
	ICTFEED			ICTINFO			ICTEFFIC		
	D. E.	Ind. E.	Total	D. E.	Ind. E.	Total	D. E.	Ind. E.	Total
ICTRES	-	-	-	.109*	-	.109*	.155*	.027*	.181*
ICTOUT	.613*	-	.613*	.241*	.064*	.304*	.175*	.074*	.249*
ICTREG	-	-	-	.204*	-	.204*	-	.050*	.050*
ICTFEED	-	-	-	.104*	-	.104*	-	.025*	.025*
ICTINFO	-	-	-	-	-	-	.243*	-	.243*

* $p < .01$

Direct effects in Table 2 refer to the standardized path coefficients in Figure 1. In contrast, indirect effects refer to the standardized coefficient of the effect of the independent variable on the dependent variable through another variable. The magnitude of indirect effects was equal to the product of the path coefficient between the independent variable and the mediator variable and the path coefficient between the mediator variable and the dependent variable. The total effect is the sum of direct and indirect effects.

The fit index values obtained for the model were presented in Table 3.

Table 3. Model Fit Indices

Index	Criterion Value of Perfect Fit	Calculated Value
RMSEA	$\leq .05$.05 [90% CI .035 - .056]
SRMR	$\leq .05$.02
CFI	$\geq .95$.99
TLI	$\geq .95$.96

Table 3 shows that RMSEA, SRMR, CFI and TLI values were within the required ranges and indicate perfect fit (Kline, 2005).

The variance explained in the model (R^2) is .38 for the ICTFEED variable, .16 for the ICTEFFIC variable and .19 for the ICTINFO variable. Regression equation for ICTEFFIC and ICTINFO variables were presented as Equation 1 and Equation 2 respectively.

$$\text{ICTEFFIC} = (.181) * \text{ICTRES} + (.249) * \text{ICTOUT} + (.050) * \text{ICTREG} + (.025) * \text{ICTFEED} + (.243) * \text{ICTINFO} \quad \text{Equation_1}$$

$$\text{ICTINFO} = (.109) * \text{ICTRES} + (.304) * \text{ICTOUT} + (.204) * \text{ICTREG} + (.104) * \text{ICTFEED} \quad \text{Equation_2}$$

Discussion and Conclusion

In this study, the relationship between ICT self-efficacy perceptions and online information practices behaviors and the related variables were examined with the data obtained from PISA 2022 Türkiye sample. As a result of the analysis, all path coefficients were found significant and the values of the fit indices showed that the model has perfect fit to the data. According to the tested structural equation model, for ICT self-efficacy, ICT resources, out-of-school ICT use related to school tasks and online information-seeking behaviors had a direct effect, while the frequency of receiving support or feedback through ICT and approaches to ICT-related rules in schools had an indirect effect. In addition, ICT resources had a direct effect on the frequency of ICT for school activities outside of the classroom, frequency of receiving support or feedback through ICT, attitudes towards ICT-related rules in schools and online information practices behaviors.

Considering the total effects in the model, it was observed that ICT resources had a small positive effect on online information-seeking behaviors and a moderate positive effect on ICT self-efficacy perceptions; and the use of ICT for school activities outside of the classroom had a moderate positive effect on both online information practices behaviors and ICT self-efficacy perceptions. Frequency of use is one of the most effective ways of learning digital skills (Kuhlemeier & Hemker, 2007). Thus, it can be stated that individuals who are exposed to ICT resources at home and at school may change their skills and usage habits towards ICT tools and differentiation may be observed in both their online information practices behaviors and their self-efficacy perceptions towards ICT tools.

In this respect, it is expected that both ICT resources and the use of ICT activities outside of the classroom will have an effect on online information practices behaviors and ICT self-efficacy perceptions. In addition, the positive relationship between ICT resources and ICT self-efficacy perceptions was also revealed in the structural equation model established by Hori and Fujii (2021). Zhong (2011) also reported that the availability of ICT tools in students' homes and schools had a positive effect on their ICT self-efficacy

perceptions. In the literature, there are also studies (Facer et al., 2003; Livingstone & Helsper, 2007) that reveal the positive effect of home internet access on online information practices behaviors. Considering that the prerequisite for internet access at home is the availability of ICT resources at home, these results seem to support each other. Eynon and Malmberg (2012) included the variable of home internet access in the model explaining online information practices behaviors and stated that there is a positive relationship between the two variables. In the structural equation model established by Livingstone and Helsper (2010), internet access and frequency of internet use were considered as variables explaining ICT self-efficacy and online information practices behaviors, and it was stated that ICT resources had a positive effect on both online information practices behaviors and ICT self-efficacy.

Out-of-classroom ICT use had a significant effect on the frequency of receiving support or feedback through ICT tools. Considering that students receive support or feedback through ICT tools outside of the classroom and that this support or feedback originates from school; in addition, teachers can provide support and feedback through ICT tools to students who have access to ICT tools, it is possible that the use of these tools has a large effect on receiving support or feedback. Although no study that includes children's views on the rules regarding ICT tools in schools (ICTREG), there are studies indicating that restrictions on access to ICT tools at school have an impact on students' online information-seeking behaviors (Dresang 2005; Ito et al. 2008; Lee 2008). It has also been revealed that students' views on these restrictions had a positive and moderate effect on their online information-seeking behaviors. In the structural equation model established within the scope of this research, it was seen that online information-seeking behaviors had a positive and moderate effect on ICT self-efficacy.

Şenyuva (2017) found a positive, weak and significant relationship between internet self-efficacy and online information practices strategies. Tsai and Tsai (2010), who obtained a similar result in their research, also confirmed the positive relationship between online information practices strategies and internet self-efficacy and stated that one way to improve online information strategies is to increase internet self-efficacy.

At the end of the research, since it is seen that feedback through ICT positively affects students' online information seeking behaviors and indirectly ICT self-efficacy, feedback through ICT can be taken into consideration in curriculum development studies in education. Similarly, considering the effect of ICT resources on online information seeking

behaviors and ICT self-efficacy, take action to increase students' access to ICT resources. Research can be planned to explore different variables affecting ICT self-efficacy. This research was conducted with the data obtained from PISA 2022. The research can be repeated with data from different samples and the results can be compared.

Acknowledgement

Due to the scope and method of the study, ethics committee permission was not required.

Author Contribution Statement

Berk DÜNDAR: *Conceptualization, literature review, methodology, data analysis, language editing, and writing.*

Melek Gülşah ŞAHİN: *Conceptualization, methodology, data analysis, language editing, and writing.*

References

- Acar, T. (2015). Examination of the PISA 2009 reading skills and information and communication technology (ICT) use skills of Turkish students. *Educational Research and Reviews*, 10(13), 1825-1831. <https://doi.org/10.5897/ERR2015.231>
- Akbaş, U. & Koşar, H. (2020). *Nicel araştırmalarda kayıp veriler ve uç değerler*. Pegem Akademi.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W.H. Freeman and Company.
- Büyüköztürk, Ş. (2023). *Sosyal bilimler için veri analizi el kitabı*. Pegem Akademi.
- Creswell, J. W. & Guetterman T. C. (2018). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Pearson.
- Çokluk, Ö., Şekercioğlu, G., & Büyüköztürk, Ş. (2012). *Sosyal bilimler için çok değişkenli istatistik: SPSS ve LISREL uygulamaları*. Pegem Akademi.
- Çuhadar, C., & Yücel, M. (2010). Yabancı dil öğretmeni adaylarının bilgi ve iletişim teknolojilerinin öğretim amaçlı kullanımına yönelik özyeterlik algıları. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi*, 27(27), 199-210.
- Dresang, E. T. (2005). Access: The information-seeking behavior of youth in the digital environment. *Library Trends*, 54(2), 178-196. <https://doi.org/10.1353/lib.2006.0015>
- Drenoyianni, H. (2006). Reconsidering change and ICT: Perspectives of a human and democratic education. *Education and Information Technologies*, 11, 401-413.
- Ekici, E., Ekici, F. T., & Kara, İ. (2012). Öğretmenlere yönelik bilişim teknolojileri öz-yeterlik algısı ölçeğinin geçerlik ve güvenirlik çalışması. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi*, 31(31), 53-65. <https://dergipark.org.tr/en/download/article-file/114558>
- Erdal, B. M. (2012). Evaluation of human development index and ICT development index, comparative analysis of the OECD and the European members and Türkiye. *International Journal of Business Research*, 2, 126-136. <https://doi.org/10.1002/isd2.12060>
- Eryılmaz, S., & Uluyol, Ç. (2015). 21. yüzyıl becerileri ışığında FATİH projesi değerlendirmesi. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 35(2), 209-229.

- Eynon, R., & Malmberg, L. E. (2012). Understanding the online information-seeking behaviours of young people: the role of networks of support. *Journal of Computer Assisted Learning*, 28(6), 514-529. <https://doi.org/10.1111/j.1365-2729.2011.00460.x>
- Facer, K., Furlong, J., Furlong, R., & Sutherland, R. (2003). *Screenplay: Children and computing in the home*. Routledge.
- Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Sage.
- Freddano, M., & Diana, P. (2012). The role of ICT to raise students' achievement in Italian technical and professional schools. *Problems of Education in the 21st Century*, 49, 15-26.
- Halverson, K. L., Siegel, M. A., & Freyermuth, S. K. (2010). Non-science majors' critical evaluation of websites in a biotechnology course. *Journal of Science Education and Technology*, 19, 612-620. <https://doi.org/10.1007/s10956-010-9227-6>
- Hatziapostolou, T., & Paraskakis, I. (2010). Enhancing the impact of formative feedback on student learning through an online feedback system. *Electronic Journal of E-learning*, 8(2), 111-122. <https://files.eric.ed.gov/fulltext/EJ895699.pdf>
- Hernandez, R. M. (2017). Impact of ICT on education: Challenges and perspectives. *Journal of Educational Psychology-Propositosy Representaciones*, 5(1), 337-347.
- Hori, R., & Fujii, M. (2021). Impact of using ICT for learning purposes on self-efficacy and persistence: Evidence from Pisa 2018. *Sustainability*, 13(11), 1-13.
- Ito, M., Horst, H. A., Bittanti, M., Herr Stephenson, B., Lange, P. G., Pascoe, C. J., & Robinson, L. (2009). *Living and learning with new media: Summary of findings from the digital youth project*. The MIT Press.
- Kline, R. B. (2005). *Principles and practice of structural equation modeling*. Guilford Publications.
- Kline, R. B. (2023). *Principles and practice of structural equation modeling* (5th ed.). Guilford Pub.
- Kuhlemeier, H., & Hemker, B. (2007). The impact of computer use at home on students' internet skills. *Computers & Education*, 49(2), 460-480.
- Lee, L. (2008). The impact of young people's Internet use on class boundaries and life trajectories. *Sociology*, 42(1), 137-153. <https://doi.org/10.1177/0038038507084829>
- Lennon, M., Kirsch, I., Von Davier, M., Wagner, M., & Yamamoto, K. (2003). Feasibility study for the PISA ICT literacy assessment: Report to network A. Educational Testing Service.
- Livingstone, S. & Helsper, E. (2010). Balancing opportunities and risks in teenagers' use of the internet: The role of online skills and internet self-efficacy. *New media & society*, 12(2), 309-329. <https://doi.org/10.1177/1461444809342697>
- Livingstone S. & Helsper E. (2007) Gradations in digital inclusion: children, young people and the digital divide. *New Media and Society* 9, 671-696.
- Martinez-Argüelles, M. J., Batalla-Busquets, J. M., Noguera-Guerra, P., & Pons-Fanals, E. (2011, October). Personalized e-Feedback and ICT. In Proceedings of the 10th European Conference on E-Learning: ECEL (p. 456). Academic Conferences Limited.
- Mikre, F. (2011). The roles of information communication technologies in education: Review article with emphasis to the computer and internet. *Ethiopian Journal of Education and Sciences*, (2), 109-126.

- Miller, B., & Atkinson, R. D. (2014). Raising European productivity growth through ICT. ITIF, June. <https://doi.org/10.2139/ssrn.3079844>
- MoNE (2023). PISA 2022 Türkiye Raporu. [PISA 2022 Türkiye Report] [https://pisa.meb.gov.tr/meb_iys_dosyalar/2023_12/05125555_pisa2022_rapor_051223 .pdf](https://pisa.meb.gov.tr/meb_iys_dosyalar/2023_12/05125555_pisa2022_rapor_051223.pdf)
- OECD. (2023). *PISA 2022 technical report*. OECD Publishing.
- Öztuzcu, Ö., & Mısırlı, Z.A. (2023). Secondary school teachers' self-efficacy beliefs regarding information technology. *Journal of Computer and Education Research*, 11 (22), 952- 965. <https://doi.org/10.18009/jcer.1344348>
- Palmer, D. H. (2006). Sources of self-efficacy in a science methods course for primary teacher education students. *Research in Science Education*, 36(4), 337-353.
- Peña-López, I. (2009). *Guide to measuring information and communication technologies (ICT) in education*.
- Sakız, G. (2013). Başarıda anahtar kelime: Öz-yeterlik. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 26(1), 185-210.
- Satorra, A., & Bentler, P. M. (1994). *Corrections to test statistics and standard errors in covariance structure analysis*. Sage Publications.
- Smith, T. D. & McMillan, B. F. (2001). A primer of model fit indices in structural equation modeling. *Annual Meeting of the Southwest Educational Research Association*. 1-16.
- Şenyuva, E. (2017). Hemşirelik öğrencilerinin internet öz-yeterlikleri ile çevrimiçi bilgi arama stratejileri ilişkisi. *Türk Eğitim Bilimleri Dergisi*, 15(2), 102-116.
- Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2013). *Using multivariate statistics*. Pearson.
- Tang, Y., Tseng, H., & Tang, X. (2022). The impact of information-seeking self-efficacy and online learning self-efficacy on students' performance proficiency. *The Journal of Academic Librarianship*, 48(5). <https://doi.org/10.1016/j.acalib.2022.102584>
- Tsai, M. J., & Tsai, C. C. (2010). Information searching strategies in web-based science learning: the role of Internet self-efficacy. *Innovations in education and teaching international*, 40(1), 43-50. <https://doi.org/10.1080/1355800032000038822>
- Wong, G. K. W., & Yang, M. (2017). Using ICT to facilitate instant and asynchronous feedback for students' learning engagement and improvements. *Emerging Practices in Scholarship of Learning and Teaching in a Digital Era*, 289-309.
- Zhong, Z. J. (2011). From access to usage: The divide of self-reported digital skills among adolescents. *Computers & Education*, 56(3), 736-746. <https://doi.org/10.1016/j.compedu.2010.10.016>

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Review Article

An Integrative and Interdisciplinary Assessment of Environmental, Ecological and Eco-Literacy

Dündar KERÇİN^{1,*}  Mehmet Şirin DEMİR² 

¹ Yıldız Technical University, Türkiye, dkercin.01@gmail.com

² Van Yüzüncü Yıl University, Türkiye, mehmetsdemir56640187@gmail.com


* Corresponding Author: dkercin.01@gmail.com

Article Info

Received: 26 March 2024

Accepted: 12 June 2024

Keywords: Environmental literacy, ecological crisis, ecological literacy, environmental education, eco-literacy

 10.18009/jcer.1458854

Publication Language: English

Abstract

This study, aiming to address environmental, ecological, and eco-literacy within the paradigms of multiple intelligences or multiple literacies on a relational-contextual level and with a comprehensive interdisciplinary approach, reveals a problematic situation concerning the insufficient adoption of these literacies in educational environments. The aim of this research is to contribute to the development of the above mentioned literacies, create social awareness for their widespread implementation in educational environments, and facilitate sustainable development and pedagogical well being. The study deals with a critical discourse analysis concerning the historical background of these concepts in the literature, relying on a plethora of data obtained from the literature. The methodology of the study conducted in line with this purpose includes a combination of mixed, theoretical, conceptual, documentary, phenomenological, and qualitative methods based on complementary and interdisciplinary assessments. These methodological postulates envision an integrated approach to addressing the concepts of environmental literacy, ecological literacy, and eco-literacy.



To cite this article: Kerçin, D. & Demir, M.Ş. (2024). An integrative and interdisciplinary assessment of environmental, ecological and eco-literacy. *Journal of Computer and Education Research*, 12 (24), 383-402. <https://doi.org/10.18009/jcer.1458854>

Introduction

The concept of environmental literacy was first coined by Roth (1968) and was expressed as a fundamental awareness towards environmental issues. Subsequently, Roth (1992) provided new meanings to the concept and expanded its scope. According to this updated definition, environmental literacy is defined as the capacity to perceive, interpret, protect, and enhance environmental systems through appropriate action. Roth (1992) emphasized the behavioral dimension when defining environmental literacy, stating that this skill can only be determined through observable behaviors.

The concept of environmental literacy has been defined from various perspectives from its initial use up to the present day. Environmental literacy entails awareness about the environment and related issues, making efforts towards solutions with concern for existing environmental problems, and possessing the knowledge, skills, and motivation to prevent potential issues (North American Association for Environmental Education, 2004). According to the definition provided by Ay and Yavuz (2016), environmental literacy involves understanding how environmental systems function and being conscious of the interaction between human-created systems and environmental systems. Environmental literacy can be defined as the process of learning how to establish a healthy, sustainable relationship between humans and the environment, increasing sensitivity towards the environment, and developing a positive attitude.

The concept of ecological literacy was first coined by Paul Gillan Risser in 1986. Risser (1986) introduced the term in a public speech at the Ecological Society of America, urging ecologists to engage in thinking, discussing, exchanging ideas, reaching consensus, taking a firm stance, and assuming responsibility as advocates for ecological literacy in the public, after contemplating what the concept encompasses. The various conceptualizations of the term in the field of ecology have continued to exist since then, together with a multidimensional focus on developing ecological knowledge necessary for conscious decision-making through scientific inquiry and systemic thinking (McBride, 2011).

Ecological literacy, a concept of increasing importance in recent years, is grounded in the integration of physical, emotional, social, geographical, and ecological intelligences or modes of thinking adapted to educational processes and environments. Social and emotional intelligence, fosters a perspective on establishing and understanding healthy dialectics in various societal or individual contexts, encompassing emotional and epistemic skills to a more advanced level, while ecological intelligence emphasizes the development of such skills or capacities by grounding them on a healthier ontological foundation of natural environments or systems, shaping cognitive abilities through emotional, environmental, and physical literacy, and adopting a dialectic accompanied by empathy. Through the combination of various literacy or intelligence forms mentioned above, ecological literacy focuses on various educational objectives, ranging from solving different pedagogical problems encountered in educational contexts and processes that aim to promote social and emotional learning to enhancing academic achievement. Thus, by adapting a more

sustainable vital ontology to educational environments, the establishment of an appropriate pedagogical environment for the development of necessary knowledge or skills, as well as empathy and activism capacities, will be facilitated. Acknowledging that individuals in educational environments characterized by plants, and animals can develop empathy and concern with an altruistic mindset towards other entities and living beings within the Earth, it would be much more tempting and worthwhile to emphasize the importance of curricula that highlight the significant roles played by individuals, and their aesthetic and moral dialectics to be established with each and every entity of the natural environments in sustaining life cycles and in order to reach a higher level of natural wellbeing. It is beneficial to emphasize that such educational curricula and designs can be adapted to various pedagogical processes; for instance, the widespread use of landscape architecture examples reflecting greenery in urban and metropolitan areas as a natural pedagogical example design could be adopted; similarly, the presence of various live plant and animal species reflecting the natural environment in pedagogical environments, and the organization of field trips to natural areas, botanical gardens, and animal rescue centers, as well as engaging students in field projects such as habitat restoration, can significantly contribute to the development of various skills, particularly ecological literacy.

The concept of eco-literacy, which can be considered relatively new compared to environmental literacy and ecological literacy, is said to be built upon the foundational skills of the two mentioned literacies. Growing concerns about the impact of escalating ecological problems, especially the rapid depletion of natural resources on the economy and social development have compelled people to contemplate and seek solutions for ensuring a more livable future. The concept of ecological literacy, conceptualized by Orr (1992), highlights the imperative of sustainable development, defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs (Imperatives, 1987). This notion has been envisioned as an ideology capable of addressing the concerns and anxieties that have emerged in individuals, and it has become a dominant perspective with its integration into education. Building on Orr's work, Capra (1996) has introduced the concept of eco-literacy into the literature, primarily centered around the idea of efficient use of resources, i.e., the concept of sustainability (McBride, 2011). Capra defines eco-literacy as understanding the organizational principles of ecological communities (ecosystems) and using these principles to create sustainable societies.

Inspired by the recognition of the challenges posed by the problematic lifestyle generated by the hyper-industrial context of the 21st century, structured with an interdisciplinary perspective, this study emphasizes the crucial importance of individuals within the educational environment acquiring significant skills based on ecological literacy. The pressure exerted by the problematic lifestyle, born out of the hyper-industrial conjuncture of the 21st century, on the ecosystems on Earth and the ontological sustainability of humanity, leaves individuals facing various difficulties and challenges. This underscores the vital necessity for individuals within the educational setting to develop skills grounded in ecological literacy at a noteworthy level.

This study aims to highlight a problem situation where environmental literacy, ecological literacy, and eco-literacy are not sufficiently adopted and emphasized in educational environments. There is an increasing awareness in the global academic community and various scientific circles, especially in global pedagogies and national education systems, that the importance of the above mentioned literacies is not adequately emphasized and that there is a lack of awareness in how to impart these literacies to students. This situation can lead individuals in educational environments to lack sufficient knowledge and skills in the neurocognitive and neuropedagogical foundations of the environment. Additionally, it may result in a cultural paradigm characterized by individuals being insensitive to environmental issues and making uninformed and problematic decisions related to environmental sustainability.

Can natural environment pedagogies, in comparison to traditional educational paradigms, approaches, or methods, demonstrate positive reflections in the learning processes, cognitive, and epistemic construction processes? What kind of benefits can these natural environment pedagogies provide concerning the enhancement of neurobiological processes and mechanisms? This question aims to address the curiosity or concern in pedagogical authorities regarding whether natural environment pedagogies can contribute to stronger and sustainable educational well-being or pedagogical improvement in learning processes and whether they can contribute to societal welfare.

Method

In this study, after initially adopting a documentary evaluation based on a literature review, postulates outlined within a theoretical framework that emphasizes the increasing

importance of multidisciplinary approaches or methods in interdisciplinary research, particularly in recent years, were grounded on a scientific basis. Following this, a variety of tools, materials, methods, and approaches were brought together within the context of the research design, and several topics, concepts, or themes were examined and presented with a multifaceted methodological approach, drawing conceptual insights.

After initiating the necessary research process for reviewing the literature proposed to address the problem outlined in the structure of this study, various studies directly related to the issues and concepts identified in the literature were analyzed. Additionally, after examining different studies and research projects that indirectly reflect a correlation with the topics, a hermeneutic perspective, along with an interdisciplinary approach, was interwoven into the fabric of the study.

Initially, a comprehensive literature review was conducted on the definitions and significance of environmental literacy, ecological literacy, and eco-literacy within the scope of the research. Subsequently, explanations regarding how these literacies can be acquired in educational environments, how they can be integrated, and how they can be adapted to educational settings were presented within the context of the methods or approaches mentioned above. The aim was to foster an awareness in pedagogies related to the problem and the statement of the problem in the research. In this context, various results and recommendations, information, and findings that can be utilized from the literature on what kind of experiences and practices can be implemented in curriculum development and other learning processes for the use of these literacies in pedagogies were presented in alignment with the scientific and academic integrity of the conducted research.

Developed within a predominantly conceptual and intricate methodological framework, this study can be considered within the framework of the arguments that can be evaluated on the plane of multidisciplinary fields of sciences. Therefore, it would be much more tempting to say that the aim in conducting this study would also be to establish a sustainable pedagogical development by considering pedagogy within the context of the nature or ontology of human beings, thereby establishing a quintessential synchronization aesthetically. Similarly, the study seeks to formulate pedagogical postulates and formulations around the concept of eco-pedagogy, which aims to design and construct natural environments that can enhance the physiological and neurobiological well-being of human beings. Based on various observational experiences and empirical findings, the study

is grounded in theoretical and conceptual assumptions, presenting novel postulates and perspectives contributing to sustainable development and biological diversity.

As part of the research methodology, it is considered that, unlike the complex, differentiating, and erroneous conceptualizations in the literature, an integrated approach or methodology that does not impose artificial and distinct distinctions between the concepts of environmental literacy, ecological literacy and eco-literacy, in other words, evaluating these concepts within a common context without placing them in separate frameworks, could be adapted to various situations throughout the course of the study. Additionally, considering the compatibility of bibliographic and documentary research as part of the adopted mixed methodology in the study, it is believed that an assessment leading to paradigm shifts towards partially inductive and partially critical discourse analysis could contribute to the literature. Therefore, a critical discourse analysis methodology has been adopted, taking into account the potential for paradigm shifts toward both inductive and critical discourse analysis, in line with the conceptual evaluations of bibliographic and documentary research as part of the mixed methodology embraced in the study.

The Ecological Crisis Arising from the Human-Nature Relationship

The interrelationship and interdialectics between humanbeings and nature extend back to and encompass a historical process that began with human existence and continue to the present day. Throughout this historical process, humans, like other living beings, have lived in and benefited from nature. However, unlike other living beings, humans have not limited themselves to benefiting from nature during this process; they have altered and transformed nature, beginning to use it according to their own interests. The advent of the Industrial Revolution, characterized by the replacement of manual production with mass production through the substitution of human labor with machines, marked a significant milestone that opened the way for the exploitation of nature due to the increased demand for raw materials. Concurrently, the process of urbanization, considered as a byproduct of the Industrial Revolution, has been both a significant part of the human-nature relationship and a contributor to the exploitation of nature, leading to the opening of new wounds and the deepening of existing ones. In addition to these developments throughout history, the recent phenomenon of technologically characterized lifestyles, the culture of digitalization, driven by technological advancements, and the resulting cultural and industrial transformation

have also played crucial roles as factors contributing to the degradation and disenchantment of the natural environment as well as any appropriate equilibrium in the natural environment.

As a result of all these developments, ecological problems have emerged, causing harm to humans, the environment, and other living beings inhabiting the environment, with destructive consequences in many aspects. Ecological issues, which negatively impact the mental and physical health, lead to various diseases and, at times, even fatalities. Furthermore, these ecological problems contribute to the damage of ecosystems, leading to the extinction of certain species in nature.

Before delving into the process of destruction of nature termed as ecological crisis or environmental degradation, understanding the primary factors that create this process and addressing the problems along with their causes will provide a comprehensible perspective on the issue. The ecological crisis, which is one of the most important and urgent problems of the contemporary world, has emerged as a result of societal activities. The free-market economy, viewing nature as a gift to humanity or as a freely available resource, is considered a major cause of the ecological crisis. The capitalist system, based on the ideology of 'Laissez faire, laissez passer!' (Aydin, 2003), instrumentalizes nature to increase capital accumulation and utilizes it in line with its own goals. Nature, turned into a commodity by capitalists, is sacrificed for further growth (Altiok, 2014). Nature mobilized in accordance with the desires of a very small minority in society is, metaphorically speaking, plundered, and the resulting ecological crisis affects the entire community.

Murray Bookchin, who laid the foundations of social ecology, also attributes the cause of ecological problems to the capitalist system and approaches the process with its historical dimension. According to Bookchin (2017), the domination of nature by humans stems from human domination over other humans. The exploitation of nature by humans is seen as a reflection of the hierarchical social order that emerged in historical processes. In other words, it is noted that the hierarchies arising from societal domination are extended to the human-nature relationship, leading to the ruthless plunder of nature and its perception as an object or raw material. Bookchin, emphasizing that he always sees ecology as social ecology, expresses his views by stating, "I believe that the concept of domination over nature arises from the domination of one human being over another, indeed, from the domination of man over woman, old over young, one ethnic group over another, the state over society,

bureaucracy over the individual, one class over other classes, and colonial powers over colonized peoples" (Bookchin, 2014, p.105).

These factors, attempted to be explained as the primary causes of ecological degradation, have brought about distorted urbanization resulting from industrialization, the indiscriminate use of natural resources, changes in consumption habits with the advancement of technology, and the emergence of irregular migration and rapid population growth. As a consequence, the destructive process of nature has gained momentum and continues (Karagozluoglu, 2020).

The environmental pollution problem created by these mentioned factors has been categorized and examined under four headings as water, soil, noise, and air pollution:

Water pollution is the disruption of the natural composition of waters, either by exceeding the normal concentrations of substances in natural water sources due to human activities or by the detection of previously unidentified substances in water sources (Uzun et al., 2014). As a result of the contamination of natural water sources such as rivers and lakes, people experience hygiene problems, become ill, and struggle to find clean drinking water. The use of chemical fertilizers to increase agricultural productivity and the toxic chemicals used to combat weeds, insects, and fungi contribute to the pollution of underground water through infiltration with rainfall, as well as endangering marine life by reaching the seas through runoff (Guler & Cobanoglu, 1994).

Soil pollution can be described as the disruption of the physical and geological structure of the soil due to the use of incorrect methods in agriculture, the introduction of toxic substances into the soil, and the disposal of waste onto the soil (Karaca & Turgay, 2012). Soil contamination leads to the pollution of plants, and contaminated plants endanger the lives of humans and animals that consume them (Mentese, 2017). As can be understood from this situation, nature operates within a system, and any disturbance in this system in one place adversely affects the lives of other living organisms in nature.

Noise pollution can be briefly defined as the pollution created by disturbing and unpleasant sounds that have a negative impact on human physical and psychological health (Soylu & Gokkus, 2016). Noise pollution is an environmental pollution that reduces human work performance, distracts attention, and prevents concentration by destroying the tranquil calmness of nature (Kaypak, 2019).

Air pollution can be defined as the presence of gases and particles in the atmosphere that alter the natural composition of the air, caused by both natural events and human activities, and can harm living organisms depending on their concentrations and the duration they stay in the atmosphere (Morcali & Akan, 2017). The resulting air pollution leads to an increase in respiratory diseases such as asthma and bronchitis in humans, as well as skin and lung cancer, nausea, watery eyes, and vomiting. Simultaneously, it causes various environmental consequences, including the greenhouse effect, the formation of acid rain, and the depletion of the ozone layer (Bayazit, 2006).

The consequences of pollution, especially those originating from industrial sources, on human health are sometimes immediately observable and sometimes emerge over time through research studies. A study conducted in the United States in 2022 investigated the impact of lead exposure during childhood on IQ. Previous studies have demonstrated the adverse effects of lead, used primarily to enhance motor performance in cars (Edelmann, 2016), leading to diseases such as paralysis, blindness, and infertility (Dundar & Aslan, 2005). Due to these harmful effects, the use of lead in gasoline was significantly reduced, especially after the 1990s. McFarland et al. (2022) collected and analyzed blood lead level data of American children aged 1-5 between 1976-1980 and 2015-2016. Population and leaded gasoline consumption data from 1940-1976 were also used in the study to estimate blood lead levels. The researchers found that children born during years when lead was used had an average lead-related cognitive ability loss of 2.6 IQ points per person. This illustrates that the damage caused by human activities to the environment can only be revealed through studies conducted many years later.

One of the ecological issues is the depletion of the ozone layer. The ozone layer, located in the upper part of the stratosphere, one of the layers of the atmosphere, acts as a shield by preventing harmful ultraviolet radiation from the sun from reaching the Earth. Ozone in the stratosphere exists in a natural balance, and when this balance between ozone production and depletion is disrupted, a problem called ozone depletion occurs. Chlorofluorocarbons emitted from sprays, refrigerators, air conditioners, and vehicle exhausts, as well as irregularly launched rockets, disrupt this balance and lead to ozone depletion. Ozone depletion allows harmful ultraviolet rays from the sun to reach the Earth, causing negative effects on both human health and the environment. These harmful rays can result in diseases such as skin cancer, cataracts, and corneal inflammations in humans, while

affecting aquatic life, natural cycles, and air quality in the environment, contributing to increased global warming (Anonymous, 2021-2022).

The thinning of the ozone layer is causally linked to global warming, creating a mutually reinforcing relationship where ozone layer depletion both results from and contributes to global warming. Alongside this interrelation, various factors leading to broad ecological issues, such as global warming, are known to exist. One of these factors is the phenomenon known as the greenhouse effect. The atmosphere, responsible for maintaining the Earth's average temperature, allows a portion of the sun's energy to be reflected back into space while directing another portion to reach the Earth. The Earth warms with this received energy, releasing energy back into the atmosphere, thereby maintaining the Earth's temperature equilibrium. However, due to the excessive use of fossil fuels during the industrialization process, deforestation, production and transportation of natural gas, the increase in large-scale livestock farming, and the use of synthetic fertilizers in agriculture, gases that disrupt this temperature balance have begun to accumulate in the atmosphere. Greenhouse gases, which contribute to the trapping of heat in the atmosphere, enhance the Earth's warming by capturing the energy emitted from the heated surface, causing the Earth's surface to warm even further. Because this effect is similar to the way a greenhouse functions, it is termed the greenhouse effect (Ozturk, 2002). These mentioned causes give rise to a significant ecological problem, namely global warming, and as a consequence of global warming, the issue of climate change arises.

The Multifaceted Positive Outcomes of Natural Environment Ontologies

Nature, which is often seen as a commodity by humans, is thought to have many positive effects. The positive effects of nature, making people feel good, can also be inferred from the lifestyle of urban dwellers. Even the act of city dwellers allocating space for plants in their home rooms or on balconies where they can breathe exemplifies this situation. Studies conducted on the subject have also revealed that nature not only makes people feel good but also has many other positive effects.

People sometimes come into contact with nature directly, through activities such as gardening, and sometimes indirectly, through passive experiences such as watching from a window. Both forms of contact have been shown to have positive effects on both physiological and psychological well-being. Exposure to environments with vegetation has

been indicated to support stress relief, reduce the number of negative emotions such as fear, anger, and sadness, and simultaneously increase positive emotions (Ulrich & Parsons, 1992). A study conducted between 1972 and 1981 in a hospital in Pennsylvania investigated whether assigning patients who had undergone gallbladder surgery to a room with a natural view had a therapeutic effect on their illnesses. In this research conducted by Ulrich (1984), patients randomly assigned to rooms with either a natural view or a brick wall in two wings of the hospital had their recovery records examined. Patients in rooms with a natural view had shorter postoperative hospital stays, used fewer strong pain relievers, and had fewer negative evaluations in nurse notes compared to patients in rooms with a brick wall view. This suggests that even passive contact with nature has a healing effect on health. In a study conducted in the state of Tennessee in the United States, individuals engaged in gardening activities and having direct interaction with nature were given a two-page written survey developed by researchers and asked to fill it out. Catanzaro and Ekanem (2004) found in their study that interacting with nature reduces the sense of stress in humans and has many positive effects, including mental health. In a study conducted by Moran and Turner (2019) in two different prisons, it was concluded that contact with nature has a calming effect, and inmates who had contact with nature experienced less stress.

It is possible to express, based on findings from some studies, that engaging in physical activities and various other activities in natural settings will provide more beneficial results compared to those conducted in artificial environments lacking vegetation in urban areas. For instance, in a study investigating the impact of nature experience on affect and cognition, participants were randomly assigned to nature and urban environments and asked to take a 50-minute walk. The study found that walking in nature provided cognitive benefits (particularly enhancing verbal working memory performance) compared to urban walking, and it also reduced anxiety and rumination (Bratman et al., 2015). Similarly, in a study conducted by Gidlow et al. (2016), it was stated that walking in a natural environment provides greater restorative benefits compared to walking in an urban environment and that the restorative benefits continued for an additional 30 minutes after departing from the natural environment. Additionally, a study conducted by Choe et al. (2020) investigated whether the effectiveness of Mindfulness-Based Stress Reduction (MBSR), a widely used well-being intervention, would increase when combined with the benefits of exposure to a natural environment. In the study, participants were randomly assigned to three different

environments: a natural outdoor setting (a large park with public greenery), a built outdoor setting (a greenery-lacking courtyard on a university campus), and an indoor setting (a windowless room in the basement). Participants practiced the MBSR program for one hour per week for six weeks. The study demonstrated that participating in the MBSR program in a natural environment resulted in better mental health and well-being outcomes compared to results in built outdoor or indoor environments.

The positive effects of natural environments is not limited to the physical spheres; it is also believed that natural settings, thought to have positive effects in various fields, have a restorative effect on some negatives arising from urbanization. In a study conducted by Kaplan (1995), it was stated that the abundance of stimuli in cities, such as light and noise, leads to attentional fatigue and mental exhaustion. In contrast, natural environments, which are quieter and have fewer stimuli compared to cities, were emphasized to prevent attentional fatigue and have a restorative effect on mental exhaustion. Supported and expanded by the research conducted by Plambech and Bosch (2015), which focused on the cognitive benefits provided by the restorative effect of natural environments, this study revealed that nature not only recharges our directed attention needed for generating new ideas and analyzing thoughts but also makes us more curious, flexes our thinking, and awakens a creative thinking style. All these studies highlighting the cognitive benefits provided by nature suggest that natural environments could also have positive effects on the educational process. Similarly, a study conducted by Dadvand et al. (2015) demonstrated the beneficial impact of exposure to natural vegetation, or greenery, in outdoor settings on the cognitive development of school children, supporting the idea that natural environments could positively influence educational processes. Another study conducted in Canada, examining the potential benefits of nature experience on children's mood, socialization, and attitudes toward nature, took 80 elementary school students to both a nature school and an aviation/space museum. The results indicated that children were more social and developed a closer connection with nature during their time at the nature school. The study also suggested that allowing time for unstructured activities in nature was beneficial for children's socialization and that children engaged with nature appeared more willing to protect the environment. This implies that children spending time in nature develop an awareness of environmental conservation and may adopt a protective attitude towards nature in the future (Dopko et al., 2019).

Towards Natural Environment Pedagogies

Several interdisciplinary explorations and research efforts, conducted through a thorough examination of the educational context defined by various problems and challenges arising from the global pedagogical paradigms of the 21st century, have demonstrated that ecological literacy's pedagogical outcomes, in other words, the establishment of an eco-pedagogical paradigm characterized by an interdisciplinary dialectic that can be established with the natural environment or surroundings, can contribute to the improvement of educational processes and the establishment of an eco-pedagogical paradigm (Magntorn, 2007).

Therefore, as expressed above, there has emerged a trend desiring the conduct of research that can reveal whether natural environment pedagogies, which can serve as antitheses to certain problematic educational paradigms, can effectively respond to individuals' physiological and psychological needs as these pedagogies gain popularity. This trend has facilitated the emergence of various empirical results and assessments from increasingly interdisciplinary studies. In other words, in recent years, education systems and curricula, predominantly departing from traditional classroom settings, where students spend more time indoors and engage in learning processes facilitated by digital technologies, have increasingly focused on building knowledge and experiences that can be gained through physical activity and an ontology of the natural environment. They have shifted their emphasis towards a pedagogical understanding that integrates educational processes more with the natural environment, concentrating on the development of various skills in individuals (Richardson, 1994).

Therefore, in contrast to the emerging trends favoring the adoption of natural environment pedagogies mentioned above, traditional closed-space pedagogies, especially when individuals within educational environments, encompassing various student portfolios, are engaged in educational processes connected to both formal education settings and distance learning modules, have kept students physically and bodily away from any dynamic or movement paradigms that may trigger various health problems. Instead, these pedagogies have positioned students, who have spent extended periods sitting in closed environments, namely in formal educational settings or in front of two-dimensional screens related to virtual technologies, away from any physical activity. As a result, their cognitive processes have been diminished and distorted by the information conveyed to them.

For centuries, in global pedagogies where the focus has been on the adverse effects of industrial civilization, a trend towards embracing natural environments has gradually gained acceptance. This trend has played a significant role in establishing an educational well-being situation and has become increasingly widespread and important. One important reason and justification for the widespread adoption of natural environment pedagogies is the growing global demand and need for interdisciplinary perspectives on learning and teaching processes and activities, methodologies that focus on the development of intellectual, pedagogical, and cognitive well-being (Barton, 2016).

Since natural environment pedagogies are considered an educational approach that allows all types of student portfolios to learn more effectively in their natural environments, this approach aims to facilitate children's exploration and experience of natural environments, enabling them to undergo a healthier cognitive and intellectual construction process. This, in turn, promotes more enthusiastic participation in learning processes and makes all kinds of pedagogical processes or activities more enjoyable.

In the study conducted by us, it was determined through documentary screening analysis that there are numerous documentaries that can be used in the teaching-learning environments for the processing of environmental literacy, ecological literacy, and eco-literacy. These documentaries provide students with the opportunity to understand environmental issues, raise awareness about the sustainable use of natural resources, and comprehend their responsibilities related to the environment. Moreover, considering the presentation and content of conferences or symposiums, it is believed that the use of documentaries in educational environments can increase students' interest in environmental issues by benefiting from visual and auditory stimuli. It is also thought that the use of documentaries can encourage more in-depth learning processes among students in these subjects. The use of documentaries also facilitates discussion and knowledge sharing among students, contributing to increased awareness of environmental issues.

Natural environment pedagogies have been closely associated, especially in recent years, with the development of environmental education and literacy related to environmental consciousness, and the establishment of a consciousness for the conservation of natural resources or reserves through the construction of a healthy foundation for sustainability education. Environmental education emphasizes the more functional implementation of pedagogical processes in natural environments, increasing individuals'

desire to learn and assisting in the exploration of various epistemic and ontological situations characterized by natural environments, leading to a more accurate understanding of the external world. Sustainability education, which emerges as an indispensable quest in these educational paradigms, enables the establishment of ecological literacy and environmental consciousness towards the natural environment, motivating individuals to take action for building a sustainable future. Therefore, it is acknowledged that natural environment pedagogies play a significant role in the construction of essential knowledge, experiences, or insights for environmental and sustainability education.

Natural environment pedagogies are also considered within the framework of learning theories grounded in the postulates of constructivism. According to this theory, environmental-social-cultural environments or contexts in which learning processes are adapted to life facilitate and encourage the mental, intellectual, and cognitive structuring of individuals (Norton, 2022). In other words, within various pedagogical processes, individuals engage in cognitive-intellectual activities, entering into a phenomenological dialectic with existing epistemic codes, experiences, or phenomena. Therefore, as expressed above, within a healthy eco-dialectic established with the external world or in a natural environment, natural environment pedagogies are associated with the construction of a shared cognitive, intellectual reservoir that can be molded by the experiences of individuals involved in educational processes.

The educational approach characterized by these pedagogical postulates is also influenced by social constructivism theory. This theory posits that individuals' learning is derived from their experiences organized within social interactions and their responses, reflexes, or reactions to various situations or factors encountered while conducting educational activities in a natural or environmental setting. Pedagogies defined by the methods or approaches with which such an educational program or curriculum is shaped can be considered as an educational approach that aligns with the predictions of social constructivism theory. These pedagogies focus and concentrate not only on the social interactions children establish but also on their experiences in natural environments, aligning with some of the predictions set forth by social constructivism theory (Smith & Sobel, 2014).

Conclusion and Recommendations

Conclusions to be drawn from all of the aforementioned interpretations and conceptualisations related with various research phenomenologies interspersed into our study have been obtained and inspired by the fact that natural environment pedagogies are becoming increasingly important in 21st-century pedagogies, focusing on interdisciplinary studies conducted in literature and based on various pedagogical postulates that are continuously being explored and evaluated in the literature on a multidimensional level. This was the reason why this study has been grounded in phenomenological, conceptual, mixed and qualitative methodologies. It has been suggested that educational activities, limited to closed environments within school walls, may be inadequate and problematic, leading to various neurocognitive and neuro-pedagogical issues. In light of this, various application areas where natural environment pedagogies can be adapted and educational programs or curricula that can be developed in these areas are discussed. It is proposed that these programs may have positive effects on various cognitive and physical well-being parameters or components of individuals.

Recently, there has been an increasing emphasis, particularly in selected pilot regions, on promoting the design and implementation of natural environment-based pedagogical programs in various primary and secondary education institutions and partially in higher education institutions. This initiative aims to enable students to have a more effective and healthier dialectic or interaction with their natural environments. It could contribute to providing a more realistic pedagogical experience, allowing students to go through cognitive-intellectual well-being conditions evaluated on the basis of multiple intelligence theories. Furthermore, it may facilitate a better understanding of nature, the establishment and development of ecological literacy, and the cultivation of environmental consciousness. By engaging students in pedagogical activities in natural environments, it can also encourage and support their ethical, social, and emotional development. In natural settings, students not only mature and develop pedagogically but also acquire collaborative learning skills, emotional literacy, empathy-building skills, a sense of duty and responsibility, as well as moral and spiritual literacy skills. Overall, such environments can foster students' development in ethical, social, and emotional dimensions, leading to a holistic growth and enhancing their overall well-being.

Furthermore, individuals who mature and develop within the aforementioned pedagogical postulates will not only grow in the areas mentioned above but also in various fields such as natural sciences, mathematics, fine arts, language, and literature. For example, in a natural environment, students can enhance their arithmetic skills, develop geometric literacy skills, and work with various spatial shapes and units of measurement. In addition to these, they will have the opportunity to conduct research and investigations on plants and animals in the natural environment.

Natural environment pedagogies are associated with many common concepts and phenomena that can be evaluated in the constructivist context. Considering the theoretical framework of such pedagogical approaches, student-centered approaches are emphasized more, facilitating students to take an active role in the learning process, enhance critical thinking skills, and personalize their learning experiences.

This approach can also assist students in solving various real-life problems rather than focusing solely on textbooks. Furthermore, one of the prerequisites for implementing learning-teaching activities in interaction with the natural environment, which is considered as an important element that allows students to interact with their natural surroundings, is the construction of school gardens, natural habitats, and parks, which can be evaluated as significant elements that can align with this approach. The arrangement and use of these areas will also contribute to the implementation of the postulates envisaged by natural environment pedagogies into practice.

Acknowledgement

Due to the scope and method of the study, ethics committee permission was not required.

The article has been generated from the M.A. thesis of the first author, who was supervised by the second author.

This study was also presented in the form of an abstract at the 10th Yıldız International Social Sciences Congress organized by Yıldız Technical University in Istanbul, Türkiye.

Author Contribution Statement

Dündar KERÇİN: *Conceptualization, literature review, methodology, data analysis, language editing, and writing.*

Mehmet Şirin DEMİR: *Conceptualization, methodology, data analysis, language editing, and writing.*

References

- Altıok, M. (2014). Ekolojik kriz, kapitalist birikimin sürdürülebilirliği, gelecek ve ütopya [Ecological crisis, sustainability of capitalist accumulation, future and utopia]. *Journal of Economic Policy Researches*, 1(1), 81-97.
- Anonymous, (2021-2022). NCERT Book Class 12 Biology Chapter 16 *Environmental Issues*. Retrieved from: <https://ncert.nic.in/textbook/pdf/lebo116.pdf>
- Ay. S. T. & Yavuz, Y. U. (2016). Sınıf öğretmenlerinin sosyal bilgiler dersinde okuryazarlık becerilerini kazandırmaya yönelik gerçekleştirdikleri uygulamalar [Practices carried out by classroom teachers to provide literacy skills in social studies classes]. *Anadolu Journal of Educational Sciences International*, 6(2) 31- 63.
- Aydin, M. K. (2003). Kapitalizm ve kriz [Capitalism and crisis]. *Kocaeli Üniversitesi Sosyal Bilimler Dergisi*, 6, 1-10.
- Barton, M. (2016). Nature-based solutions in urban contexts: A case study of Malmo, Sweden. *IIIEE Masters Thesis*.
- Bayazit, A. H. (2006). Çevre kirliliğinin önlenmesinde ailenin yeri ve önemi [The place and importance of the family in preventing environmental pollution]. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, 7(2), 359 - 376.
- Bookchin, M. (2014). *Kentsiz kentleşme yurttaşlığın yükselişi ve çöküşü [Urbanization without Cities: The rise and decline of citizenship]*. (Çev. B. Özyalçın). Sümer Yayıncılık.
- Bookchin, M. (2017). *Toplumsal ekoloji ve komünalizm [Social ecology and communalism]* (2. bs). (Çev. F. D. Elhüseyni). Sümer Yayıncılık.
- Bratman, G. N., Daily, G. C., Levy, B. J. & Gross, J. J. (2015). The benefits of nature experience: Improved affect and cognition. *Landscape and Urban Planning*, 138, 41-50.
- Capra, F. (1996). A new scientific understanding of living systems: The web of life. *Anchor Books. Chapters*, 5.
- Catanzaro, C. & Ekanem, E. (2004). Home gardeners value stress reduction and interaction with nature. In XXVI International Horticultural Congress: Expanding Roles for Horticulture in Improving Human Well-Being and Life Quality, 639 (pp. 269-275).
- Choe, E. Y., Jorgensen, A. & Sheffield, D. (2020). Does a natural environment enhance the effectiveness of mindfulness-based stress reduction (MBSR)? Examining the mental health and wellbeing, and nature connectedness benefits. *Landscape and Urban Planning*, 202, 103886.
- Dadvand, P., Nieuwenhuijsen, M. J., Esnaola, M., Forn, J., Basagaña, X., Alvarez-Pedrerol, M., ... & Sunyer, J. (2015). Green spaces and cognitive development in primary schoolchildren. *Proceedings of the National Academy of Sciences*, 112(26), 7937-7942.
- Dopko, R. L., Capaldi, C. A. & Zelenski, J. M. (2019). The psychological and social benefits of a nature experience for children: A preliminary investigation. *Journal of Environmental Psychology*, 63, 134-138.
- Dundar, Y. & Aslan, R. (2005). Yaşamı kuşatan ağır metal kurşunun etkileri [The effects of the heavy metal lead surrounding life]. *Kocatepe Tıp Dergisi*, 6(2), 1-5.
- Edelmann, F. T. (2016). The life and legacy of Thomas Midgley Jr. *Papers and Proceedings of the Royal Society of Tasmania*, 150(1). 45-49.
- Gidlow, C. J., Jones, M. V., Hurst, G., Masterson, D., Clark-Carter, D., Tarvainen, M. P., ... & Nieuwenhuijsen, M. (2016). Where to put your best foot forward: Psycho-physiological responses to walking in natural and urban environments. *Journal of Environmental Psychology*, 45, 22-29.

- Guler, C., & Cobanoglu, Z. (1994). Su kirliliği. *Çevre Sağlığı Temel Kaynak Dizisi [Water pollution. Environmental Health Essential Resource Series]*, 12(1). Aydoğdu Ofset. s. 11-24.
- Imperatives, S. (1987). Report of the world commission on environment and development: Our common future. *Accessed Feb, 10*, 1-223.
- Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, 15(3), 169-182.
- Karaca, A. & Turgay, O. C. (2012). Toprak kirliliği [Soil pollution]. *Toprak Bilimi ve Bitki Besleme Dergisi*, 1(1), 13-19.
- Karagozluoglu, N. (2020). Çevre sorunları, nedenleri ve çözüm önerileri: Yozgat örneği [Environmental problems, causes and solution suggestions: Yozgat example]. *International Journal of Geography and Geography Education*, 42, 356-373.
- Kaypak, S. (2019). Kent yaşamında gürültü, kirliliği ve hukuksal politikaya yansımaları [Noise and pollution in urban life and its reflection on legal policy]. *ASSAM Uluslararası Hakemli Dergi, Özel Sayı*, 91-104.
- Magntorn, O. (2007). *Reading nature: Developing ecological literacy through teaching* (Doctoral dissertation, Swedish National Graduate School in Science and Technology Education).
- McBride, B. B. (2011). *Essential elements of ecological literacy and the pathways to achieve it: Perspectives of ecologists*. Graduate Student Theses, Dissertations, & Professional Papers. 380.
- McFarland, M. J., Hauer, M. E., & Reuben, A. (2022). Half of US population exposed to adverse lead levels in early childhood. *Proceedings of the National Academy of Sciences*, 119(11), e2118631119.
- Mentese, S. (2017). Çevresel sürdürülebilirlik açısından toprak, su ve hava kirliliği: Teorik bir inceleme [Soil, water and air pollution in terms of environmental sustainability: A theoretical review]. *Journal of International Social Research*, 10(53), 381-389.
- Moran, D. & Turner, J. (2019). Turning over a new leaf: The health-enabling capacities of nature contact in prison. *Social Science & Medicine*, 231, 62-69.
- Morcali, M. H. & Akan, D. S. (2017). Kahramanmaraş hava kirliliği kaynaklarının izlenmesi ve belirlenmesi [Monitoring and determining Kahramanmaraş air pollution sources]. *Kahramanmaraş Sütçü İmam Üniversitesi Mühendislik Bilimleri Dergisi*, 20(2), 105-115.
- North American Association for Environmental Education. (2004). Excellence in environmental education: Guidelines for learning (K-12). North American Association for Environmental Education. Retrieved from: https://cdn.naaee.org/sites/default/files/learnerguidelines_new.pdf
- Norton, S. C. (2022). *Exploration: Nature-based preschools (NBPS) and the level of job satisfaction for early childhood educators* (Doctoral dissertation, Southern New Hampshire University).
- Orr, D.W. (1992). *Ecological literacy: Education and transition to a postmodern world*. Suny Press.
- Ozturk, K. (2002). Küresel iklim değişikliği ve Türkiye'ye olası etkileri [Global climate change and its possible effects on Turkey]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 22(1).
- Plambech, T. & Van Den Bosch, C. C. K. (2015). The impact of nature on creativity—A study among Danish creative professionals. *Urban Forestry & Urban Greening*, 14(2), 255-263.
- Richardson, J. T. (1994). Mature students in higher education: I. A literature survey on approaches to studying. *Studies in Higher Education*, 19(3), 309-325.
- Risser, P. G. (1986). Address of the past president: syracuse, New York; August 1986: ecological literacy. *Bulletin of the Ecological Society of America*, 67(4), 264-270.

- Roth, C. E. (1968). *Curriculum overview for developing environmentally literate citizens*. (ERIC Reproduction Service No. ED 032982).
- Roth, C. E. (1992). *Environmental literacy: Its roots, evolution and directions in the 1990s*. (ERIC Document Reproduction Service No. ED348235).
- Smith, G. A., & Sobel, D. (2014). *Place-and community-based education in schools*. Routledge.
- Soylu, M. & Gokkus, O. (2016). Endüstriyel kaynaklı gürültü kirliliğinin araştırılması ve bir tekstil fabrikasında uygulama örneği [Investigation of industrial noise pollution and an application example in a textile factory]. *Erciyes Üniversitesi Fen Bilimleri Enstitüsü Fen Bilimleri Dergisi*, 32(2).
- Ulrich, R. S. & Parsons R. (1992). Influences of passive experiences with plants on individual well-being and health, Chapter 15. pp. 93-105. In: D. Relf (ed.). *The Role of Horticulture in Human Well-Being and Social Development*. Timber Press.
- Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, 224(4647), 420-421.
- Uzun, A., Keles, R. & Bal, I. (2014). Sapanca gölü içme suyu havzasında otoyol ve demiryolundan kaynaklanan kirliliğin yağmur suyu sulak alan metoduyla giderilmesi [Elimination of pollution caused by highways and railways in the Sapanca Lake drinking water basin by using the rainwater wetland method]. *Academic Platform-Journal of Engineering and Science*, 2(1), 9-15.

Research Article

Self-Regulation and Psychological Resilience as Predictors of the Academic Self-Efficacy of University Students

Mine SAYIN KILIÇ^{1,*}  Özge ERDURAN TEKİN²  Berra KEÇECİ³ 

¹ Bartın University, Türkiye, msayin@bartin.edu.tr

² National Defense University, Air Force Academy, Türkiye, oerduran@hho.msu.edu.tr

³ Istanbul Health and Technology University, Türkiye, berra.kececi@istun.edu.tr


* Corresponding Author: msayin@bartin.edu.tr

Article Info

Received: 31 March 2024

Accepted: 22 June 2024

Keywords: Academic self-efficacy, self-regulation, psychological resilience, university students

 10.18009/jcer.1448525

Publication Language: English

Abstract

The purpose of this study is to determine the effects of the self-regulation and psychological resilience levels of university students on their academic self-efficacy. The sample of the correlational study consisted of a total of 520 university students, 414 female and 106 male. The Self-Regulation Scale, the Brief Resilience Scale, and the Academic Self-Efficacy Scale were used to collect data. In the study, independent groups t-test was applied to determine the differences between genders regarding the variables, Pearson Correlation Analysis was applied to examine the correlation between variables, and Hierarchical Regression Analysis was applied to examine its prediction. It was determined that the psychological resilience levels of the participants varied based on their genders, while their self-regulation and self-efficacy levels did not differ based on the gender variable. Self-regulation and psychological resilience were found to be associated with academic self-efficacy, where self-regulation and psychological resilience together predicted academic self-efficacy.



To cite this article: Sayın-Kılıç, M., Erduran-Tekin, Ö. & Keçeci, B. (2024). Self-regulation and psychological resilience as predictors of the academic self-efficacy of university students. *Journal of Computer and Education Research*, 12 (24), 403-421. <https://doi.org/10.18009/jcer.1448525>

Introduction

It is important to examine the factors that affect the academic success of university students, who have a key part in the future of countries. The purpose of an education system is to train individuals who have learned how to learn, are aware of their talents and can use these talents, believe in themselves and what they can do, can regulate their behaviors in line with their goals, and believe in their capacity (Arseven, 2016; Özkale, 2022). One of the significant concepts in the achievement of these goals is self-efficacy. Self-efficacy is the belief of an individual in their performance in a task (Zimmerman, 2000). In other words, a person's self-efficacy is the degree to which they perceive themselves capable in terms of learning some behaviors and implementing what they have learned (Shunk & DiBenetto,

2014). The self-efficacy of a person affects their thoughts, emotions, and motivational factors that may lead their behaviors (Bandura, 1998).

Self-efficacy skills may be important in determining whether the individual can cope with the problems they encounter in society or how much effort they will make while coping with these problems (Bandura, 1977). According to Bandura (1995), self-efficacy can be developed by an individual, and direct experiences, indirect experiences, verbal persuasion, physical status, and emotional tendencies contribute to the development of self-efficacy. The successful experiences in an individual's past and their positive mood significantly contribute to their self-efficacy. In addition to this, the individual can strengthen their belief that they can perform a task by taking others as role models, and they can achieve an increase in their self-efficacy by self-persuasion or persuasion by others that they will be successful (Bandura, 1995).

Self-efficacy is an important concept for an individual and contributes to their success in various areas of life (Bandura, 1977). In the literature, the concept of self-efficacy is explained in the context of various skills; one of them is academic self-efficacy (Shunk & Pajares, 2009). If the belief of an individual in their capacity to perform a task is related to an academic activity and connected to the successful completion of academic tasks, this belief is called academic self-efficacy (Ekici, 2012; Yılmaz et al., 2007). Therefore, it can be said that academic self-efficacy has an important role in predicting academic achievement (Chemers et al., 2001; Zimmerman, 1995).

According to the Social Cognitive Theory, people are active beings that have the capacity to self-regulate (Pajares, 2002). Self-regulation refers to the ability of the individual to manage their thoughts, feelings, and behaviors based on their goals (Cascallar et al., 2006). Therefore, a student with self-regulation skills may be expected to make plans to use the appropriate strategies for success while performing a task assigned to them, be able to keep track of their progress and have a strong motivation for success (Zimmerman, 1989). External factors are not the only factors effective in the formation of human behavior, and people have self-regulation skills that allow them to control their thoughts, emotions, and behaviors (Bandura, 1991). Individuals with self-regulation skills are aware of their responsibility for their own learning, can choose the most suitable learning strategy for themselves, and show the effort necessary to succeed (Arends, 1998; Israel, 2007). Thus, like their academic self-efficacy, the self-regulation skills of students also predict their success levels (Posner &

Rothbart, 2009). When a student with high levels of self-efficacy experiences failure, they re-evaluate their self-regulation skills thinking that they have not spent enough effort for success (Akin, 2008). In the relevant literature, there are studies that have investigated the relationship between self-regulation and academic self-efficacy (Aldan Karademir et al., 2018; Hamimi, 2018; Luszczynska et al., 2005). While there is a relationship between self-regulation and academic self-efficacy, self-regulation also encompasses self-efficacy, and it can contribute to the confidence of the person in their abilities by affecting self-efficacy positively (Pintrich, 2000). According to its definition by Bandura (1997), self-efficacy is the belief of the person that they will succeed after regulating what needs to be done to reach success. Considering this definition, it may be stated that self-efficacy and self-regulation skills are necessities for each other (Bandura, 1997). Zimmerman (1995) argued that for academic self-efficacy, a person needs to have the skills to plan and regulate the goals they need to reach. With the help of self-regulation, a person can increase their self-efficacy by putting their thoughts and feelings into action toward the goal they want to achieve (Yahsi Sari et al., 2020). This shows that self-regulation predicts academic self-efficacy.

Psychological resilience is another variable that could be associated with academic self-efficacy (Ateş & Sağar, 2021). Psychological resilience, considered a coping and adjustment capacity, is defined as a person's ability to overcome the difficult situations that they encounter in life and preserve harmony in their life (Masten & Barnes, 2018; Robbins et al., 2018). In other words, psychological resilience is the ability of a person to pull oneself together and return to their previous conditions after the experience of a negative situation (Ramirez, 2007). Psychological resilience is influenced by individual, familial, and environmental relationships, and while explaining psychological resilience, it is important to understand risk factors and protective factors (Masten & Reed, 2002). Having high levels of psychological resilience makes it easier for individuals to cope with problem situations encountered in life and then adapt (Fergusson & Horwood, 2003). As one of the important coping skills of individuals, psychological resilience develops as a result of the sound operation of basic adjustment skills, and one of these basic adjustment skills is self-regulation (Masten, 2001). There are studies in the literature on self-efficacy and psychological resilience (Toraman et al., 2023). These studies show that there is a positive relationship between psychological resilience and self-efficacy. It is thought that psychological resilience, which adds strength to the person in coping with challenging life events, may positively affect

academic self-efficacy by increasing the person's problem solving skills and empowerment. Bandura (1997) assumed that while individuals with low self-efficacy avoid their actions, those with high self-efficacy are much more resilient against challenges and successful. Reports showing that individuals with high psychological resilience are more persistent, and patient (Smokowski, 1999) may also indicate that students with high psychological resilience can also have increased academic self-efficacy while dealing with difficult academic tasks. Previous studies have also demonstrated the relationships between psychological resilience, endurance, and self-efficacy (Yahsi Sari et al., 2020). This may mean that being psychologically resilient affects the academic self-efficacy of students and can contribute to their academic success.

Considering the factors affecting self-efficacy as stated by Bandura (1997), which are direct experiences, indirect experiences, verbal persuasion, and psychological-physiological state, it is thought that the self-regulation and psychological resilience of university students may be associated with their academic self-efficacy. Likewise, it has been reported that the self-efficacy of university students is associated with their status of taking responsibility (Akbay & Gizir, 2010), having behavioral problems (Odacı & Berber Çelik, 2012), self-control and ability to manage the events in their lives, and their display of positive attitudes toward the future (Sagone & De Caroli, 2014). In this sense, it is believed that the academic self-efficacy expectations of university students would be influenced by their self-regulation skills, which provide control and planning, and their psychological resilience levels, which provide adjustment to difficult situations and flexibility. Hence, the main purpose of this study was to investigate whether the self-regulation and psychological resilience levels of university students predicted their academic self-efficacy.

The transition period to university is an important developmental process in which students experience many things about being an adult for the first time, start to live separately from their families, and strive to gain identity (Berman et al., 2009; Erkoç & Danış, 2020). In addition, since neuroplasticity begins to decrease after young adulthood, it can be said that the period in which university students are in is a critical period that shapes mental health and it is important to examine the coping resources that can improve students' mental health (Haynes et al., 2020). At this point, students' psychological resilience and self-regulation are important resources that protect mental health. Because increased psychological resilience and self-regulation skills can enable students to cope with

challenging life events more easily and regulate their behaviours in the desired direction. This can be expected to positively affect university students' academic self-efficacy. Since university students' academic self-efficacy is related to their academic success and development, it is important to examine the variables affecting academic self-efficacy (Mirlohi et al., 2024). At this point, self-regulation and psychological resilience are thought to be related to academic self-efficacy. In the review of the relevant literature in this process, a limited number of studies examining the relationships between academic self-efficacy, self-regulation, and psychological resilience were encountered (Dai et al., 2022; Yahsi Sari et al., 2020). However, to improve the academic self-efficacy of university students, it is needed to examine the variables that could be effective on self-efficacy. It is thought that self-regulation and psychological resilience are variables that affect the academic self-efficacy of university students. The research questions determined in line with this consideration were as follows:

1. Are there significant differences in the self-regulation, psychological resilience, and academic self-efficacy of university students based on their gender?
2. Are there significant relationships between the self-regulation and psychological resilience of university students and their academic self-efficacy?
3. Do the self-regulation and psychological resilience levels of university students predict their academic self-efficacy?

Method

Design

In this study, to investigate the relationships between the examined variables, as a quantitative research method, the correlational design was employed. The correlational design is a method that is used in quantitative studies to test whether there is a simultaneous change in multiple variables or identify the degree of this change if such a change exists (Fraenkel et al., 2012).

Sample

The sample of the study included 520 university students enrolled in the Atatürk Education Faculty at Marmara University in the 2021-2022 academic year. While 414 (79.6%) of the participants were women, 106 (20.4%) were men. Among the participants, 69 (13.3%) were 1st-year students, 91 (17.5%) were 2nd-year students, 120 (23.1%) were 3rd-year students, and 240 (46.2%) were 4th-year students. The ages of the participants varied in the

range of 18-44, and their mean age was 21.78. The convenience sampling method was used to form the sample. This method is called convenience sampling because it is used to select participants who can easily be reached and included when there are limitations in terms of time, economic resources, labor, and other factors (Büyüköztürk et al., 2010). To conduct the study, approval dated 03/05/2021 and numbered 4-4 was obtained from the Ethics Committee of the Institute of Educational Sciences at Marmara University.

Data Collection Instruments

Self-Regulation Scale (SRS): SRS was adapted to Turkish by Demiraslan Çevik et al. (2015). It measures the attention control aspect of self-regulation and consists of 7 items and 1 dimension. The exploratory factor analysis of the scale revealed that the factor loads of its items varied from 0.558 to 0.800. Following the confirmatory factor analysis and the modification process, the goodness-of-fit indices of the scale were found to be in a suitable range. Cronbach's alpha internal consistency coefficient for the scale was reported to be 0.84. In the scoring of the scale, higher scores are interpreted to indicate that the person has a higher level of attention control in goal pursuit. In the analyses conducted in this study, the internal consistency coefficient of the scale was calculated as 0.84.

Brief Resilience Scale (BRS): BRS was adapted to Turkish by Doğan (2015). It is a 5-point Likert-type scale consisting of 1 dimension and 6 items. Items 2, 4, and 6 are inversely scored. Higher scale scores indicate higher levels of psychological resilience. The unidimensional structure of the scale was demonstrated by its exploratory factor analysis. According to the results of the confirmatory factor analysis of the scale, its goodness-of-fit indices satisfied the relevant criteria, and the factor loads of its items varied from 0.52 to 0.76. Cronbach's alpha internal consistency coefficient for the scale was reported to be 0.83. In the analyses conducted in this study, the internal consistency coefficient of the scale was calculated as 0.78.

Academic Self-Efficacy Scale (ASES): ASES was adapted to Turkish by Yılmaz et al. (2007). It is a 4-point Likert-type scale with 7 items. The minimum and maximum scores that can be obtained on the scale are 7 and 28. Higher scores are interpreted to indicate higher academic self-efficacy levels. The construct validity analyses of the scale demonstrated its unidimensional structure, whereas its factor load values were found to be between 0.500 and 0.829. Cronbach's alpha internal consistency coefficient for the scale was reported to be 0.79.

In the analyses conducted in this study, the internal consistency coefficient of the scale was calculated as 0.75.

Table 1. Descriptive statistics of the variables

Variables	N	\bar{X}	SD	Min	Max	Skewness	Kurtosis
Self-regulation	520	21.72	3.80	10	28	-0.176	-0.397
Psychological Resilience	520	18.95	4.06	7	30	0.146	0.028
Academic Self-Efficacy	520	20.21	3.50	11	28	0.127	-0.304

Descriptive statistics of the variables in the study were examined. Table 1 presents the mean and standard deviation values of the scores of the participants on ASES (\bar{x} =20.21, SD =3.50), BRS (\bar{x} =18.95, SD =4.06), and SRS (\bar{x} =21.72, SD =3.80).

Data Analysis

Before the analyses of the data, the presence of errors in coding and missing data was checked. The analyses were carried out using the SPSS 26 package program. Descriptive statistics were calculated for the data, independent-samples t-tests were conducted to determine whether the measured variables varied based on gender, and hierarchical regression analysis was performed to test whether self-regulation and psychological resilience predicted academic self-efficacy.

Findings

Statistical analysis of the data obtained from the participants in the study was performed. The findings obtained as a result of the analyzes performed are included in this section.

Table 2. Analyses of academic self-efficacy, psychological resilience, and self-regulation based on gender

Score	Gender	N	\bar{X}	SD	Sh $_{\bar{x}}$	t- Test		
						t	df	p
Academic Self-efficacy	F	414	20.12	3.51	0.17	-1.35	518	0.179
	M	106	20.63	3.48	0.34			
Psychological Resilience	F	414	18.68	3.93	0.19	-3.06	518	0.002*
	M	106	20.02	4.41	0.43			
Self-Regulation	F	414	21.86	3.51	0.18	1.61	518	0.108
	M	106	21.20	3.48	0.39			

Statistical analysis was carried out to determine whether the participants' academic self-efficacy, psychological resilience and self-regulation characteristics differ according to gender. As seen in the independent-samples t-test results shown in Table 2, the psychological resilience levels of the participants varied significantly based on their gender ($t = -3.06; p < 0.05$). The mean BRS score of the male participants ($\bar{x} = 20.02$) was significantly higher than the mean BRS score of the female participants ($\bar{x} = 18.68$). On the other hand, there was no significant difference in the academic self-efficacy ($t = -1.35; p > 0.05$) or self-regulation ($t = 1.61; p > 0.05$) levels of the participants based on their gender.

Table 3. Results of the Pearson product moment correlation analysis on the relationships between the variables of the study

	Self-regulation	Psychological Resilience	Academic Self-efficacy
Self-regulation	1	0.278*	0.310*
Psychological Resilience	0.278*	1	0.398*
Academic Self-efficacy	0.310*	0.398*	1
N	520	520	520

* $p < 0.001$

Statistical analysis was performed to determine whether there was a significant relationship between the participants' academic self-efficacy, psychological resilience and self-regulation scores. According to the Pearson correlation analysis results given in Table 3, there was a moderate, positive, and significant relationship between academic self-efficacy and self-regulation ($r = 0.310, p < 0.001$), there was a moderate, positive, and significant relationship between academic self-efficacy and psychological resilience ($r = 0.398, p < 0.001$), and there was a low, positive, and significant relationship between self-regulation and psychological resilience ($r = 0.278, p < 0.001$). Accordingly, as self-regulation increased, psychological resilience and academic self-efficacy also increased. Similarly, as psychological resilience increased, academic self-efficacy also increased.

Before testing the predictive effects of the self-regulation and psychological resilience levels of the participants on their academic self-efficacy levels, the presence of a multicollinearity problem between the predictor variables was tested. According to the

results of the analyses, there was no multicollinearity problem ($VIF < 10$, $Tolerance > 0.10$, $CI < 30$). The results of the hierarchical regression analysis are presented in Table 4.

Table 4. Results of the hierarchical regression analysis of the predictors of academic self-efficacy (self-regulation, psychological resilience)

Model Predictors	R	ΔR^2	B	SE	β	t	F
Constant			12.25	.82		14.97	
Self-Regulation	.398	.159	.37	.037	.398	9.89	97.71*
Constant			9.92	.91		10.87	
Self-Regulation			.31	.038	.338	8.27	
Psychological Resilience	.449	.202	.19	.035	.216	5.29	65.36*

p < 0.01*

Statistical analysis was performed to determine whether self-regulation and psychological resilience levels were predictive of participants' academic self-efficacy scores. In the regression analysis of the predictors of academic self-efficacy, self-regulation was included in the first model, whereas psychological resilience was added in the second model. According to the results, both models predicted academic self-efficacy to a significant extent. Here, self-regulation explained 16% of the total variance in academic self-efficacy ($\beta = 0.398$, $p < 0.001$). When the effect of self-regulation was controlled for, psychological resilience, which was introduced in the second model, explained 4% of the variance in academic self-efficacy ($\beta = 0.216$, $p < 0.001$). Therefore, 20% of the total variance in academic self-efficacy was explained together by self-regulation and psychological resilience. This result demonstrated that changes in the SRS and BRS scores of the participants explained changes in their ASES scores to a statistically significant extent. In other words, the self-regulation and psychological resilience levels of the participants were significant predictors of their academic self-efficacy levels.

Discussion and Conclusion

The purpose of this study was to determine the predictive effects of the self-regulation and psychological resilience levels of university students on their academic self-efficacy. Before addressing the main question of the study, an independent-samples t-test was carried out to see whether the self-regulation, psychological resilience, and academic self-efficacy levels of the participants varied depending on their gender. It was found that

while the self-regulation and academic self-efficacy levels of the participants did not vary based on their gender, their psychological resilience levels varied significantly between the male and female participants, and the former had significantly higher levels of psychological resilience. Some studies in the literature have provided similar results, indicating higher levels of psychological resilience in men (Erkoç & Danış, 2020), whereas there are also studies showing higher psychological resilience levels in women (Akdeniz et al., 2020). Moreover, in the relevant literature, there are studies reporting that self-regulation did not differ based on gender (Agrawal et al., 2012; Tezel-Şahin, 2015) and those reporting that it did (Haşlamam & Aşkar, 2007). In most of the previous studies on academic self-efficacy conducted with university students, as in our study, no significant difference was identified in academic self-efficacy levels based on gender (Akyürek, 2020; Oğuz, 2012). However, there are also few studies in the literature showing that academic self-efficacy differs according to gender and male students have more academic self-efficacy than female students (Osmanoğlu & Ulu, 2024). Therefore, it may be useful to analyze this finding in a larger group of participants with a balanced gender distribution.

Afterward, the relationships between the self-regulation, psychological resilience, and academic self-efficacy variables were examined by correlation analyses in this study, and significant correlations were identified. According to the results, there was a significant positive relationship between academic self-efficacy and self-regulation. Additionally, according to the regression analysis results, self-regulation explained 16% of the total variance in academic self-efficacy. Similarly, other studies in the literature have revealed that there is a positive relationship between self-regulation and academic self-efficacy, and self-regulation predicts academic self-efficacy (Aldan-Karademir et al., 2018). In this study, it was found that as self-regulation increased, academic self-efficacy also increased. This result was supported by other studies showing the positive effect of self-regulation on the academic performance of students (Al Khatib, 2010; Cho & Shen, 2013; Theobald, 2021). Based on all these results, one may conclude that self-regulation skills affect the academic self-efficacy of students positively by raising their academic success levels, and they affect the academic success levels of students positively by supporting their academic self-efficacy.

Another result of this study was the significant positive relationship between the psychological resilience and academic self-efficacy levels of the participants. Based on this result, the participants with high levels of psychological resilience also had high levels of

academic self-efficacy. Various studies in the literature have investigated the relationship between psychological resilience and self-efficacy (Ateş & Sağar, 2021, 2022; Toraman et al., 2023; Yıldız & Kardaş, 2021; Yılmaz-Bingöl et al., 2019). Yılmaz-Bingöl et al. (2019), who investigated the predictive role of psychological resilience and positivity in the self-efficacy of university students, reported a moderate, positive, and significant relationship between psychological resilience and self-efficacy. Ateş and Sağar (2021), who studied the self-efficacy levels of university students, found a positive and significant relationship between self-efficacy and psychological resilience, and they stated that psychological resilience was a significant predictor of self-efficacy. For this reason, it is believed that interventions aimed at increasing the psychological resilience of university students will have a positive effect in supporting their self-efficacy. In another study that included university students, psychological resilience and self-efficacy were examined as potential predictors of academic success by Ateş and Sağar (2022), who concluded that psychological resilience and self-efficacy predicted academic success. Sagone et al. (2020), who investigated the relationship between psychological resilience and self-efficacy in youths, showed that higher levels of perceived self-efficacy in life skills corresponded to higher psychological resilience levels. In their study on the academic self-efficacy and academic resilience of university students, Cassidy (2015) reported a significant relationship between the academic self-efficacy and academic resilience of their participants and found that academic self-efficacy predicted academic resilience. Hamill (2003) researched the psychological resilience and self-efficacy levels of high school students and observed that psychological resilience was a significant predictor of self-efficacy. The results of these studies were in line with the result of our study showing a significant relationship between psychological resilience and academic self-efficacy. As a coping and adjustment skill, psychological resilience is expected to contribute to the development of self-efficacy by a person by helping them overcome the difficulties they face on their way to their goals and success and making it easier for them to adapt (Cassidy, 2015). Thus, it is believed that psychological resilience contributes to academic self-efficacy, which is known to be a significant predictor of academic success, by affecting academic performance positively.

To find an answer to the primary question of this study, which was “Do the self-regulation and psychological resilience levels of university students predict their academic self-efficacy?”, a hierarchical regression analysis was performed. As a result of the analysis, it

was determined that self-regulation and psychological resilience were significant predictors of academic self-efficacy, and they collectively explained 20% of the total variance in academic self-efficacy. Likewise, other studies in the literature presented the effects of self-regulation and psychological resilience on academic self-efficacy (Ateş & Sağar, 2021; Yahsi Sari et al., 2020). Most studies in this field have investigated the effects of self-regulation and psychological resilience on academic self-efficacy separately, and few studies were found to examine self-regulation and psychological resilience together as predictors of academic self-efficacy (Dai et al., 2022; Yahsi Sari et al., 2020). Yahsi Sari et al. (2020), who examined the factors affecting the academic self-efficacy levels of Syrian asylum-seeker students, stated that self-regulation affected academic self-efficacy directly, and psychological resilience had a mediator effect in the relationship between self-regulation and academic self-efficacy. They concluded that to increase the self-efficacy levels of students, it is needed to improve their self-regulation skills and raise their resilience against difficulties (Yahsi Sari et al., 2020). Ateş and Sağar (2021), who examined some variables affecting self-efficacy in university students, found cognitive flexibility, emotional regulation, and psychological resilience to be significant predictors of self-efficacy. In this study, we investigated the effects of self-regulation and psychological resilience on academic self-efficacy both separately and together, and we found that, as in other studies in the literature, both self-regulation and psychological resilience affected academic self-efficacy. In the hierarchical regression analysis, when the effect of self-regulation was controlled for, it was seen that psychological resilience explained 4% of the total variance in academic self-efficacy. The decrease in the explanation rate when the effect of self-regulation was controlled may be explained by that self-regulation skills are among the basic adjustment skills that contribute to psychological resilience by making adjustment easier (Masten, 2001).

Information in the literature has shown that an individual with good self-regulation skills can plan their behaviors effectively in terms of reaching their goals and regulate their learning process in a way suitable for them as they are aware of their rate and methodology of learning. Because they are open to learning by themselves and receiving feedback, individuals with this quality can easily adapt to different conditions and shape their learning methods according to current conditions (Zimmerman, 1989, 2000). Furthermore, these individuals have stronger motivations and beliefs in their capacity to succeed, and they enjoy the learning process. Theobald (2021), who investigated the effectiveness of self-regulated

learning programs aimed at increasing the academic performance, learning strategies, and motivations of university students in their meta-analysis study, concluded that self-regulated learning programs increased the academic performance and motivation of students. Their result was consistent with our finding that the self-regulation skills of university students raised their academic self-efficacy. In this context, it is expected that a person who has the skills to self-regulate would have a higher level of self-efficacy. From another perspective, a person who has high self-efficacy and believes that they can perform a task would be expected to utilize self-regulation skills such as developing unique strategies and reaching their goals by regulating their behaviors. Hence, one may argue that self-efficacy and self-regulation skills have a reciprocal relationship in terms of contributing to each other.

Consequently, in this study where the effects of the self-regulation and psychological resilience levels of university students on their academic self-efficacy were investigated, it was observed that the self-regulation skills and psychological resilience of university students were effective on their academic self-efficacy. There are other studies in the literature demonstrating the contribution of self-regulation, psychological resilience, and academic self-efficacy to academic performance (Ateş & Sağar, 2022; Posner & Rothbart, 2009; Theobald, 2021). Considering the results of all these studies, self-regulation and psychological resilience may be expected to increase the academic self-efficacy of a person by affecting their academic success and their perceptions regarding success positively. Based on this inference, it can be said that it would be beneficial to gain self-regulation skills, which are skills of regulating and organizing thoughts, feelings, and behaviors, and to improve psychological resilience, which covers the concepts of adaptation and flexibility in order to increase the self-efficacy of students in their academic lives. Especially along with challenging life events such as epidemics and natural disasters in recent years, distance education and online learning environments have become prevalent, and the shift of education toward online settings has brought about various problems in terms of the establishment of suitable learning environments for students, time management, and motivation (Adnan & Anwar, 2020). Therefore, coping and adjustment skills such as self-regulation and psychological resilience have gained much significance for students who are experiencing substantial changes in their education lives and trying to adapt to new circumstances (Tülübaş, 2022). Following the devastating Kahramanmaraş Earthquakes that happened in February 2023 in Turkey, many students who were affected and had to

continue their studies through distance education have had to cope with various challenges and regulate their learning processes based on their changing conditions. Skills and qualities like self-regulation, psychological resilience, and academic self-efficacy become more important for the maintenance of academic performance in difficult and distressing times. For this reason, it may be recommended to examine these factors that influence academic performance in samples of students who have to continue their education outside their schools due to their challenging living conditions. Furthermore, it is believed that examining other psychological and cognitive skills and qualifications of students in the context of their academic self-efficacy in future studies will be important in terms of the world of education that is constantly being updated and transformed.

The sample of this study consisted of 520 university students receiving face-to-face education. Therefore, the results obtained in the study are limited to the data collected from this sample. Collecting data from university students who are in distance education could contribute to the results of this study. Furthermore, the fact that most of the participants of this study were female students may be considered a limitation. It is thought that this situation arose due to the higher number of female students at the faculty of education where the study was carried out. Reaching students of different faculties through online data collection methods may be helpful in balancing the gender distributions by reaching more participants. In short, this study shows that, in addition to the effect of self-regulation on university students' academic self-efficacy levels, students' psychological resilience is also an important predictor. Based on the results of this study, it can be concluded that organizing psychoeducation and psycho-support activities at universities to help them improve their self-regulation skills and psychological resilience and establishing education and instruction programs aimed at developing their capacity to regulate their thoughts, feelings, and behaviors, as well as learning strategies, will be beneficial in increasing their academic performance.

Ethical Committee Permission Information

Name of the board that carries out ethical assessment:

Marmara University Ethics Committee of the Institute of Educational Sciences

The date and number of the ethical assessment decision: 03.05.2021 / 4-4

Author Contribution Statement

Mine SAYIN KILIÇ: Literature review, conceptualization, preparation of data collection form, data collection, methodology, data analysis, interpretation, organization, writing and editing.

Özge ERDURAN TEKİN: Literature review, conceptualization, preparation of data collection form, data collection, methodology, data analysis, interpretation, organization, writing and editing.

Berra KEÇECİ: Literature review, conceptualization, preparation of data collection form, data collection, methodology, data analysis, interpretation, organization, writing and editing.

References

- Adnan, M., & Anwar, K. (2020). Online learning amid the COVID-19 pandemic: Students' perspectives. *Journal of Pedagogical Sociology and Psychology*, 2(1), 45-51. <http://www.doi.org/10.33902/JPSP.%202020261309>
- Agrawal, S., Norman, G. R., & Eva, K. W. (2012). Influences on medical students' self-regulated learning after test completion. *Medical Education*, 46(3), 326-335.
- Akbay, S., & Gizir, C. (2010). Cinsiyete göre üniversite öğrencilerinde akademik erteleme davranışı: Akademik güdülenme, akademik öz yeterlik ve akademik yükleme stillerinin rolü [Academic procrastination behavior in university students according to gender: The role of academic motivation, academic self-efficacy and academic attribution styles]. *Mersin Üniversitesi Eğitim Fakültesi Dergisi*, 6(1), 60-78.
- Akdeniz, H., Savtekin, G., & Köylü, K. (2021). Üniversite öğrencilerinin yaşam doyumlarının, psikolojik sağlamlık düzeylerine etkisinin incelenmesi [Examining the effect of university students' life satisfaction on their psychological resilience levels]. *Spor ve Rekreasyon Araştırmaları Dergisi*, 3(1), 36-52.
- Akın, A. (2008). The relationships between university students' chemistry laboratory anxiety, attitudes, and self-efficacy beliefs. *Australian Journal of Teacher Education*, 35(8), 48-49.
- Akyürek, M. İ. (2020). Öğretmen adaylarında akademik öz-yeterlik ve akademik güdülenme ilişkisi: Hacettepe Üniversitesi örneği [The relationship between academic self-efficacy and academic motivation in teacher candidates: Hacettepe University example]. *Medeniyet Eğitim Araştırmaları Dergisi*, 4(2), 36-50.
- Al Khatib, S. A. (2010). Meta-cognitive self-regulated learning and motivational beliefs as predictors of college students' performance. *International Journal for Research in Education*, 27(8), 57-7
- Aldan Karademir, Ç., Deveci, Ö., & Çaylı, B. (2018). Investigation of secondary school students' self-regulation and academic self-efficacy. *E-Kafkas Journal of Educational Research*, 5(3), 14-29.
- Arseven, A. (2016). Öz yeterlilik: Bir kavram analizi [Self-efficacy: A concept analysis]. *Electronic Turkish Studies*, 11(19). <http://dx.doi.org/10.7827/TurkishStudies.10001>
- Arends, R. I. (1998). *Learning to teach*. McGraw Hill.

- Ateş, B., & Sağar M. E. (2021). Üniversite öğrencilerinde özyeterliğin yordayıcısı olarak bilişsel esneklik, duygu düzenleme becerileri ve psikolojik sağlamlık [Cognitive flexibility, emotion regulation skills and psychological resilience as predictors of self-efficacy in university students]. *İstanbul Aydın Üniversitesi Sosyal Bilimler Dergisi*, 13(3), 679-695.
- Ateş, B., & Sağar, M. E. (2022). Psikolojik danışman adaylarında akademik başarının yordayıcısı olarak psikolojik sağlamlık, bilişsel esneklik ve öz-yeterlik [Psychological resilience, cognitive flexibility and self-efficacy as predictors of academic success in psychological counselor candidates]. *Erzincan Üniversitesi Eğitim Fakültesi Dergisi*, 24(1), 1-9. <https://doi.org/10.17556/erziefd.894637>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191.
- Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50(2), 248-287.
- Bandura, A. (1995). *Exercise of personal and collective efficacy in changing societies*. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp.1-45), Cambridge University. <https://doi.org/10.1017/CBO9780511527692.003>
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W H Freeman/Times Books/ Henry Holt & Co.
- Bandura, A. (1998). *Self-efficacy*. In V. S. Ramachandran (Ed.), *Encyclopedia of human behavior* (Vol. 4, pp. 71-81). Academic Press.
- Berman, S. L., Weems, C. F., & Petkus, V. F. (2009). The prevalence and incremental validity of identity problem symptoms in a high school sample. *Child Psychiatry and Human Development*, 40(2), 183-195. <https://doi.org/10.1007/s10578-008-0117-6>
- Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö., Karadeniz, Ş., & Demirel, F. (2010). *Bilimsel araştırma yöntemleri [Scientific research methods]*. Pegem.
- Cascallar, E., Boekaerts, M., & Costigan, T. (2006). Assessment in the evaluation of selfregulation as a process. *Educational Psychology Review*, 18(3), 297-306.
- Cassidy, S. (2015). Resilience building in students: The role of academic self-efficacy. *Frontiers in Psychology*, 6(1781), 1-14. <https://doi.org/10.3389/fpsyg.2015.01781>
- Chemers, M. M., Hu, L. T., & Garcia, B. F. (2001). Academic self-efficacy and first year college student performance and adjustment. *Journal of Educational Psychology*, 93(1), 55-64.
- Dai, Y., Jang, H. S., Salisbury-Glennon, J. D., Wang, C. H., & Strunk, K. K. (2022). A cross-cultural comparison of college student self-efficacy, self-regulation, and resilience between the US and China during the COVID-19 pandemic. In *Handbook of research on interdisciplinary studies on healthcare, culture, and the environment* (pp.21-40). IGI Global.
- Demiraslan-Çevik, Y., Haşlaman, T., Mumcu, F. K., & Gökçearsan, Ş. (2017). Özdüzenlemenin dikkat kontrolü boyutu: Bir ölçek uyarlama çalışması [Attention control dimension of self-regulation: A scale adaptation study]. *Başkent University Journal of Education*, 2(2), 229-238.

- Doğan, T. (2015). Kısa psikolojik sağlamlık ölçeği'nin Türkçe uyarlaması: Geçerlik ve güvenilirlik çalışması [Turkish adaptation of the short psychological resilience scale: Validity and reliability study]. *The Journal of Happiness & Well-Being*, 3(1), 93-102.
- Ekici, G. (2012). Akademik öz-yeterlik ölçeği: Türkçeye uyarlama, geçerlik ve güvenilirlik çalışması [Adaptation to Turkish, validity and reliability study]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 2012(43), 174-185.
- Erkoç, B., & Danış, M. Z. (2020). Üniversite öğrencilerinin psikolojik sağlamlık düzeylerinin tespit edilmesine yönelik bir araştırma [A study to determine the psychological resilience levels of university students]. *Kırklareli Üniversitesi Sosyal Bilimler Dergisi*, 4(1), 34-42.
- Fergusson, D. M., & Horwood, L.J. (2003). *Resilience to childhood adversity: Results of a 21-year study*. In S.S. Luthar (Ed.), *Resilience and Vulnerability: Adaptation in the Context of Childhood Adversities* (pp.130-155), Cambridge University.
- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education* (Vol. 7, p. 429). McGraw-hill.
- Hamill, S. K. (2003). Resilience and self-efficacy: The importance of efficacy beliefs and coping mechanisms in resilient adolescents. *Colgate University Journal of the Sciences*, 35, 115-146.
- Hamimi, T. (2018). Prediction of happiness based on self-regulation and self-efficacy among female students of secondary highschoools in Hamedan. *International Journal of School and Cognitive Psychology*, 5(4), 1-4. <http://doi.org/10.4172/2469-9837.1000217>
- Haşlamam, T., & Aşkar, P. (2007). Programlama dersi ile ilgili özdüzenleyici öğrenme stratejileri ve başarı arasındaki ilişkinin incelenmesi [Examining the relationship between self-regulated learning strategies and success in programming course]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 32(32), 110-122.
- Haynes, E., Crouch, E., Probst, E., Radcliff, E., Bennett, K., & Glover, S. (2020). Exploring the association between a parent's exposure to adverse childhood experiences (ACEs) and outcomes of depression and anxiety among their children. *Children and Youth Services Review*, 113, 1-6. <https://doi.org/10.1016/j.childyouth.2019.05.019>
- İsrael, E. (2007). *Öz düzenleme eğitimi, fen başarısı ve özyeterlilik* [Unpublished doctoral thesis]. Dokuz Eylül University.
- Luszczynska, A., Gutierrez- Dona, B., & Schwarzer, R. (2005). General self-efficacy in various domains of human functioning: Evidence from five countries. *International Journal of Psychology*, 40(2), 80-89.
- Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist*, 56(3), 227.
- Masten, A., & Barnes, A. (2018). Resilience in children: Developmental perspectives. *Children*, 5(7), 98-113. <https://doi.org/10.3390/Children5070098>
- Masten, A. S., & Reed, M. G. J. (2002). Resilience in development. *Handbook of Positive Psychology*, 74, 88.




- Mirlohi, M., Khajehpour, L., & Yousefi, E. (2024). The structural model of the causal relationship between childhood trauma and deviant behaviors and academic performance with the mediation of resilience in students. *Journal of Adolescent and Youth Psychological Studies*, 5(7), 33-42. <https://doi.org/10.61838/kman.jayps.5.7.4>
- Odacı, H., & Berber-Çelik, Ç. (2012). Üniversite öğrencilerinin problemleri internet kullanımlarının akademik öz-yeterlik, akademik erteleme ve yeme tutumları ile ilişkisi [The relationship between university students' problematic internet use and academic self-efficacy, academic procrastination and eating attitudes]. *Education Sciences*, 7(1), 389-403.
- Oğuz, A. (2012). Sınıf öğretmeni adaylarının akademik öz yeterlik inançları [Academic self-efficacy beliefs of classroom teacher candidates]. *Anadolu Journal of Educational Sciences International*, 2(2), 15-28.
- Osmanoğlu, C., & Ulu, M. (2024). Din kültürü ve ahlak bilgisi öğretmen adaylarının akademik öz-yeterlik ve üstbilişsel farkındalıklarının incelenmesi [An investigation of religious culture and moral knowledge teacher candidates' academic self-efficacy and metacognitive awareness]. *Bilimname* 51 (1), 87-146.
- Özkale, G. (2022). Üniversite öğrencilerinde akademik öz yeterlik, akademik erteleme ve öz düzenleme arasındaki ilişkilerin incelenmesi (Unpublished master's thesis). Çukurova University Institute of Social Sciences.
- Pajares, F. (2002). Gender and perceived self-efficacy in self-regulated learning. *Theory into Practice*, 41(2), 116-125.
- Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In Boekarters M., Pintrich P. R. & Zeidner M. (Eds), *Handbook of self-regulation* (452-502), Academic Pr.
- Posner, M. I., & Rothbart, M. K. (2009). Toward a physical basis of attention and self-regulation. *Physics of Life Reviews*, 6(2), 103-120.
- Ramirez, E.R. (2007). Resilience: A concept analysis. *Nursing Forum*, 42, 73-82.
- Robbins, A., Kaye, E., & Catling, J. C. (2018). Predictors of student resilience in higher education. *Psychology Teaching Review*, 24(1), 44-52.
- Sagone, E., & De Caroli, M. E. (2014). Locus of control and academic self-efficacy in university students: The effects of self-concepts. *Procedia-Social and Behavioral Sciences*, 114, 222-228.
- Sagone, E., De Caroli, M. E., Falanga, R., & Indiana, M. L. (2020). Resilience and perceived self-efficacy in life skills from early to late adolescence. *International Journal of Adolescence and Youth*, 25(1), 882-890. <https://doi.org/10.1080/02673843.2020.1771599>
- Toraman, Ç., Sarıgedik, E., Çavdar Toraman, M., & Noyan, C. O. (2023). Kurum bakımında kalan ergenlerin, psikolojik dayanıklılık, öz yeterlilik ve sosyal duygusal öğrenme becerilerinin değerlendirilmesi [Evaluation of psychological resilience, self-efficacy and social emotional learning skills of adolescents staying in institutional care]. *Toplum ve Sosyal Hizmet*, 34(1), 169-184. <https://doi.org/10.33417/tsh.1062003>

- Schunk, D. H., & DiBenedetto, M. K. (2014). Academic self-efficacy. In M. J. Furlong, R. Gilman, & E. S. Huebner (Eds.), *Handbook of positive psychology in schools* (pp. 115–130). Routledge/Taylor & Francis.
- Schunk, D. H., & Pajares, F. (2009). Self-efficacy theory. In K. R. Wenzel & A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 35–53). Routledge/Taylor & Francis.
- Smokowski, P. R., Reynolds, A. J., & Bezruczko, N., (1999). Resilience and protective factors in adolescence: An autobiographical perspective from disadvantaged youth. *Journal of Social Psychology, 37*(3), 425-448.
- Theobald, M. (2021). Self-regulated learning training programs enhance university students' academic performance, self-regulated learning strategies, and motivation: A meta-analysis. *Contemporary Educational Psychology, 66*. <https://doi.org/10.1016/j.cedpsych.2021.101976>.
- Tezel-Şahin, F. (2015). Beden eğitimi ve spor yüksek okulunda öğrenim gören öğrencilerin öz düzenleme yeterliliklerinin incelenmesi [Examining the self-regulation competencies of students studying at the school of physical education and sports]. *International Journal of Sport Culture and Science, 3*(Special Issue 4), 425-438.
- Tülübaş, T. (2022). The effect of self-regulated online learning skills on academic achievement. *Anadolu Journal of Educational Sciences International, 12*(2), 389-416. <https://doi.org/10.18039/ajesi.1021613>
- Yahsi Sari, H., Gelbal, S., & Sari, H. İ. (2020). Factors affecting academic self-efficacy of Syrian refugee students: A path analysis model. *International Journal of Assessment Tools in Education, 7*(2), 266-279. <https://doi.org/10.21449/ijate.702041>.
- Yılmaz-Bingöl, T., Vural-Batık, M., Hoşoğlu, R., & Fırıncı-Kodaz, A. (2019). Psychological resilience and positivity as predictors of self-efficacy. *Asian Journal of Education and Training, 5*(1), 63-69. <https://doi.org/10.20448/journal.522.2019.51.63.69>
- Yılmaz, M., Gürçay, D., & Ekici, G. (2007). Akademik özyeterlik ölçeğinin Türkçe'ye uyarlanması [Adaptation of the academic self-efficacy scale into Turkish]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 33*(33), 253-259.
- Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*(3), 329.
- Zimmerman, B. J. (1995). *Self-efficacy and educational development*. In A. Bandura (Ed.), *Self-efficacy in Changing Societies* (pp. 202–231). Cambridge University.
- Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Academic.

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article

Bibliometric Analysis of Studies between 2010-2023 on Leadership in the Field of Educational SciencesGüler SHAIKH^{1,*}  Semra KIRANLI GÜNGÖR² ¹ Eskişehir Osmangazi University, Türkiye, gulershaikh@gmail.com² Eskişehir Osmangazi University, Türkiye, semk2009@gmail.com* Corresponding Author: gulershaikh@gmail.com**Article Info****Received:** 29 March 2024**Accepted:** 03 August 2024**Keywords:** Leadership, bibliometric analysis, scopus index, VOSviewer 10.18009/jcer.1461156**Publication Language:** English**Abstract**

This study analyzed articles on "leadership" published in the Scopus database and the Web of Science between the years 2010-2023. The search term "leadership" was used and the filter section included "education". After excluding non-article entries, a total of 5208 articles were reached. The research methodology -was qualitative, and the data were analyzed using Scopus Analysis Tools and the VOSviewer bibliometric analysis software. The highest density of leadership studies was found to be in the USA, UK, Australia, Canada, South Africa, Spain, Turkey, Indonesia, Malaysia, and the Netherlands. The year with the most studies on leadership was 2022, and the author Grint K. conducted the most studies on this topic. The University of Toronto had the highest number of leadership articles. 'Transformational Leadership' emerged as the most studied leadership type in education. The frequently used keywords included 'motivation', 'education reform', 'school effectiveness', 'higher education', and 'sustainability.'



To cite this article: Shaikh, G. & Kıranlı-Güngör, S. (2024). Bibliometric analysis of studies between 2010-2023 on leadership in the field of educational sciences. *Journal of Computer and Education Research*, 12 (24), 422-445. <https://doi.org/10.18009/jcer.1461156>

Introduction

Leadership has been a significant part of civilization since the beginning of written history (Antonakis & Day, 2018). There have been various types of leadership throughout history. Early leadership dates back to religious, spiritual and military authority that guided the communities to provide resources, protect the people, and navigate political alliances with figures such as pharaohs, priests, and shamans taking on important roles in shaping the course of human events (Grint, 2011). The types of leadership in human history have generally differed depending on time, geography, culture and social structure. Monarchy is a type of leadership where a single person rules. This leader is usually known as a king or queen and rule is usually based on family or lineage (Croft & Coleman, 2015). Tyranny

describes the arbitrary and oppressive rule of an authoritarian leader. As a rule, the despot usually has absolute power and controls the government alone. An oligarchy is a form of leadership in which a group of people rule collectively. This group usually consists of the rich, influential or a special class. Democratic leadership is a form of leadership with the participation of the people. The people determine leaders and contribute to government policies through elections or direct participation (Devi & Subiyantoro, 2021). Dictatorship is a type of leadership in which one person has absolute power and rules in an authoritarian way. The Dictator is usually not elected and obtains his or her authority by force. Military leadership is the type of leadership exhibited by commanders of military forces. Such leaders manage the army, develop military strategies and make decisions on the battlefield. Religious leadership describes the leader of a religious community or congregation. These leaders interpret religious teachings, may be responsible for the governance of the community and conduct religious ceremonies. Technocratic leadership is a form of leadership based on scientific and technical expertise. These leaders use their technical knowledge and skills to influence policy and management. Entrepreneurial leadership is the type of leadership exhibited by managers in institutions or organizations. The entrepreneurial leader sets the vision, manages teams and implements business strategies (Barnes, 1978).

Although leaders and leadership practices have always intrigued people, leadership as a focus of scientific research only started in the middle of the 20th century as part of work optimization studies in economics. From these origins, leadership studies have spread over to different disciplines, including education (Oplatka, 2012). Education management has an important place within the subject of leadership. Therefore, different types of leadership have emerged in this field. The types of leadership that have emerged in the field of educational administration include the following:

Transformational Leadership

A transformational leadership style refers to a leadership style in which the leader aims to influence team members to unlock and transform their potential (Bass & Riggio, 2006). In this way, transformational leaders motivate team members with an inspiring vision and help them to develop and transform themselves. They construct an inspiring vision. The vision offers a perspective of the future that challenges team members, encourages the achievement of big goals, and is aligned with the team's values (Berkovich, 2016).

Transformational leaders empathize with and understand the needs of team members. They have good interpersonal skills and communicate effectively with team members. They develop a solid rapport with team members by being open to listening and receiving feedback (Ghasabeh et al., 2015). They entrust them with responsibility, involve them in decision-making processes and make them confident in themselves. They allow team members to unleash their leadership potential and manage independently. Transformational leadership increases the motivation of team members (Bass, 1999).

Distributed Leadership

Distributed leadership refers to the fact that the leadership role in an organization or team is not focused on a single individual, but that leadership responsibilities are shared among different individuals. Distributed leadership aims to unlock the leadership potential of all members with different skills and knowledge to achieve the goals of the organization or team (Bush & Ng, 2019). In this leadership approach, everyone can be involved in leadership roles and contribute to decision-making processes based on their expertise and competencies in their field. Distributed leadership aims to be effective in fast-changing and challenging situations. It enhances team motivation, encourages creativity and builds a culture of collaboration (Hashem, 2020).

Humanistic Leadership

Humanistic leadership implies a people-oriented leadership style. In this leadership approach, the leader prioritizes the needs, well-being and development of team members (Cowan, 2007). Humanistic leaders provide a fair and equitable environment. They provide the same opportunities to all team members, show impartiality in evaluating performance and base decisions on objective criteria. Humane leaders communicate openly and effectively. They listen to team members' views, accept feedback, and promote cooperation and understanding among team members through communication (Colbert et al., 2018). They trust their team members, believe in their abilities and provide an open communication environment. The leader creates a healthy and supportive work environment for long-term success by emphasizing the personal and professional development of team members (Cowan, 2007).

Collaborative Leadership

Collaborative leadership refers to a leader's approach to leading based on cooperation, participation and equality. Interacting with team members, collaborative leaders evaluate different perspectives, encourage teamwork and support a culture of cooperation to achieve common goals. The collaborative leader establishes open and effective communication with team members. They emphasize listening, evaluate the views of team members and are open to feedback (Heck & Hallinger, 2010). They promote cooperation and understanding among team members through communication. Moreover, collaborative leaders stimulate the participation of team members. They involve team members in decision-making processes, listen to their ideas and give them responsibility. They build trust with team members and celebrate successes. Collaborative leaders intervene constructively in conflict situations. They mediate to resolve conflicts and achieve reconciliation. They encourage team members to see their differences as a source of strength (De Meyer, 2011).

Strategic Leadership

Strategic leadership is a leader's adoption and application of strategic management to shape the future of the organization, achieve goals and succeed (Davies, 2003). Strategic leadership involves the leader setting the vision, strategic planning, managing resources and leading teams towards these strategic goals. Strategic leaders create a vision that will shape the future of the organization. Moreover, they use analytical thinking skills, evaluate different scenarios and make the best decisions. Strategic leaders use communication skills to effectively communicate their vision and strategic goals (Hitt et al., 2010). They motivate team members, persuade different stakeholders and keep them focused on the organization's goals. Strategic leaders effectively manage the organization's change processes. They provide leadership in adapting to change, create a culture that supports change, and provide innovation and flexibility for the organization to be competitive. Strategic leaders enhance the organization's competitiveness, foster innovation and adapt to changing situations (Davies, 2003).

Servant Leadership

Servant leadership is a leadership philosophy based on the leader serving and meeting the needs of others. Servant leadership focuses on understanding, supporting and serving the needs of others, rather than the leader using power and authority to direct followers. Servant leaders try to understand other people's needs by using their empathy

skills. Empathy enables the leader to listen to followers, understand their emotional state and support them. Servant leaders prioritize serving others. They support teamwork, facilitate communication among team members and enable cooperation to achieve common goals. Servant leadership fosters teamwork, increases follower commitment and motivation, and creates a sustainable impact (Bavik, 2020).

Situational Leadership

Situational Leadership is a model of leadership approach that varies depending on the situation. This model argues that leaders should adopt different leadership styles in different situations. Leadership influence depends on the leader's ability to adjust his behavior to a particular situation. This model emphasizes that no single leadership style will be effective in all situations, and that leaders must be flexible according to the situation, task requirements, and followers' needs. Situational Leadership theory is based on two key components: leadership styles and the level of development of followers. Leadership styles are divided into two main categories: directive and supportive behaviors. The development level of the followers is determined according to their competence and commitment levels. This leadership identifies four different leadership styles: directing, coaching, supporting and delegating. These styles are applied according to the development level of the followers (Vroom & Jago, 2007).

Situational Leadership is a dynamic approach that emphasizes leaders' flexibility and adaptability. By adjusting their behaviors according to the situation and the needs of followers, leaders can increase the performance and commitment of their teams. This model guides leaders in choosing and applying the most effective leadership style appropriate to a particular situation. As a result, Situational Leadership allows leaders to better manage both themselves and their teams and contributes significantly to organizational success (Thompson & Glasø, 2015).

Instructional Leadership

Instructional Leadership is a leadership style in which the leader supports teachers, encourages their professional development and provides guidance to improve the learning environment. The instructional leaders guide teachers (Hallinger & Chen, 2014). They also create an environment where teachers can receive support from each other and where learning opportunities can be created. Instructional leaders monitor teachers' classrooms and provide feedback. They adopt a constructive and supportive approach in the feedback

process. Instructional leaders work to improve the learning environment. They provide teachers with resources to create a good learning environment, offer classroom management strategies and encourage student participation. Instructional leadership increases student achievement by supporting teachers' professional development (Skaalvik, 2020).

Educational Leadership

Educational leadership is a type of leadership that aims to provide effective leadership among teachers, students and other staff in educational institutions. Educational leadership can have positive effects on students' achievement and school improvement. There are different types of educational leaders. For instance, an educational leader is the person at the head of a school or educational institution. Headmasters, rectors or administrators usually take on this role. The educational leader sets the overall vision of the school, manages staff, allocates resources and monitors the academic and administrative performance of the school. These leaders manage school events, represent the needs of the students and positively shape the culture of the school (Dempster & Lizzio, 2007). They can also support teachers' professional development and provide them with feedback. They help students achieve their academic goals, support their personal and social development, improve their decision-making skills and help students discover their potential (Sims et al., 2017).

Pedagogical Leadership

Pedagogical leadership aims to improve the quality of teaching and learning and supports the professional development of teachers. By focusing on innovative and effective pedagogical methods, they increase student achievement and improve the quality of teaching. Through the process of lesson planning, pedagogical leaders guide teachers and contribute to the development of programs. Pedagogical leaders promote the use of data and monitor student achievement (Caingcoy, 2020). They make data-driven decisions, analyze data for instructional and curricular improvements, and share data with their followers. Pedagogical leadership promotes collaboration and sharing among teachers, ensures the exchanging of best practices and supports the dissemination of pedagogical knowledge and experiences. Pedagogical leadership guides teachers on how to improve the quality of teaching, increase student achievement and provide teachers with the necessary guidance they inquire about (Heikka & Waniganayake, 2011).

Teacher Leadership

Teacher leadership is a leadership style in which a teacher assumes a leadership role within the classroom and at the school level. Teacher leadership involves teachers effectively leading students' education, mentoring colleagues and contributing to change processes in the school (Wenner & Campbell, 2016). Teacher leaders prioritize students' needs and interests. They appreciate students' differences and personalize learning experiences. Teacher leaders foster a culture of collaboration and sharing. They work collaboratively with colleagues, share best practices and create opportunities for collaboration for professional development. They contribute to educational policies at the school and system levels. They offer new and innovative ideas, take part in setting school goals and decision-making, and represent the voice of teachers (Ripki et al., 2020).

School Leadership

School leadership refers to the style of leadership that undertakes the management and direction of a particular school. School leaders prioritize the success and well-being of students (Spillane et al., 2001). They understand the individual differences of students, tailor educational programs to student needs, and encourage student participation. School leaders ensure that the school builds strong relationships with the community. They collaborate with parents, local community leaders and other stakeholders, highlight the school as part of the community and strengthen the school's reputation. School leadership manages and coordinates the many factors that influence the success of the school. An effective school leader promotes teamwork, increases motivation and fosters a positive school climate (Johnston, 1996).

Effective Leadership

Effective leadership can be broadly defined as a leader's ability to effectively lead, motivate and manage people to achieve goals. It requires the leader to have the necessary skills to clearly communicate vision, communicate effectively with team members, build trust and respect, make decisions, and manage and solve problems (Cote, 2017). Effective leaders have clear and effective communication skills. Good communication is essential to convey the leader's vision, explain instructions, provide feedback and interact with team members. Effective leaders have a charismatic presence (Grimm, 2010). Effective leaders have a leadership style that empathizes with team members and understands their emotional needs.

There have been many types of leadership identified based on different criteria including the context in which it is being used and the strengths and weaknesses of the leaders and their followers (Van Seters & Field, 1990). Leadership which can be defined as the ability to mobilize a group of followers toward a shared goal can be analyzed through various perspectives and as a consequence, various theories explaining leadership have been propagated.

The behavioural theory asserts that correct behaviour shown by the leader is the key to successful leadership. Similarly, the Great Man Theory asserts that correct and naturally acquiring traits of the leader is the key to successful leadership. Theories that focus on followers are transformational theory and transactional theory. Transformational Theory holds that leaders' relationship with followers is key to successful leadership practice whereas transactional theory believes leaders' use of punishment and reward toward the followers is the main element (Bamberg et al., 2011).

Each of these leadership theories leads to different leadership styles. Leadership styles and their effects are what are especially studied in the field of education. Educational Leadership has grown to be its area of expertise. Heck and Hallinger (2005) note that leadership is the most researched topic in Educational Management and Administration. Oplatka (2012) notes that leadership is mostly researched on empirical studies with simple analysis without much scientific rigour. Leadership is often researched on principal leadership styles, with a comparatively limited focus on teacher leadership (Szeto, et al., 2015). *"Distributed leadership"*, *"Culturally Sensitive" "Leadership"*, and *"Women and Minorities as Leaders"* are also topics of much educational research in recent years.

Reviews allow researchers to see the current situation in the field and predict the trends of the field. In other words, to metaphorically create a map of the field. With its ever-growing both quantitatively and perspective-wise- body of research 21st-century leadership research review is important, especially considering what a central stage it occupies in educational management (Bush & Crawford, 2012). This article aims to review articles written in the past ten years to answer these questions;

1. What are the most common keywords in leadership research?
2. Which types of leadership have been studied the most?
3. Who has been the most cited author in the field of leadership?
4. Which publications are the most cited in the field of leadership?

5. What is the most cited year in the field of leadership?
6. Who are the most active authors and what are their demographics?
7. What is the year with the most leadership studies in education?
8. Which universities lead the most research in the field of leadership?
9. Which Universities cites the most in the field of leadership?
10. Which countries lead in the production of leadership studies in education?
11. Which countries cited the most in the field of leadership?

To answer these questions, a bibliometric analysis of the last ten years' corpus, accessed on the Web of Science will be done using the Scopus Analytics and the VOSviewer.

Method

Design and Procedure

In this study, the bibliometric analysis research method was used. Bibliometric analysis is a subfield of document analysis research method, specifically, it deals with the quantitative analysis of publications, such as journal articles, books, and conference proceedings. Bibliometric analysis is a quantitative method that measures the impact and influence of scholarly work. Moreover, it provides information about the number of citations a publication receives, the number of times it has been downloaded, or the number of times it has been listed in other publications (Roig-Tierno et al., 2017). Bibliometric analysis is used to identify publication trends and tendencies in a particular research field. This information can guide future research planning and strategic decisions.

In this research VOSviewer 1.6.20 package program was used. The VOSviewer includes a variety of tools for analyzing and interpreting the data, such as a clustering algorithm that identifies groups of related publications or authors, and a module for creating maps of research fields (Jeong & Koo, 2016).

Data Analysis

In the beginning, the researchers identified the research question and objectives of the study. The scope and boundaries of the study, including the databases and years were determined between 2010-2023. To identify relevant literature, a literature search using various databases was conducted. In the search field, the word leadership was typed first. 23191 results were obtained. Afterwards, only articles were selected by filtering and the subject area was limited to social science. After filtering, 2895 articles were obtained and then the analysis proceeded. Furthermore, the scope of the research was narrowed down by collecting and cleaning the data on authors, institutions, journals, citation counts and so on. Thus, the results of the research and its development were interpreted. Additionally, the results were visualized using diagrams and graphs.

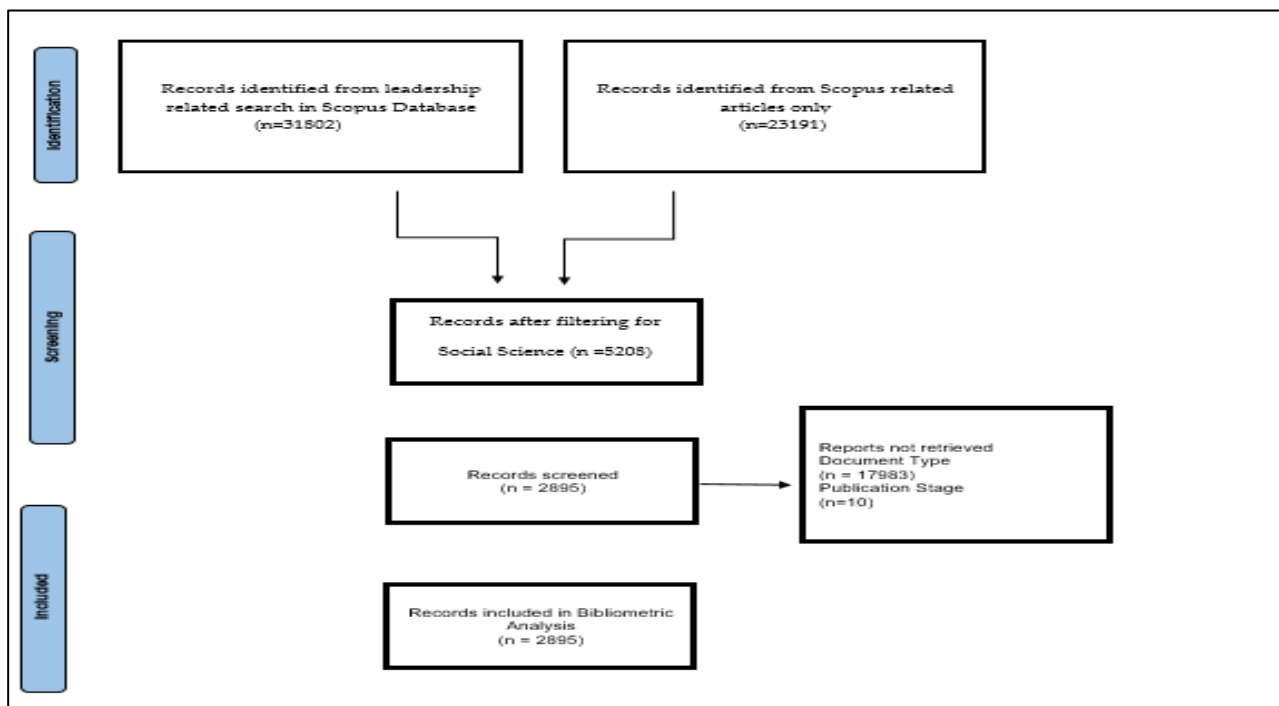


Figure 1. Prisma 2020 flow diagram for scopus search query process

Finding

After all documents were extracted, Scopus' inbuilt analysis search function and the VOSviewer were used to visualize the results.

Publication Year Analysis

The increase in research on leadership over the years is due to various reasons. Leadership is a subject of great importance in the corporate world, businesses and other organisations. Good leadership is a critical factor for a successful business or organization.

Therefore, there has been an increased interest in research on leadership. Researchers are working to understand and develop effective strategies in leadership, leadership styles, leadership development and leadership effectiveness. The concept of leadership has changed and evolved (Van Seters & Field, 1990). While the traditional understanding of leadership was based on an authoritarian and hierarchical structure, today participative, visionary and transformational leadership approaches have come to the fore. This changing understanding of leadership has led to the emergence of new topics and perspectives in leadership research. Therefore, measuring leadership effectiveness and leader performance has become a focus of leadership research.

First of all, within the scope of the research, we limited the studies conducted in the field of leadership to cover the years between 2010 and 2023. A total of 5208 articles with open access were published between 2010 and 2023, obtained from the Scopus database. Research data were collected on the 27th of June 2023. In line with the data obtained, while 107 studies were published in 2010, this number has started to increase over the years. The year 2022 is seen as the year with the most publications on “Leadership” with 822 articles. However, although the year 2023 has not yet been completed, it seems that it will surpass 2022 with 306 publications so far. Figure 2 shows the annual distribution of the articles published between the years 2010 to 2023.

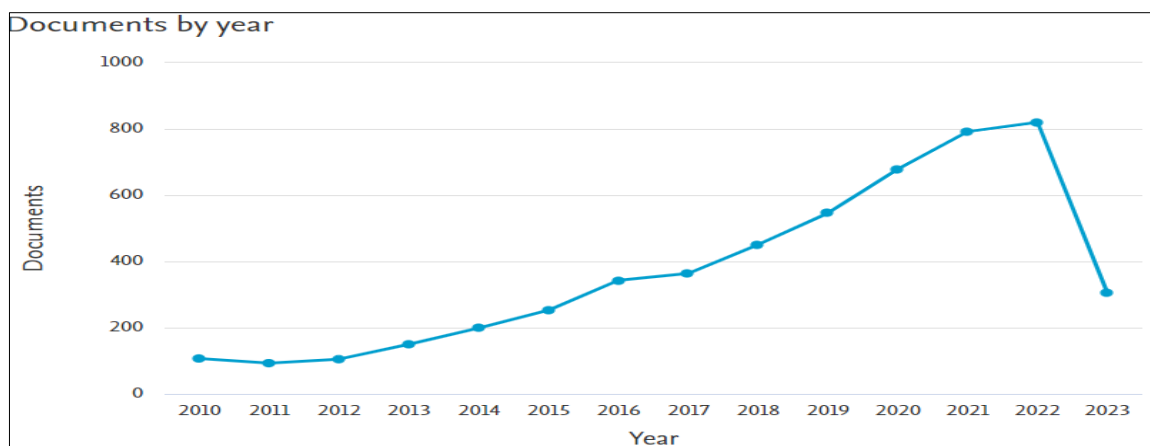


Figure 2. Annual distribution of publications according to the Scopus database (Search date: June 27, 2023).

Keywords Analysis

There are several reasons for using keywords in research. Keywords are used to determine the subject of the research and to distinguish the research from other studies. By

As a result of the findings obtained from VOSviewer, transformational leadership has been the most studied leadership type. Transformational leadership has been studied 85 times and 165 total strength links have been observed. It is seen that the same results are obtained in similar studies (Abdullah et al., 2020). Authentic leadership follows transformational leadership with 32 publications and 60 total strength links. Ethical leadership ranked third with 28 publications and 18 total strength links. Finally, the distributed leadership type ranked fourth with 23 publications and 28 total strength links. These are followed by transactional leadership, servant leadership and political leadership, sustainable leadership, school leadership, shared leadership, educational leadership and so on. Figure 5 also shows the density of leadership styles according to the VOSviewer database.

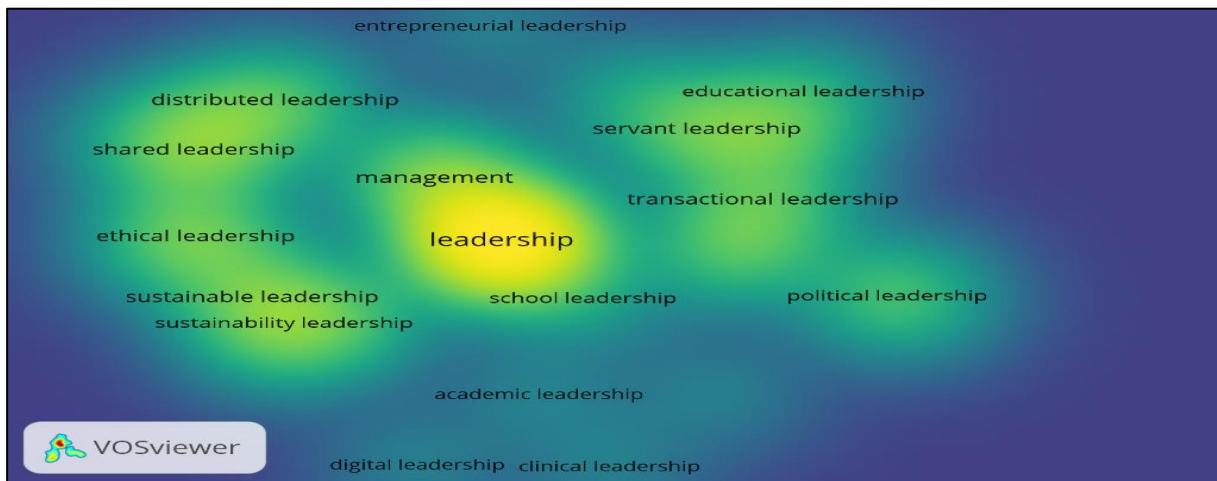


Figure 5. Density of the most studied leadership style in the field according to the VOSviewer database

Citation Analysis

In this part of the report, we have an analysis of the most cited authors. There are several important reasons for citation in research. Citation is important for identifying the sources of information used and for referencing the sources appropriately. It enables researchers to identify the sources used to support their work, to track relevant literature, and to draw on previous work in related fields (Frank et al., 2019).

Citation implies respect for the work and contributions of previous research. Research is often based on and influenced by the results of previous studies. Citation helps to avoid errors and misunderstandings. Citing previous studies prevents misinformation and the drawing of misleading conclusions (Nielsen & Andersen, 2021).

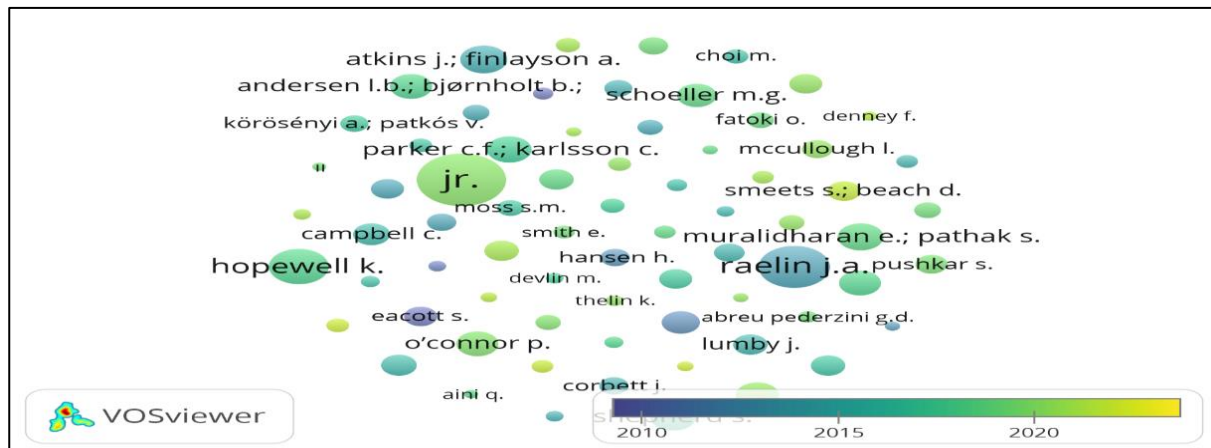


Figure 6. The most cited authors on leadership in the field according to the VOSviewer database

Figure 6 shows all of the researchers with the highest number of citations. Using a threshold of at least six citations and two publications, we identify the citation structure of researchers who have published studies on leadership. Out of 5112 authors, only 71 met the criteria. According to the results of the analysis obtained from VOSviewer, the most cited author is Jr. who is cited 241 times with 7 documents. He is followed by Raelin, Joseph A. with 154 citations, and thirdly by Hopewell K. with 109 citations.

Table 1. The most cited publications on leadership according to the scopus database

Rank	From 2010 to 2015		From 2016 to 2023	
	Documents	Citations	Documents	Citations
1.	(Bridges et al., 2011)	544	(Eva et al., 2019)	489
2.	(Alkire et al, 2011)	445	(Hughes et al., 2018)	396
3.	(Parris & Peachey, 2013)	425	(Hallinger, 2018)	265
4.	(Carsten et al., 2010)	298	(Cath et al., 2018)	238
5.	(Achtenhagen, Melin & Naldi, 2013)	287	(Gelfand et al., 2021)	211
6.	(Alvesson & Spicer, 2012)	260	(Prendeville et al., 2018)	193
7.	(Carpenter et al., 2012)	242	(Albertazzi et al., 2018)	164
8.	(Harms & Credé, 2010)	242	(Ansell et al., 2021)	163
9.	(Schaufeli, 2015)	207	(Raelin, 2016)	149
10.	(Davis et al., 2014)	200	(Ryan et al., 2016)	148

Table 1 shows the top ten influential authors regarding the “Leadership” topic, sorted by maximum number of citations. According to the data obtained as a result of filtering by selecting the keyword "leadership" in Scopus, the most cited document is the article titled "Interprofessional collaboration: Three best practice models of interprofessional education" published in 2011 by Bridges, D.R., Davidson, R.A., Odegard, P.S., Maki, I.V., Tomkowiak, J. This is followed by the article "Servant Leadership: A systematic review and call for future research" authored by Eva, N., Robin, M., Sendjaya, S., van Dierendonck, D., Liden, R.C. and published in 2019.

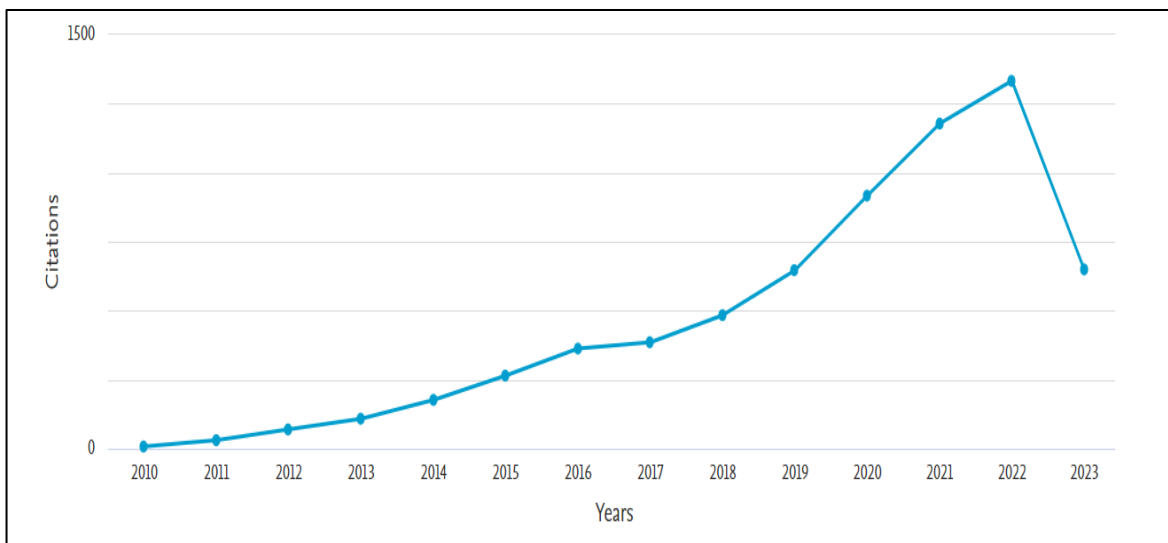


Figure 7. The most cited years on leadership according to the Scopus database

Figure 7 shows information about the most cited years obtained from Scopus. According to the data publications containing the keyword "leadership" received 21 citations in 2010, while the most cited year was 2022 with 6128 citations. In 2023, 3319 citations were made so far in the articles on "leadership".

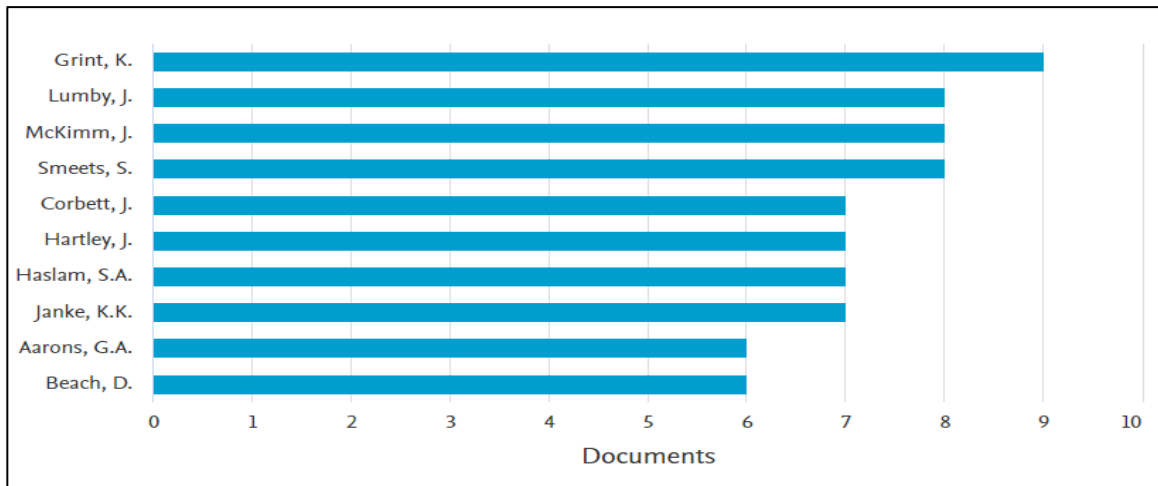


Figure 8. The most active authors on leadership according to the Scopus database

According to the data obtained after filtering in Scopus, Grint, Keith was the author who produced the most articles by publishing 9 articles in the field of "leadership". The author's article "Leadership, Management and Command in the Time of the Coronavirus" published in 2020 has been the most cited article which was cited 46 times so far. In this article, the researcher touched on the implications for leadership requirements during the Corona pandemic and suggested three modes of decision-making, which were leadership, management and command. Next is Lumby, Jacky with 8 articles. In 2016, the author published "Internationalisation and Culture in Higher Education" which has been cited 52 times. Lumby and Foskett, (2016) suggest that thoughtful and careful management of internationalization that maintains distinctness and encourages equality across cultures is in the long-term commercial interest of universities, as well as benefiting individuals and society.

Countries and Affiliations

Scientific research leads to the discovery of new knowledge, technological advances and innovative solutions. By leading scientific research, countries promote scientific and technological progress at the national level. This progress supports economic growth, provides a competitive advantage and promotes social development. Countries that lead the way by investing in scientific research can gain a competitive advantage in the international arena. Scientific achievements enhance a country's reputation and create opportunities for cooperation with other countries (Copeland et al., 2021).

From country administration to education, leadership continues to be an important phenomenon. Therefore, countries continue to attach importance to research in the field of leadership. Countries support research in leadership because leadership increases a country's influence and steering power. Leadership enables a country to position itself effectively in the international arena. Research to develop leadership capabilities supports a country to be at the forefront of policy-making processes and take a leadership role in international fora. This enhances a country's ability to protect national interests, steer foreign policy and influence global affairs. Leadership is closely linked to innovation and competitiveness. Research supports the innovation and competitive advantage that underpin leadership. A good research infrastructure is a source of new inventions and technological advances, which in turn boosts the country's economic growth and competitiveness (Contreras et al., 2020). Research studies support education and training processes to develop leadership skills and leadership potential. Countries promote leadership research and provide leadership training to support leadership capabilities. This enables leaders to develop their leadership skills and be effective in leadership positions. Leadership research plays an important role in understanding the inner workings of a country, public policies and societal transformation. It helps to identify best practices and strategies in leadership. Leadership research can inform a country's governance system, social services, economic policies and social transformation. This in turn promotes national prosperity and social development (De Bortoli et al., 2019).

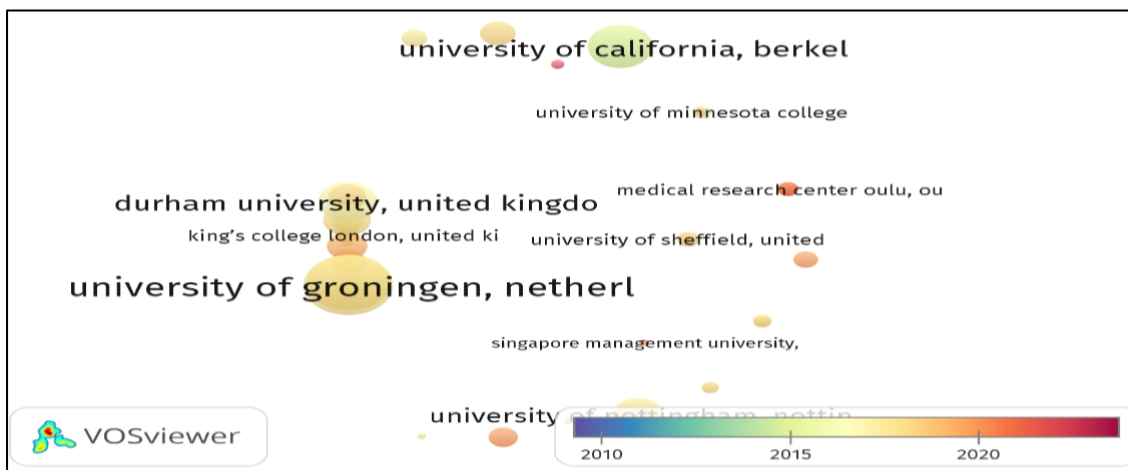


Figure 9. The most cited universities on leadership according to VOSviewer database

Universities are centers of scientific research and studies in the field of leadership increase academic knowledge. By supporting leadership research, universities contribute to the development of new theories, the understanding of leadership behaviours and the enhancement of leadership effectiveness. As a result, by supporting leadership research,

universities contribute to the development of leadership knowledge, the transfer of leadership skills to students, applied research and social impact (Fischer, & Sitkin, 2023). Table 8 shows the most cited universities in leadership-related research. As a result of the analysis, the University of Groningen in the Netherlands is the most cited institution with 12 articles and 383 citations. This is followed by the University of Exeter in the United Kingdom with 13 articles and 352 citations. This was followed by the University of California, Berkeley in the United States of America, Durham University in the United Kingdom, University of Nottingham in the United Kingdom and the University of Melbourne in Australia.

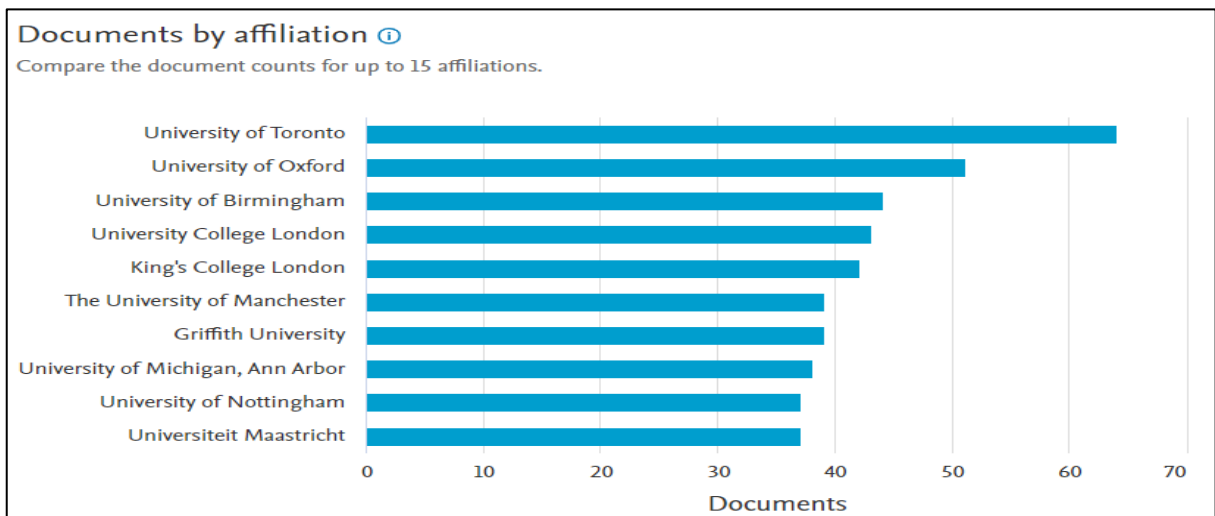


Figure 10. The most active universities on leadership according to the Scopus database

Figure 10 presents information on the 10 universities with the highest number of publications on leadership. It is seen that the University of Toronto has been actively involved in leadership and has published 64 publications on the subject. This is followed by the University of Oxford with 51 documents. In the third place is the University of Birmingham with 44 documents. These universities are efficient and productive in the field of "leadership" and have therefore contributed the most to the field.

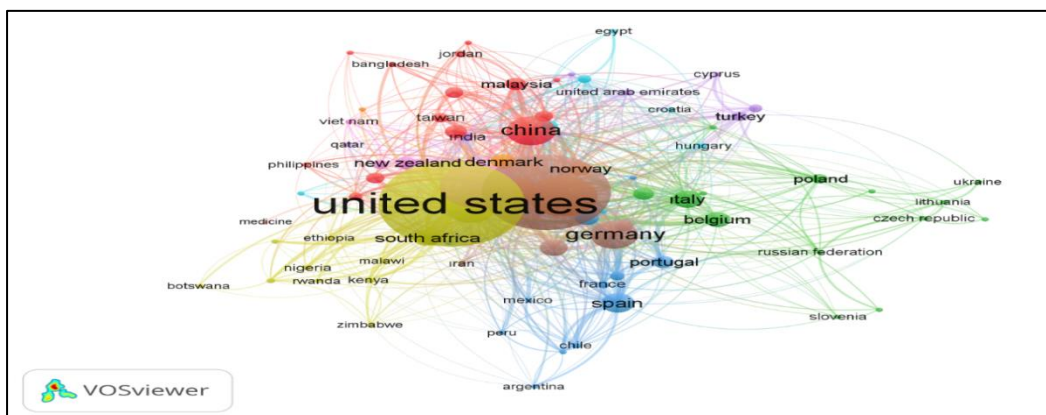


Figure 11. The most cited countries on leadership according to the VOSviewer database

Figure 11 shows the result obtained from the VOSviewer regarding the most cited countries on leadership-related research. According to the research results, the most cited country in the field of "leadership" was the United States of America with 20866 citations. Moreover, it ranked second with 620 co-authorships. The United Kingdom is next with 17008 citations, ranking second. In addition, the United Kingdom ranks 1st with 679 co-authorships. These two countries are followed by Australia, the Netherlands, Canada, China Germany, Switzerland and Spain, respectively. In Asian countries, China is the leading country, followed by Malaysia, Pakistan, Singapore and Turkey. According to the results "leadership" is heavily focused on the American and European continents. Other bibliometric analyses on leadership have yielded similar results.

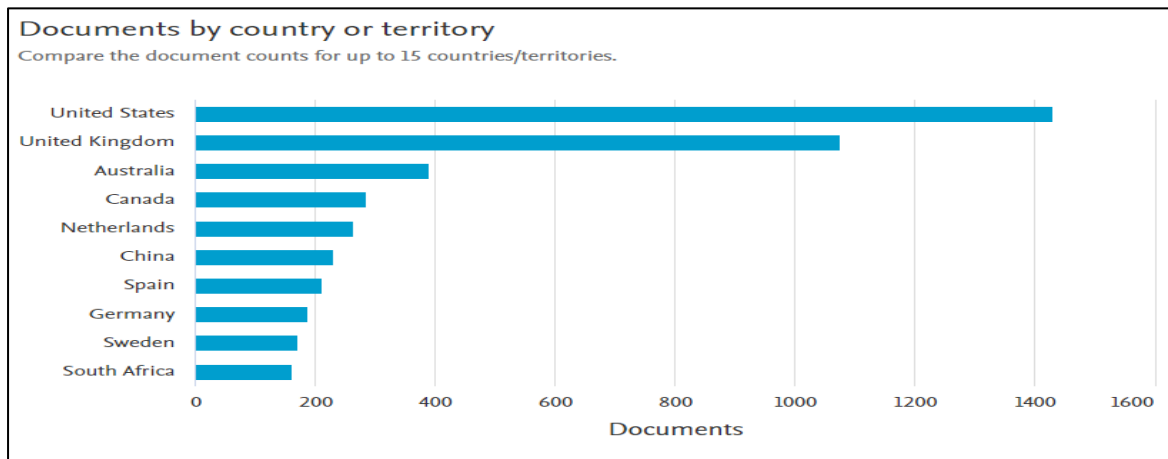


Figure 12. The most active countries in leadership-related research according to the Scopus database

The last analysis was to examine the country and academic affiliation of the researchers. This analysis was undertaken to obtain a greater insight into the geographical origin of the researchers contributing to the field. The variety of countries and academic institutions is striking. In the light of the data obtained from Scopus, the United States of America is the leading country with 1428 publications on "leadership". The United States is followed by the United Kingdom with 1037 publications. In addition, Australia ranks third with 388 publications. In most bibliometric studies conducted in the field of leadership, the United States of America ranks first and has published significantly in the field of leadership.

Discussion and Conclusion

Bibliometric analysis is a method that enables the evaluation and understanding of scientific research by performing statistical and quantitative analysis on scientific publications and citations (Roig-Tierno et al., 2017). In this study, we summarized the bibliometric information of the articles published in English in Scopus in the field of social sciences between 2010 and 2023. We tried to obtain an intellectual perspective by using different analysis methods such as VOSviewer and Scopus analysis tools. In sum, this research not only includes information on the most frequently used keywords but also the most cited researchers, countries and universities. In addition, the years, countries and universities with the highest number of publications and the figures related to this information were also included. In light of the data obtained from the research, it is seen that the research on leadership has increased since 2010 and continues to increase. Tigre, et al., (2023) also reported an increase over the years in their biometric research. The reason for this increase is that leadership is becoming increasingly important in the corporate world and other areas of society. Leadership is a subject linked to business management, organizational behaviour, psychology, sociology and other disciplines.

Leadership skills are increasingly in demand for effective leadership, leading to an increasing number of studies on leadership. In addition, leadership research includes practice-oriented studies to develop leadership skills and improve leadership practices. Consequently, there has been a noticeable increase in leadership studies (Alvesson, 1996).

It was seen that transformational leadership ranked first in the most studied leadership type. Transformational leadership is a leadership style that has an important position among leadership theories and approaches. This leadership style focuses on a process in which the leader leads by influencing and transforming followers. Transformational leadership aims to change followers by influencing and inspiring them to realise their potential. In similar studies, it is seen that transformational leadership studies have increased over the years (Contreras et al., 2020). Studies on leadership among countries have been increasing over the years. It has been observed that the United States of America is one of the countries where this increase is the most (Abdullah et al, 2020; Tigre et al., 2023). Moreover, according to the data obtained from the research, the University of Toronto was the university with the highest number of publications in the field of leadership. In addition, Grint, Keith was the author who produced the most articles by publishing 9 articles in the

field of "leadership". On the other hand, according to the results of the analysis obtained from the VOSviewer, the most cited author is Jr. who is cited 241 times with 7 documents.

Based on the results of our bibliographical research, several future recommendations can be proposed to enhance the depth and scope of leadership studies. Firstly, expanding the time frame of the research is essential. By including publications from years before 2010, a more comprehensive understanding of the evolution of leadership research in Turkey and globally can be achieved. Secondly, broadening the research areas to encompass related fields such as business, education, psychology, and political science is highly recommended. Including diverse perspectives can enrich the analysis and lead to more robust conclusions. Incorporating non-English publications is another critical recommendation. By including articles written in Turkish and other languages, the research can capture a broader spectrum of contributions that might be overlooked in an English-only search. Additionally, utilizing different types of publications, such as conference papers, theses, books, and book chapters, can enhance the study. These sources often contain valuable research that might not be available in journal articles. Including them can provide a more comprehensive view of the field and highlight important contributions from various types of scholarly work. Conducting comparative studies of leadership research trends in Turkey with those in other countries can provide valuable contextual insights. Lastly, engaging with the academic community through workshops or seminars to discuss findings and gather feedback is highly beneficial. Such engagement can provide new perspectives and enhance the quality and relevance of the research.

Appendix 1

TITLE-ABS-KEY-AUTH (leadership) AND PUBYEAR > 2009 AND PUBYEAR < 2024 AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (SUBJAREA, "SOCI")) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (EXACTKEYWORD, "Leadership"))

Acknowledgement

Due to the scope and method of the study, ethics committee permission was not required.

Author Contribution Statement

Güler SHAIKH: *Conceptualization, literature review, methodology, implementation, data analysis, translation and writing*

Semra KIRANLI GÜNGÖR: *Conceptualization, literature review, methodology, implementation, data analysis, translation and writing*

References

- Abdullah, K. H., Hashim, M. N., & Aziz, F. S. A. (2020). A 39-year (1980-2019) bibliometric analysis of safety leadership research. *TEST Engineering & Management*, 83, 4526–4542.
- Agbo, F. J., Oyelere, S. S., Suhonen, J., & Tukiainen, M. (2021). Scientific production and thematic breakthroughs in smart learning environments: A bibliometric analysis. *Smart Learning Environments*, 8(1). <https://doi.org/10.1186/s40561-020-00145-4>
- Alvesson, M. (1996). Leadership studies: From procedure and abstraction to reflexivity and situation. *The Leadership Quarterly* 7(4), 455-485.
- Antonakis, J., & Day, D. V. (2018). Leadership: past, present, and future. In *SAGE Publications, Inc. eBooks* (pp. 3–26). <https://doi.org/10.4135/9781506395029.n1>
- Bamberg, S., Fujii, S., Friman, M., & Gärling, T. (2011). Behaviour theory and soft transport policy measures. *Transport Policy*, 18(1), 228–235.
- Barnes, D. F. (1978). Charisma and religious leadership: A historical analysis. *Journal for the Scientific Study of Religion*, 17(1), 1. <https://doi.org/10.2307/1385423>
- Bass, B. M. (1999). Two decades of research and development in transformational leadership. *European Journal of Work and Organizational Psychology*, 8(1), 9-32.
- Bass, B. M., & Riggio, R. E. (2006). *Transformational leadership*. Psychology Press eBooks.
- Bavik, A. (2020). A systematic review of the servant leadership literature in management and hospitality. *International Journal of Contemporary Hospitality Management*, 32(1), 347–382. <https://doi.org/10.1108/ijchm-10-2018-0788>
- Berkovich, I. (2016). School leaders and transformational leadership theory: Time to part ways? *Journal of Educational Administration*, 54(5), 609-622.
- Boyle, F., & Sherman, D. (2006). ScopusTM: The product and its development. *The Serials Librarian*, 49(3), 147–153. https://doi.org/10.1300/j123v49n03_12
- Bush, T., & Crawford, M. (2012). Mapping the field over 40 years. *Educational Management Administration & Leadership*, 40(5), 537–543. <https://doi.org/10.1177/1741143212451827>
- Bush, T., & Ng Yoon Mooi, A. (2019). Distributed leadership and the Malaysia education blueprint: From prescription to partial school-based enactment in a highly centralised context. *Journal of Educational Administration*, 57(3), 279-295.
- Caingcoy, M. E. (2020). Weaving teaching and leading: A systematic literature review on pedagogical leadership contributions. *International Journal of Innovative Science and Research Technology*, 5(4), 551–556. <https://doi.org/10.38124/ijisrt20apr727>
- Chamorro-Padial, J., & Rodríguez-Sánchez, R. (2023). The relevance of title, abstract, and keywords for scientific paper quality and potential impact. *Multimedia Tools and Applications*, 82(15), 23075–23090. <https://doi.org/10.1007/s11042-023-14451-9>
- Chapman, A., Simperl, E., Koesten, L., Konstantinidis, G., Ibáñez, L. D., Kacprzak, E., & Groth, P. (2020). Dataset search: A survey. *The VLDB Journal*, 29(1), 251-272.
- Colbert, B. A., Nicholson, J., & Kurucz, E. C. (2018). Humanistic leadership for sustainable transformation. In *Building Leadership Bridges* (pp. 33–47).
- Contreras, F., Baykal, E., & Abid, G. (2020). E-Leadership and teleworking in times of COVID-19 and beyond: What we know and where do we go. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.590271>
- Copeland, L., Littlecott, H., Couturiaux, D., Hoddinott, P., Segrott, J., Murphy, S., . . . Evans, R. (2021). The what, why and when of adapting interventions for new contexts: A qualitative study of researchers, funders, journal editors and practitioners' understandings. *PloS One*, 16(7), e0254020.

- Cote, R. (2017). Vision of effective leadership. *International Journal of Business Administration*, 8(6), 1. <https://doi.org/10.5430/ijba.v8n6p1>
- Cowan, D. A. (2007). Artistic undertones of humanistic leadership education. *Journal of Management Education*, 31(2), 156–180. <https://doi.org/10.1177/1052562905285099>
- Croft, W., & Coleman, N. (2015). *The monarch as a politician: The leadership qualities of Queen Elizabeth I* (Doctoral dissertation). University of the Cumberlands, Kentucky, USA
- Davies, B. (2003). Rethinking strategy and strategic leadership in schools. *Educational Management & Administration*, 31(3), 295–312.
- De Bortoli Cassiani, S. H., De Fatima Fernandes, M. N., Lecorps, K., & Da Silva, F. a. M. (2019). Leadership in nursing: Why should we discuss it? *Revista Panamericana De Salud Pública*, 43, 1. <https://doi.org/10.26633/rpsp.2019.46>
- De Meyer, A. (2011). Collaborative leadership: New perspectives in leadership development. In *Palgrave Macmillan UK eBooks* (pp. 44–63).
- Dempster, N., & Lizzio, A. (2007). Student leadership: Necessary research. *Australian Journal of Education*, 51(3), 276–285. <https://doi.org/10.1177/000494410705100305>
- Devi, A. D., & Subiyantoro, S. (2021). Implementation of democratic leadership style and transformational head of madrasah in improving the quality. *Nidhomul Haq*, 6(1), 14–26. <https://doi.org/10.31538/ndh.v6i1.1162>
- Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2007). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. *The FASEB Journal*, 22(2), 338–342. <https://doi.org/10.1096/fj.07-9492lsf>
- Fischer, T., & Sitkin, S. B. (2023). Leadership Styles: A comprehensive assessment and way forward. *the Academy of Management Annals*, 17(1), 331–372.
- Frank, M. R., Wang, D., Cebrian, M., & Rahwan, I. (2019). The evolution of citation graphs in artificial intelligence research. *Nature Machine Intelligence*, 1(2), 79–85.
- Ghasabeh, M. S., Soosay, C., & Reaiche, C. (2015). The emerging role of transformational leadership. *The Journal of Developing Areas*, 49(6), 459–467.
- Grimm, J. W. (2010). Effective leadership: Making the difference. *Journal of Emergency Nursing*, 36(1), 74–77. <https://doi.org/10.1016/j.jen.2008.07.012>
- Hallinger, P., & Chen, J. (2014). Review of research on educational leadership and management in Asia. *Educational Management Administration & Leadership*, 43(1), 5–27. <https://doi.org/10.1177/1741143214535744>
- Hashem, R. (2020). ‘Al Faza’a’ leadership: An implicit cultural barrier to distributed leadership in Jordanian public schools. *Educational Management Administration & Leadership*, 50(1), 26–42. <https://doi.org/10.1177/1741143220932580>
- Heck, R. H., & Hallinger, P. (2005). The study of educational leadership and management. *Educational Management Administration & Leadership*, 33(2), 229–244.
- Heck, R. H., & Hallinger, P. (2010). Collaborative leadership effects on school improvement: integrating unidirectional- and reciprocal-effects models. *The Elementary School Journal*, 111(2), 226–252. <https://doi.org/10.1086/656299>
- Heikka, J., & Waniganayake, M. (2011). Pedagogical leadership from a distributed perspective within the context of early childhood education. *International Journal of Leadership in Education*, 14(4), 499–512. <https://doi.org/10.1080/13603124.2011.577909>
- Hitt, M. A., Haynes, K. T., & Serpa, R. (2010). Strategic leadership for the 21st century. *Business Horizons*, 53(5), 437–444. <https://doi.org/10.1016/j.bushor.2010.05.004>
- Jeong, D., & Koo, Y. (2016). Analysis of trend and convergence for science and technology using the VOSviewer. *International Journal of Contents/Journal of Contents*, 12(3), 54–58.

- Johnston, B. J. (1996). Types of educational leadership in a postindustrial society. *Urban Review the Urban Review*, 28(3), 213–232. <https://doi.org/10.1007/bf02355338>
- Lumby, J. (2013). Distributed leadership. *Educational Management Administration & Leadership*, 41(5), 581–597. <https://doi.org/10.1177/1741143213489288>
- Lumby, J., & Foskett, N. (2015). Internationalization and culture in higher education. *Educational Management Administration & Leadership*, 44(1), 95–111.
- Nielsen, M. W., & Andersen, J. P. (2021). Global citation inequality is on the rise. *Proceedings of the National Academy of Sciences of the United States of America*, 118(7).
- Oplatka, I., & Hemsley-Brown, J. (2012). The management and leadership of educational marketing. *Emerald Group Publishing eBooks* (Vol. 15). Retrieved from <https://books.emeraldinsight.com/page/detail/?k=9781781902424>
- Ripki, A., Murni, S., & Wahyudi, M. (2020). Creative thinking of vocational high school teachers: effects of transformational leadership and job satisfaction. *International e-Journal of Educational Studies*, 4 (7), 93-105. <https://doi.org/10.31458/iejcs.608021>
- Roig-Tierno, N., Gonzalez-Cruz, T. F., & Llopis-Martinez, J. (2017). An overview of qualitative comparative analysis: A bibliometric analysis. *Journal of Innovation & Knowledge*, 2(1), 15–23.
- Sims, M., Waniganayake, M., & Hadley, F. (2017). Educational leadership. *Educational Management Administration & Leadership*, 46(6), 960–979.
- Skaalvik, C. (2020). School principal self-efficacy for instructional leadership: Relations with engagement, emotional exhaustion and motivation to quit. *Social Psychology of Education*, 23(2), 479–498. <https://doi.org/10.1007/s11218-020-09544-4>
- Spillane, J. P., Halverson, R., & Diamond, J. B. (2001). Investigating school leadership practice: A Distributed Perspective. *Educational Researcher*, 30(3), 23–28.
- Szeto, E., Lee, T. T. H., & Hallinger, P. (2015). A systematic review of research on educational leadership in Hong Kong, 1995-2014. *Journal of Educational Administration*, 53(4), 534–553. <https://doi.org/10.1108/jea-03-2015-0027>
- Tigre, F. B., Curado, C., & Henriques, P. L. (2022). Digital leadership: a bibliometric analysis. *Journal of Leadership & Organizational Studies*, 30(1), 40–70.
- Thompson, G., & Glasø, L. (2015). Situational leadership theory: a test from three perspectives. *Leadership & Organization Development Journal*, 36(5), 527–544.
- Van Seters, D. A., & Field, R. H. (1990). The evolution of leadership theory. *Journal of Organizational Change Management/Journal of Organisational Change Management*, 3(3), 29–45. <https://doi.org/10.1108/09534819010142139>
- Vroom, V. H., & Jago, A. G. (2007). The role of the situation in leadership. *The American Psychologist*, 62(1), 17–24. <https://doi.org/10.1037/0003-066x.62.1.17>
- Wenner, J. A., & Campbell, T. (2016). The theoretical and empirical basis of teacher leadership. *Review of Educational Research*, 87(1), 134–171.

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article/Araştırma Makalesi

The Effects of Using Science News in Teaching the Nature of Science

Büşra ASLANGÖZ¹  Özgecan KIRIK*² 

¹ Çukurova University, Department of Mathematics and Science Education, Adana, Turkey, aslangozbusra@gmail.com

² Çukurova University, Department of Mathematics and Science Education, Adana, Turkey, ozge.deniz@gmail.com


* Corresponding Author: ozge.deniz@gmail.com

Article Info

Received: 07 May 2024

Accepted: 31 July 2024

Keywords: Science news, nature of science, scientific literacy, media literacy, socio-scientific issues

 10.18009/jcer.1479639

Publication Language: Turkish

Abstract

This study examines the impact of incorporating science news into the teaching of nature of science (NOS) on pre-service science teachers' understanding of NOS, universal scientific literacy, and media literacy. A total of 55 pre-service science teachers participated in the study following a non-equivalent control group design. The experimental group was taught NOS using science news in socio-scientific contexts, whereas the control group received NOS instruction solely through socio-scientific issues (SSIs) without science news. Data were gathered using the "Nature of Science Scale", "Global Science Literacy Scale", and "Media Literacy Skills Scale". The findings indicate that integrating science news when teaching NOS alongside SSIs enhances pre-service teachers' evaluation skills related to media literacy compared to teaching only within socio-scientific contexts. However, incorporating science news did not significantly impact NOS understanding or global scientific literacy, likely due to both groups addressing similar SSIs. Recommendations were made based on the study's results.



To cite this article: Aslangöz, B., & Kırık, Ö. (2024). Bilimin doğasını öğretmede bilim haberleri kullanmanın etkileri. *Journal of Computer and Education Research*, 12 (24), 446-475. <https://doi.org/10.18009/jcer.1479639>

Bilimin Doğasını Öğretmede Bilim Haberleri Kullanmanın Etkileri

Makale Bilgisi

Geliş: 07 Mayıs 2024

Kabul: 31 Temmuz 2024

Anahtar kelimeler: Bilim haberleri, bilimin doğası, fen okuryazarlığı, medya okuryazarlığı, sosyo-bilimsel konular

 10.18009/jcer.1479639

Yayın Dili: Türkçe

Öz

Bu çalışma, bilimin doğası öğretiminde bilim haberleri kullanmasının, fen bilimleri öğretmen adaylarının bilimin doğasını anlamalarına, evrensel fen okuryazarlıklarına ve medya okuryazarlıklarına etkisini araştırmaktadır. Araştırma, eşitlenmemiş kontrol gruplu desen kullanılarak 55 fen bilgisi öğretmen adayıyla gerçekleştirilmiştir. Deney grubunda sosyo-bilimsel konular (SBK) temelinde bilimsel gazete haberleri kullanılarak bilimin doğası öğretilirken, kontrol grubunda gazete haberleri olmaksızın, yalnızca SBK kullanılarak öğretilmiştir. Veriler, "Bilimin Doğası Ölçeği", "Evrensel Fen Okuryazarlığı Ölçeği" ve "Medya Okuryazarlığı Becerileri Ölçeği" ile toplanmıştır. Sonuçlar, SBK bağlamında bilimin doğası öğretiminde bilim haberleri kullanmasının, yalnızca sosyo-bilimsel konu bağlamında yapılan öğretime kıyasla fen bilimleri öğretmen adaylarının medya okuryazarlığı boyutlarından değerlendirme becerisini geliştirdiğini göstermektedir. Diğer yandan, bilim haberlerinin kullanmasının bilimin doğası anlayışları ve evrensel fen okuryazarlığına anlamlı bir etkisi olmamıştır. Bu durum, her iki grupta da SBK kullanılmasıyla açıklanabilir. Çalışma sonuçlarına dayanarak çeşitli öneriler sunulmuştur.

Summary

The Effects of Using Science News in Teaching the Nature of Science

Büşra ASLANGÖZ¹  Özgecan KIRIK*² 

¹ Çukurova University, Adana, Turkey, aslangozbusra@gmail.com

² Çukurova University, Adana, Turkey, ozge.deniz@gmail.com

* Corresponding Author: ozge.deniz@gmail.com

Introduction

Understanding the nature of science is recognized as an essential component of scientific literacy (McComas & Clough, 2020). Science education research considers discussions of socio-scientific issues (SSIs) as an ideal context for students to understand the nature of science (Herman et al., 2023). Analyzing science news in the media, which includes both scientific and social content, can effectively address the complex perspectives and situations inherent in SSIs. Moreover, science news offers insights into scientific practices and the universe, potentially enhancing students' scientific literacy and understanding of the nature of science (Elliott, 2006). Superficial analysis of these news items can also help students to improve their media literacy (Cakmakçı & Yalaki, 2012). Considering the benefits of using science news through popular mass media to help students acquire knowledge, skills, and motivation about NOS, *"very little empirical research and guidance exists for helping teachers to incorporate such media into the science curriculum and effectively use them in their classroom practice"* (Cakmakçı & Yalaki, 2012, p.1). Given these gaps in the literature, the aim of this study is to investigate the effect of using science news in NOS lessons on pre-service science teachers' understanding of NOS, global scientific literacy, and media literacy.

Method

The study used an experimental design with a non-equivalent control group from quasi-experimental designs. The participants consisted of 55 students who were enrolled in the course "Teaching Nature of Science" which was taught in the fourth year of science teacher training at a university in Adana. There were 28 students (17 female and 11 male) in the experimental group and 27 students (22 female and 5 male) in the control group. In the study, the 19-item Nature of Science Scale (NOSS) developed by Özgelen (2012) was used to determine the pre-service teachers' views on the NOS. The 48-item Global Scientific Literacy Scale (GSLs) was used to assess global scientific literacy (Çelik, 2016). To measure media

literacy, the Media Literacy Skills Scale (MLSS) developed by Erdem (2018) consisting of 45 Likert-type items was used. In the activities developed for the experimental and control groups in teaching NOS, the same SSIs were used as the context. In the experimental group, students used SSI-based science newspaper articles and conducted superficial analyses focusing on scientific quality, reliability, and NOS elements. Conversely, the control group studied theoretical texts about the same SSIs, analyzing NOS elements and engaging in socio-scientific argumentation. Both groups participated in collaborative work and socio-scientific argumentation. Data were analyzed using the Mann-Whitney U test, independent samples t-test, and MANCOVA.

Results

The Results Related to the Understanding of the NOS

The independent samples t-test conducted on the pre-NOSS dimensions revealed no statistically significant differences between the groups. The findings from the Mann-Whitney U-test applied to post- NOSS dimensions of subjectivity and technology (ST), socio cultural structure (SCS), and tentativeness (Te) scores indicate that there were no statistically significant differences between the groups. The analysis using the independent samples t-test on the post-NOSS dimensions of characteristics of scientific knowledge and theories in science (TS) scores revealed no statistically significant differences between the groups.

Results Related to Global Scientific Literacy

The Mann-Whitney U-test results for the pre-test dimensions of character and values in the GSLS indicated no statistically significant differences between the groups. Likewise, the t-test analysis for the pre-GSLS dimensions of habit of mind (HM) and metacognition and self-direction (MSD) showed no significant differences between the experimental and control groups. However, a significant difference was observed in science as a human endeavor (SHE), favoring the experimental group. Due to this identified difference in pre-SHE, MANCOVA was employed for post-GSLS with SHE as a covariate. The analysis found no statistically significant differences in global scientific literacy at the post-test.

The Results Related to Media Literacy Skills

The independent samples t-test conducted on the pre-test sub-scales of the MLSS revealed that there were no statistically significant differences between the groups. Similarly, the t-test results for the post-test subscales of the MLSS showed no significant differences in

accessing, analyzing, and communicating. However, a statistically significant difference was identified in evaluating.

Discussion and Conclusion

The results indicated that using scientific newspaper articles within SSIs did not impact pre-service science teachers' understanding of the NOS compared to solely teaching NOS within SSIs. This uniformity in NOS conceptions is likely due to the consistent use of SSIs in both groups. Research shows that discussions about NOS within SSIs effectively enhance understanding (Adal & Çakıroğlu, 2022; Herman et al., 2023; Karakaya & İrez, 2022). Based on this, the current study suggests that science news, by contextualizing NOS, could be an effective alternative instructional resource in NOS teaching focused on SSIs (Garcia-Carmona, 2021). Teaching NOS through science news within SSIs didn't affect pre-service science teachers' global scientific literacy compared to teaching NOS only within SSIs. Given the direct link between decision-making in SSIs and understanding NOS, as well as the subcomponents of global scientific literacy, such as habit of mind, character and values, science as a human endeavor, metacognition, and self-direction, the observed similarities among groups become clearer. Additionally, the participation of both groups in collaborative group work and socio-scientific argumentation may have led to similar advancements in global scientific literacy.

The study's findings show that while using science news in teaching the nature of science did not impact pre-service science teachers' media literacy in accessing, analyzing, and communicating, it did moderately enhance their evaluation skills ($\eta^2=0.116$). The participants' analysis of news elements like content quality, news objectivity, source reliability, publication status, and reporter background improved their ability to judge media message value. Before accepting news messages as their own views, students assessed them using provided criteria, thereby enhancing their ability to evaluate the messages' reality and quality (Thoman & Jolls, 2005). The findings of this study suggest that incorporating science news into the pre-service teacher training has the potential to enhance media literacy skills. This finding could serve as a basis for developing methodological approaches in teacher education programs for the more conscious and critical use of media content.

Giriş

Bilimin doğasının anlaşılması, fen okuryazarlığının temel bir bileşeni olarak kabul edilmektedir (McComas & Clough, 2020). İnsanlar, bilim ve teknoloji alanında toplumu ilgilendiren sorunları değerlendirirken bu anlayıştan yararlanırlar (Shamos, 1995). Fen eğitimi alanındaki araştırmalar, sosyo-bilimsel konular (SBK) hakkında yapılan tartışmaların, öğrencilerin bilimin doğasını anlamaları için ideal bir bağlam olarak değerlendirmektedir (Herman ve diğ., 2023). SBK, bilimin yanı sıra toplumsal ve ahlaki boyutları da içeren ve genellikle etik değerlendirmeleri gerektiren, tartışmaya açık meselelerdir (Zeidler & Sadler, 2008). Medyada yer alan bilim haberlerinin analizi, SBK'ı ele alırken karşılaşılan çeşitli bakış açıları ve karmaşık durumları başarılı bir şekilde yönetmede iyi bir kaynak olabilir; çünkü haberler hem bilimsel hem de sosyal içerik sunar. Ayrıca, bilim haberleri toplumdaki bireylerin bilim, bilimsel süreçlerin işleyişi, bilimsel olaylar ve araştırmalara dair bilgi sahibi olmalarında önemli bir araçtır (García-Carmona & Díaz 2016). Bilim haberleri, bilim ve bilim insanlarının evreni anlamak için ne yaptığı hakkında bilgi sağlar ve bu bilgi, öğrencileri fen okuryazarlığı ve bilimin doğası açısından bilgilendirme potansiyeline sahiptir (Elliott, 2006). Bu haberlerin yüzeysel analizi, öğrencilerin medya okuryazarlığının artmasına da yardımcı olur (Cakmakçı & Yalaki, 2012).

Bu bağlamda, fen okuryazarlığının ve bilimin doğasının anlaşılmasının önemini gösteren en çarpıcı örneklerden biri olan Covid-19 pandemisi, bireysel ve toplumsal düzeyde beklenmedik sosyo-bilimsel olaylara nasıl uyum sağladığımızı ve sorunlar karşısında muhakeme yeteneğimizi ne ölçüde kullanabildiğimizi değerlendirmemize olanak tanımıştır. Toplumda fen okuryazarı bireylerin bulunmasının önemini vurgulayan bu durum, çeşitli SBK'ın eğitim süreçlerine entegrasyonunun önemli olduğunu ortaya koymaktadır. Bu temelden hareketle bu araştırmada, bilimin doğasının öğretilmesi sürecinde SBK temel alınmıştır.

Bilim haberleri değerli bir öğrenme ve öğretme kaynağı olarak kullanılabilir (Murcia, 2009). Fen öğretiminde bilim haberleri; öğrencilerin dikkatini çekmede ve günlük hayatta karşılaşılabilecekleri fen konularını tartışmada etkin bir araç olarak kullanılabilir. Bilim haberleri fen bilimlerinin sosyal ve kültürel bağlamını gösterme fırsatı sunar. Bu haberler, bilimin sadece laboratuvar ortamında değil, aynı zamanda toplum içinde de nasıl şekillendiğini ve etkilendiğini vurgular. Yani SBK'ı bağlam olarak aldığı için öğrencilerin bu

konulara olan ilgisini artırabilir. Bilim haberleri, öğrencilere bilimin temel unsurlarını ve bilimsel yöntemleri, günlük hayatta karşılaşılabilecekleri örnekler üzerinden gözlemleyerek ve bilimsel düşünceyi pratik bir şekilde uygulayarak öğrenme imkanı sağlar (Demirdöğen & Aydın-Günbatar, 2021; Jarman & McClune, 2007; Shibley 2003). Ayrıca bilim haberlerinin kullanılması, öğrencilere fen okuryazarlığı (Jarman & McClune, 2007; Shibley, 2003) ve medya okuryazarlığı becerileri kazandırmak için de etkili bir yöntemdir (Austin ve diğ., 2021). Öğrencilere medyada yer alan bilimsel yanlış bilgilere karşı eleştirel düşünme ve savunma stratejileri geliştirme şansı verir.

Popüler kitle iletişim araçları yoluyla bilim haberleri kullanılmasının öğrencilerin bilimin doğası hakkında bilgi, beceri ve motivasyon kazanmalarına sağladığı avantajlar göz önüne alındığında, "öğretmenlerin bu tür medyayı fen derslerine entegre etmeleri ve ders içinde etkin kullanmaları için gereken ampirik araştırmaların ve rehberliklerin yetersiz olduğu" belirtilmektedir (Cakmakçı & Yalaki, 2012, s.1). Literatürdeki bu eksiklikler dikkate alınarak bu çalışmanın amacı bilimin doğası öğretiminde bilim haberleri kullanmanın, fen bilimleri öğretmen adaylarının bilimin doğasını anlamaları, evrensel fen okuryazarlıkları ve medya okuryazarlıkları üzerindeki etkisini araştırmaktır.

Bilimin Doğası

Bilimin doğası genel bir bakış açısıyla, bilime ve onun gelişimine ilişkin değerler ve inançlarla ilgilidir (Lederman, 1992). Bilimin doğası, karmaşık ve çok yönlüdür ve sadece bilimin ne olduğuna odaklanmakla kalmaz, aynı zamanda bilimin nasıl çalıştığı, hangi değerleri içerdiği ve toplumla nasıl etkileşime girdiği gibi daha derinlemesine soruları yanıtlar (Lederman 2007; McComas ve diğ., 1998). Her ne kadar bilimin doğasına yönelik tanımlamalar yapılsa da, bu tanımlamalar geneldir ve filozoflar, tarihçiler ve bilim sosyologları, bilimin doğası ile ilgili konularda her zaman anlaşamazlar. Lederman (2007) bu durumu bireylerin bilimin doğasına yönelik farklı anlayışlara sahip olmaları ve bilimin doğasının da tıpkı bilim gibi zamanla değişim geçirmesi olarak açıklamıştır. Bilimin doğasının temel boyutları şu şekilde belirtilmektedir: Bilimsel bilgi geçicidir (değişebilir), ampirik temellidir (doğal dünyanın gözlenmesine dayanır), öznedir (teori-yüklüdür), insanın hayal gücü ve yaratıcılığının bir ürünüdür, sosyo-kültürel bağlama gömülüdür. Diğer boyutlar ise gözlem ve çıkarım arasındaki ayrım, bilim yapmanın evrensel bir

yönteminin olmayışı ve bilimsel teori ve yasalar arasındaki ilişki olarak ifade edilmektedir (Lederman ve diğ., 2002)

Genel olarak, bilimin doğası üzerine yapılan çalışmaların çoğunda, bilimin doğasının ders sürecine entegre edilmesi için doğrudan yansıtıcı, dolaylı ve tarihsel yaklaşımlar ele alınmıştır (Abd-El-Khalick & Akerson, 2004). Bu yaklaşımlara yönelik yapılan çalışmalar, doğrudan yansıtıcı yaklaşımın, bilimin doğasına yönelik görüşleri olumlu yönde değiştirmede daha etkili olduğunu tespit etmiştir (Lin & Chen, 2002).

Doğrudan-yansıtıcı yaklaşım, dolaylı yaklaşımın aksine, bilimin doğasını öğrenmenin, bilim uygulamalarına katılım ile otomatik olarak gerçekleşmeyeceği fikrine dayanır. "Doğrudan" terimi, öğretmenlerin bilimin doğasını öğretirken, öğretim hedeflerini açıkça belirlemeleri gerektiğini ifade eder. "Yansıtıcı" özellik ise, öğrencilerin fen öğrenme süreçlerinin temel epistemolojik yapılarını değerlendirmelerini ve bu deneyimleri bilimin doğası kavramlarıyla bağdaştırmalarını gerektirir (Khishfe & Abd-El-Khalick, 2002). Bilimin doğasının doğrudan yansıtıcı yaklaşımla ele alındığı bağlam, bilimsel içeriğin doğrudan kendisi olabileceği gibi aynı zamanda SBK da olabilir (Demirdöğen & Aydın-Günbatır, 2021). Bu çalışmada, SBK bağlamında doğrudan-yansıtıcı yaklaşım kullanılarak bilimin doğası öğretilmiştir.

Bilimin Doğasını Öğretirken Bilimsel İçerikli Gazete Haberlerini Kullanmak

Eğitimde bilimsel düşünceyi teşvik etmek için değerli bir kaynak olarak görülen bilim haberleri, öğrenenleri bilimsel okuryazarlık ve bilimin doğası konularında besleme potansiyeline sahiptir. Uygun haber içerikleri ve metinler seçilerek, fen programının içeriğiyle bütünleşik veya bağlamsal olarak bilimin doğasının tüm yönleri ele alınabilir (Demirdöğen & Aydın-Günbatır, 2021). Bu, öğrencilerin bilimin doğası unsurlarını tartışma yeteneklerini geliştirmelerine ve bu unsurlarla ilgili anlayışlarını diğer bilimsel durumlara aktarmalarına yardımcı olur.

Bilimin doğasının öğretilmesinde gazete haberlerinin kullanılmasının avantajları vardır. Ancak Oliveras ve diğerleri (2013) tarafından da vurgulandığı üzere, bir bilim haberinin topluma iletmek istediği mesaj her zaman açık olmayabilir ve okuyucular tarafından çeşitli şekillerde yorumlanabilir. Bu sebeple, bilim haberlerini özellikle bilimin doğasını ele almada ders sürecinde kullanırken, haberin içeriğini eleştirel olarak değerlendirmek için özelleştirilmiş ve bağlamlara uygun soruların dahil edilmesi önemlidir.

Bu, bilimin doğası hakkında derinlemesine tartışmaları teşvik eder (García-Carmona & Diaz, 2016). Ayrıca bu haberleri hazırlayan gazetecilerin eğitimci olmadıkları, haberleri sadece bilgi sağlamak amacıyla oluşturmadıkları ve bu haberlerin özellikle fen öğretmenlerinin ihtiyaçlarına göre düzenlenmediği hatırlanmalıdır (Fooladi 2020; Jarman & McClune, 2007). Bu nedenle bilim öğrenimi aracı olarak veya bilimin doğasının yönlerini ele alan haberleri pedagojik bir kaynak olarak fen öğretiminde kullanmayı planlayan öğretmenlerin bu kaynakları dikkatli bir şekilde seçmeleri, hazırlamaları ve planlamaları gerekmektedir (Shibley, 2003).

Araştırmacılar katılımcıların bilimin doğasına yönelik anlayışlarını desteklemek için çeşitli gazete haberlerini sıklıkla kullanmaktadırlar. García-Carmona ve Díaz (2016), grup tartışmaları sırasında gazete haberlerinin kullanılmasının ilköğretim öğretmen adaylarının bilimin doğası hakkındaki görüşlerine etkisini araştırmıştır. Bulgular, öğretmen adaylarının çalışmaya başlamadan önce bilimsel araştırmalara yönelik şüphecilik konusunda eksik görüşlere sahip olduklarını ortaya koymuştur. Ancak, bu süreçte görüşlerini geliştirmiş ve bilimsel araştırmalarda şüpheciliğin faydalarını dile getirmişlerdir. Bunun yanı sıra, bilimdeki nesnellik ve öznellik ile bilimdeki hatalar hakkındaki düşünceleri de müdahale sonrası daha doğru hale gelmiştir. Cakmakçı ve Yalaki (2012), medya raporlarının kullanımının öğretmen adaylarının bilimin doğasına yönelik görüşlerine etkisini incelemiştir. Bu raporlar, 14 haftalık doğrudan-yansıtıcı yaklaşımla bilimin doğası öğretimi için pedagojik araçlar olarak kullanılmıştır. Öğretim, katılımcıların bilimin doğası hakkındaki anlayışlarını geliştirmiş, öğretmen adayları başta medya haberleri ile bilimin doğasını bağdaştırmakta zorlansa da, eğitim sonunda bu entegrasyonu öğrenmişlerdir. Ayrıca, katılımcıların alan bilgisi medya raporu tartışmalarına katkıda bulunmuştur. Huang ve diğerleri (2014), literatürdeki diğer çalışmalardan farklı olarak Facebook temelli bilim haberleri hakkında, Facebook üzerinden yapılan farklı tartışma türlerinin ortaokul öğrencilerin bilimin doğası görüşlerini nasıl etkilediğini araştırmıştır. Öğrenciler, iki derste senkron tartışma yapmışken, diğer iki derste asenkron tartışma yapmışlardır. Araştırma bulguları, öğrencilerin hangi çevrimiçi tartışma grubuna dahil olduklarından bağımsız olarak, bilimsel içerik bilgisi, bilimin doğası hakkındaki görüşleri ve bilim haberlerinde bilimin doğasını analiz etme becerilerini geliştirdiklerini ortaya koymuştur. Tüm bu çalışmalar göz önünde bulundurulduğunda öğretmen adaylarına bilimin doğasını

öğretmede bilimsel gazete haberleri kullanmanın evrensel fen okuryazarlığı, medya okuryazarlığı ve bilimin doğası anlayışlarını geliştirmek için etkili bir yaklaşım olduğu düşünülmektedir.

Evrensel Fen Okuryazarlığı

Fen okuryazarlığı kavramı, ülkelerin toplumsal ve küresel gereksinimleri de göz önünde bulundurularak araştırmacılar tarafından yeniden gözden geçirilmiş ve 21. yüzyıl için yeni bir kavramsal çerçeve önerilmiştir (Mun ve diğ., 2015). Fen okuryazarı bireyler, bilimin doğasını ve bilimsel gelişmeleri anlar, temel fen kavramlarını, prensiplerini, kanunlarını ve teorilerini kavrayarak bunları uygun şekilde kullanır. Ayrıca, bilimsel süreçleri kullanarak problemleri çözer ve kararlar alır; bilim ve teknoloji ile bilim ve çevre arasındaki ilişkileri ve bu ilişkilerin toplum üzerindeki etkilerini anlar (Köseoğlu ve diğ., 2003). Bu bireyler, toplumsal sorunların çözümünde aktif rol alır ve yaratıcı ile analitik düşünme becerileriyle işbirlikçi çözüm önerileri geliştirir (Milli Eğitim Bakanlığı [MEB], 2013). Evrensel fen okuryazarlığı ise bu yetenekleri küresel bir perspektifle bütünleştirir. Evrensel fen okuryazarı bireyler, bilimin temel kavramlarını anlayıp, farklı kültür ve değerlere saygı gösterirken, diğer insanlarla iş birliği yaparak sosyal değerlerin gelişimine katkıda bulunur. Ayrıca, bilimle ilgili küresel konularda sorumluluk alarak küresel toplumun bir parçası olarak karakter ve değerler geliştirirler. Bu özellikler beş temel boyut kapsamında temsil edilir: İçerik bilgisi; zihin alışkanlıkları; karakter ve değerler; insan gayreti olarak bilim; üst biliş ve öz-denetim (Mun ve diğ., 2015). İçerik bilgisi, bilimsel kavramların anlaşılmasını ifade eder. 21. yüzyılda zihin alışkanlıkları, bilimsel dünyayı araştırma ve kişisel, toplumsal, küresel sorunları çözme yeteneklerini zorunlu kılar. Bu bağlamda, iletişim ve iş birliği, sistematik düşünme, rutin olmayan problemleri çözme, kanıtlarla iddiaları destekleme, model geliştirme ve bilgi yönetimi gibi unsurların önemi öne çıkar. Bireylerin bilimsel bilgi ve becerileri içselleştirebilmeleri için, fen bilimlerine özgü değerlerle birlikte toplumun ve çevrenin değerleri de önem taşır (MEB, 2005). Bu bağlamda, karakter ve değerler boyutu, ekolojik dünya görüşü, sosyal ve ahlaki duyarlılık ile sosyo-bilimsel sorumluluk faktörlerini kapsar. Bireyler, sadece tutum ve motivasyonla sınırlı kalmayıp aynı zamanda küresel vatandaşlar olarak karakter ve değerler geliştirmelidir. Bu, küresel sorunlara duyarlı olma, diğer insanlara ve çevreye saygı gösterme ve sorunlara sorumlu bir şekilde yaklaşma becerisi gerektirir. Bilimsel bilginin özelliklerini içeren insani

bir çaba olarak bilim boyutu, SBK'ın anlaşılmasını evrensel bir bakış açısıyla ele almaktadır. Üst biliş ve özdenetim boyutu, bireylerin kendi öğrenme ve düşünme süreçlerini yönetmek için bilişsel mekanizmalarını etkin bir şekilde kullanma yeteneklerini ifade etmektedir (Mun ve diğ., 2015).

Evrensel fen okuryazarlığı, SBK'ın önemli bir bileşeni olarak görülmekte ve çevresel ve sosyal etkileşimlerle ilişkili fen bilimleri konularını anlamada kritik bir rol oynamaktadır. Mun ve diğerleri (2015) evrensel fen okuryazarlığının alt boyutları ile SBK arasındaki ilişkide, bilimsel bilginin toplumsal ve kültürel bağlamda kullanımını ve sosyal etkilerini vurgulamaktadır. Bu ilişkinin anlaşılması, fen bilimleri eğitimi ve toplumsal bilinç oluşturma açısından kritik bir adımdır. Fen sınıflarında SBK üzerine yapılan sözlü ve yazılı argümanlar, öğrencilerin fen okuryazarlığı ve düşünme yetilerinin gelişimine katkıda bulunabilir. Bu yöntem, öğrencilere bilimin doğası hakkında derinlemesine bilgi sağlarken, kanıta dayalı argüman oluşturma, fikir birliği ve akıl yürütme gibi bilimsel düşünme becerilerini pekiştirir. Ayrıca, SBK'nın fen eğitimine entegrasyonu, öğrencilerin katılımını artırarak bilimin doğasını tartışacak bir ortam oluşturur. (Eastwood ve diğ., 2012; Zeidler, 2014).

Jarman ve McClune (2007) haberlerdeki bilimin fen okuryazarlığına katkıda bulunma potansiyeline sahip olduğunu belirtmektedir. Haberlerde tartışılan bilim, kamusal alanı bilimsel bilgi açısından besler, SBK ile ilgili tartışma ve karar alma süreçlerine katkı sağlar ve böylece bilim ve toplum arasında müzakere süreçlerinin başlatılabileceği bir alan yaratır. Bu durum fen okuryazarlığının gelişimine önemli düzeyde katkı sağlamaktadır. Ancak bilim içerikli haberlerin toplumu "eğitmek" gibi bir sorumluluğu ve rolü olmadığı ve amacının da fen okuryazarlığını arttırmak olmadığı unutulmamalıdır. Diğer yandan öğretmenler, ilginç ve heyecan verici bilgiler olarak bilim haberlerini öğrencilerin dikkatine sunarak onları bilimin topluma etkisini öğretmek için bağlam olarak kullanabilir. Sonuç olarak "haberlerdeki bilim" fen okuryazarlığının geliştirmek için bir kaynak olduğu kadar fen okuryazarlığı da "haberlerdeki bilimi" değerlendirmek için bir kaynak olarak görülebilir.

Medya Okuryazarlığı

Medya, internet, televizyon, radyo, gazeteler ve dergiler gibi çeşitli iletişim araçlarını kapsar. Bu araçlar, ses, video, görsel ve metin gibi farklı formatlarda ve bilim, sağlık, ekonomi gibi çeşitli konularda insanlara bilgi sunar. Bilim içerikli medya raporları ise, belirli bir bilim konusunu ele alan, metinsel ve görsel bilgiler içeren ve çeşitli iletişim araçları

yoluyla yayımlanan makaleler olarak tanımlanır (Demirdöğen & Aydın-Günbatır, 2021). Medya raporlarından olan bilim haberleri, informal bilim öğrenme biçimi olarak kabul edilebilir (Wellington, 1991). Ancak bilim haberlerinin bilimsellik ve güvenilirlik açısından değerlendirilmesi ve güvenilir bilimsel bilginin tanımlanması önemlidir. Bu konuda bireylerin bilimsel haberleri nasıl değerlendirdiklerine dair pek çok araştırma yapılmıştır. Bu çalışmalar, öğrencilerin medya raporlarındaki bilimsel iddiaların güvenilirliğini değerlendirmek için değerlendirme stratejilerini nasıl kullandıklarına (Bisanz ve diğ., 1998; Kolstø, 2001; Kolstø ve diğ., 2006), öğrencilerin bilimsel ifadeleri nasıl yorumladıklarına ve bunların bilime dayalı haber metinleriyle ilişkilerine (Norris & Phillips, 1994; Norris ve diğ., 2003) ve bilim haberlerini değerlendirme becerilerine (Oliveras ve diğ., 2013) odaklanmıştır. Bu çalışmalardaki haberlerin içeriğine bakıldığında çoğunlukla SBK içerdiği (çevre sorunları, küresel ısınma) veya yeni bilimsel araştırma bulguları (örneğin ilaçların bireylerin sağlığına etkileri) ile ilgili olduğu görülmüştür. Bilim haberlerinin değerlendirilmesi medya okuryazarlığı sağlanarak mümkün olabilir. Aufderheide (1993), medya okuryazarlığını bireyin çeşitli türdeki iletilere ilişkin 'erişme', 'analiz etme', 'değerlendirme' ve 'iletme' becerisi olarak tanımlamıştır. Medya okuryazarı bir birey, bilim haberlerinin temel mesajını doğru anlamalı, bilinçli analizler yapabilmeli ve medya içeriklerine etkin şekilde erişebilmelidir. Ayrıca, bilim haberlerini eleştirel bir bakış açısıyla analiz edebilmeli, değerlendirebilmeli ve içeriği diğer bireylerle etkili bir şekilde paylaşabilmelidir. Bu yetenekler, sosyobilimsel bilgileri medyada eleştirel olarak analiz etme gerekliliğini de içerir (Kurt & Kürüm, 2010).

Yanlış bilginin yaygınlığı ve medya haberlerindeki sansasyonellik göz önünde bulundurulduğunda, fen bilgisi öğretmen adaylarının bilginin güvenilirliğini eleştirel olarak değerlendirebilmeleri, bilimsel gerçeklerle fikirleri ayırt edebilmeleri ve medyanın bilim algısı üzerindeki etkisini anlayabilmeleri için gerekli becerileri geliştirmeleri son derece önemlidir. Gazete makaleleri, teorik fen eğitimi ile gerçek dünya uygulamaları arasındaki boşluğu dolduran güncel ve ilgili bilimsel gelişmeleri tartışır. Bu bağlantı, öğretim programını günlük bilimsel konular ve toplumsal tartışmalarla ilişkilendirerek öğrenmeyi motive edebilir ve öğretmen adaylarının ilgisini çekebilir. Öğretmen adayları, öğretimde medya raporlarını kullanarak bu kaynakları gelecekteki öğretim uygulamalarına nasıl etkili bir şekilde dahil edebileceklerini de öğrenebilirler. Bu da onları gerçek dünyadaki fen

konularını sınıfa entegre etme, dinamik bir öğrenme ortamı oluşturma ve öğrencileri eleştirel ve yansıtıcı düşünmeye teşvik etme gibi pedagojik zorluklarla başa çıkmaya hazırlar. Bilimsel gazete haberleriyle ilgilenmek, öğretmen adaylarının SBK'ı ele alma becerilerini geliştirebilir. SBK'ı tartışmadaki yeterlilik, öğrencilerin üst düzey düşünme becerilerini geliştirmek ve onları karmaşık toplumsal zorluklarla yüzleşmeye hazırlamak için çok önemlidir.

Evrensel fen okuryazarlığı, medya okuryazarlığı tanımları ve bilimin doğasının bireylerin SBK'da karar verme biçimlerinde oynadığı rol, sürekli olarak bireyin medyadaki bilimsel bilgiye erişme, analiz etme, değerlendirme ve iletme becerisine işaret etmektedir. Fen eğitiminde medya okuryazarlığı ve fen okuryazarlığıyla ilgili yakın zamanda birçok makale yayınlanmasına rağmen, bu konuların bilimin doğasıyla ilişkilendirilmesine ve bu bağlamda ele alınmasına yeterince vurgu yapılmadığı görülmektedir (Demirdöğen & Aydın-Günbatar, 2021; García-Carmona,2021). Ayrıca, bilim haberlerinin sınıf uygulamalarında etkili bir şekilde kullanılması için yeterli ampirik araştırmanın olmaması da göz önüne alındığında fen bilimleri öğretmen adaylarına bilimsel gazete haberleri kullanarak bilimin doğasını öğretmenin etkilerinin araştırılması önemli görülmektedir. Bu araştırmanın amacı; bilimin doğası öğretiminde bilim haberleri kullanmanın, fen öğretmen adaylarının bilimin doğasını anlamalarına, evrensel fen okuryazarlıklarına ve medya okuryazarlıklarına etkisini incelemektir. Araştırmanın genel amacı doğrultusunda şu sorulara yanıt aranacaktır:

- 1) Bilimin doğası öğretiminde bilim haberleri kullanmanın fen bilimleri öğretmen adaylarının bilimin doğasını anlamalarına etkisi nedir?
- 2) Bilimin doğası öğretiminde bilim haberleri kullanmanın fen bilimleri öğretmen adaylarının evrensel fen okuryazarlıklarına etkisi nedir?
- 3) Bilimin doğası öğretiminde bilim haberleri kullanmanın fen bilimleri öğretmen adaylarının medya okuryazarlıklarına etkisi nedir?

Yöntem

Araştırma Deseni

Çalışmada, yarı deneysel desenlerden eşitlenmemiş kontrol gruplu deneysel desen kullanılmıştır. Çalışmanın katılımcıları olan fen öğretmen adaylarının sınıfları önceden belirlenmiş olduğu için katılımcıların gruplara seçkisiz atanması mümkün olmamıştır.

Ancak örnekleme oluşturan iki gruptan hangisinin deney, hangisinin kontrol grubu olacağı seçkisiz olarak belirlenmiştir. Çalışmanın bağımlı değişkenleri bilimin doğası anlayışı, evrensel fen okuryazarlığı ve medya okuryazarlığıdır. Bağımsız değişken ise, medya haberleri kullanılarak ve kullanılmadan yapılan bilimin doğası öğretimini içeren iki düzeyli öğretim stratejisidir.

Katılımcılar

Çalışmanın örneklem grubunu, 2021-2022 bahar yarıyılında Adana'da bir üniversitenin Fen Bilimleri Öğretmenliği dördüncü sınıfında okutulan Bilimin Doğası ve Öğretimi dersini alan 55 öğrenci oluşturmaktadır. Örnekleme yöntemi olarak uygun örnekleme kullanılmıştır çünkü zaman ve yer sınırı sebebiyle örneklem kolay ulaşılabilir ve katılımcılar gönüllüdür. Deney grubunda 28 (17 kadın ve 11 erkek), kontrol grubunda 27 (22 kadın ve 5 erkek) öğrenci bulunmaktadır. Çalışmanın etik kurul izni Çukurova Üniversitesi Sosyal ve Beşeri Bilimler Alanında Bilimsel Araştırma ve Yayın Etiği Kurulu tarafından 30.03.2022 tarih ve 19 nolu kararı ile alınmıştır. Çalışmanın başlangıcında, katılımcıların tamamı uygulama süreci hakkında bilgilendirilmiş ve bilgilendirilmiş onam formu doldurmuşlardır.

Veri Toplama Araçları

Araştırmada öğretmen adaylarının bilimin doğası hakkındaki görüşlerini ortaya koymak için Özgelen (2012) tarafından geliştirilmiş olan 19 maddelik Bilimin Doğası Ölçeği (BDÖ) kullanılmıştır. BDÖ'deki maddeler şu beş faktör altında toplanmaktadır: Faktör 1 bilimsel bilginin ve bilim insanının özellikleri (BBO), faktör 2 değişime açık olma (DAO), faktör 3 öznellik ve teknoloji (ÖT), faktör 4 bilimin sosyal-kültürel yapısı (SKY) ve faktör 5 bilimde teorilerin yeri (BTY). Likert tipindeki maddelerin yanıt seçenekleri "4 = Tamamen Katılıyorum", "3 = Çoğunlukla Katılıyorum", "2 = Kısmen Katılıyorum" ve "1 = Hiç Katılmıyorum" şeklinde düzenlenmiştir.

Ölçeğin tamamına ilişkin Cronbach's alpha iç tutarlılık katsayısı 0.83 bulunmuştur. Her faktör için yapılan güvenilirlik analizi sonuçlarına göre Cronbach's Alpha değeri faktör 1 için 0.82, faktör 2 için 0.63, faktör 3 için 0.50, faktör 4 için 0.53 ve faktör 5 için 0.43'tür. Bu çalışma verileri içinse ölçeğin tamamına ilişkin Cronbach's Alpha iç tutarlılık katsayısı 0.70 bulunmuştur. Her faktör için yapılan güvenilirlik analizi sonuçlarına göre Cronbach's Alpha

değeri faktör 1 için 0.76, faktör 2 için 0.52, faktör 3 için 0.51, faktör 4 için 0.44 ve faktör 5 için 0.47 olarak hesaplanmıştır.

Öğretmen adaylarının evrensel fen okuryazarlığını değerlendirmek için 48 maddeden oluşan Evrensel Fen Okuryazarlığı Ölçeği (EFOYÖ) kullanılmıştır. Bu ölçek, Mun ve diğerleri (2015) tarafından geliştirilmiş olup, Çelik (2016) tarafından Türkçe'ye uyarlanmış bir Likert tipi ölçektir. EFOYÖ dört ana boyutta yapılandırılmıştır: Zihin alışkanlığı (ZA), karakter ve değerler (KD), bir insan gayreti olarak bilim (BİGOB) ve üst biliş ve özdenetim (ÜBO). *Zihin alışkanlığı boyutu* (13 madde), iletişim ve iş birliği ve sistematik düşünme/bilgi yönetimi, *karakter ve değerler boyutu* (8 madde), ekolojik dünya görüşü/sosyal ve ahlaki vicdan ve sosyo-bilimsel sorumluluk, *bir insan gayreti olarak bilim boyutu* (13 madde), fen ve toplum/bilim ruhu ve bilimsel bilginin karakteristiği, *üst biliş ve özdenetim boyutu* (13 madde), planlama/gözlem ve değerlendirme faktörlerini içerir.

Ölçek maddelerindeki yanıt seçenekleri “Kesinlikle Katılmıyorum (1)”, “Katılmıyorum (2)”, “Kararsızım (3)”, “Katılıyorum (4)” ve “Kesinlikle Katılıyorum (5)” şeklinde düzenlenmiştir. EFOYÖ'nün orijinal İngilizce formu 7-12. sınıf öğrencileri için geliştirilmiştir. Mun ve diğerleri (2015) 1607 öğrenciden toplanan veriler üzerinde açımlayıcı faktör analizi yapmıştır. Analizler sonucunda bazı maddeler silinerek 4 boyut ve 8 faktör altında toplanan 48 maddelik hali elde edilmiştir. Cronbach alfa katsayıları ile hesaplanan her bir faktörün iç tutarlılık dereceleri; fen ve toplum/bilim ruhu için 0.74, planlama/gözlem için 0.84, sistematik düşünme/bilgi yönetimi için 0.79, ekolojik dünya görüşü/sosyal ve ahlaki vicdan için 0.69, değerlendirme için 0.64, iletişim ve işbirliği için 0.81, sosyo-bilimsel sorumluluk için 0.85, bilimsel bilginin karakteristiği için 0.71 ve genel ölçek için 0.94 olarak ölçülmüştür. Bu sonuçlar, sekiz faktörün her biri için yeterli güvenilirlik düzeyine ulaşıldığını göstermektedir.

Çelik (2016) Türkçe'ye uyarlama çalışmasını son sınıfta öğrenim görmekte olan öğretmen adaylarıyla yapmıştır. Ölçek maddeleri Türkçe'ye çevrilerek dil eşdeğerliği sağlandıktan sonra 645 öğretmen adayıyla doğrulayıcı faktör analizi yapılmış ve hesaplanan uyum indeksleri ölçeğin Türkçe formunun İngilizce formuyla aynı modeli gösteren geçerli bir yapıya sahip olduğunu ortaya koymuştur. Türkçe formun Cronbach's Alpha iç tutarlılık katsayısı zihin alışkanlığı boyutu için 0.81, karakter ve değerler için 0.76, insan gayreti olarak bilim boyutu için 0.79 ve üst biliş ve özdenetim boyutu için 0.85 bulunmuştur. Ölçeğin

tamamı içinse bu değer 0.91'dir. Ölçeğin Türkçe formunun da geçerli ve güvenilir olduğu söylenebilir. Bu çalışma verileri içinse Cronbach's Alpha iç tutarlılık katsayısı zihin alışkanlığı boyutu için 0.80, karakter ve değerler için 0.79, insan gayreti olarak bilim boyutu için 0.72 ve üst biliş ve özdenetim boyutu için 0.86 bulunmuştur. Ölçeğin tamamı içinse bu değer 0.91 olarak hesaplanmıştır.

Araştırmada öğretmen adaylarının medya okuryazarlıklarını ölçmek üzere Erdem (2018) tarafından geliştirilmiş olan Likert tipindeki 45 maddeden oluşan Medya Okuryazarlığı Becerileri Ölçeği (MOBÖ) kullanılmıştır. Ölçek maddelerindeki yanıt seçenekleri "(1) Bana hiç uygun değil", "(2) Bana pek uygun değil", "(3) Fikrim yok", "(4) Bana oldukça uygun" ve "(5) Bana tamamen uygun" şeklinde düzenlenmiştir. Ölçeğin yapı geçerliği için 322 öğretmen adayından toplanan veriler üzerinde doğrulayıcı faktör analizi yapılmıştır. Faktör analizi sonuçlarına göre ölçeğin erişme, analiz, değerlendirme ve iletme olmak üzere dört faktörden oluşan bir yapıya iyi uyum gösterdiği belirlenmiştir. Ölçeğin Cronbach's Alpha iç tutarlılık katsayısı 0.91 olarak bulunmuştur. Ölçeğin erişme faktörü için bu değer 0.76, analiz faktörü için 0.83, değerlendirme için 0.72 ve iletme için 0.83 olarak verilmektedir. Doğrulayıcı faktör analizi yapılarak ölçek uyum indeksleri belirlenmiştir. Bu verilere göre MÖBO'nun geçerli ve güvenilir bir ölçek olduğu söylenebilir. Bu çalışma verileri içinse ölçeğin Cronbach's Alpha iç tutarlılık katsayısı 0.92 olarak bulunmuştur. Erişme faktörü için bu değer 0.74, analiz faktörü için 0.86, değerlendirme için 0.72 ve iletme için 0.82 olarak hesaplanmıştır.

Süreç

Araştırma, bahar yarıyılı boyunca Bilimin Doğası ve Öğretimi dersi kapsamında yürütülmüştür. Bu dersin içeriği, bilimin doğasına ilişkin kavramlar, bilimsel bilgi ve özellikleri, bilimin doğasını öğretmede kullanılan yaklaşımlar, bilimin doğasının öğretiminde sınıf içi etkinlikler ve bilimin doğası ve fen, teknoloji, toplum, çevre ilişkisini kapsamaktadır. İlk aşamada öğretmen adaylarına BDÖ, EFOYÖ ve MOBÖ Google formlar aracılığıyla ön test olarak uygulanmıştır. Ön testlerin ardından üç hafta boyunca öğretmen adaylarına ders içeriğini kapsayan teorik bilgiler verilmiştir. Ayrıca, uygulama sürecinde yapılacak etkinlikler ve öğrencilerden beklenenler hakkında bilgilendirme yapılmıştır. Ardından dokuz hafta boyunca etkinlikler gerçekleştirilmiştir. Her iki grupta da dersler,

birinci yazarın asistanlığında ikinci yazar tarafından yürütülmüştür. Etkinliklerin bitimini takiben aynı ölçekler çevrimiçi ortamda son test olarak uygulanmıştır.

Bilimin doğası öğretiminde deney ve kontrol grubu için geliştirilen etkinliklerde bağlam olarak aynı SBK kullanılmıştır. Bu konular, COVID-19 aşısı, yapay, insan beyni genleri eklenen maymunlar, genetik değiştirme yoluyla hayvandan insana organ nakli ve Çin'deki genetiği değiştirilmiş insan bebekleridir. Araştırmada, bilim içerikli gazete haberlerinin analizi yoluyla bilimin doğası öğretiminin etkileri araştırıldığından, SBK'ın bağlam olarak alındığı bilimin doğası öğretimi her iki grupta da sağlanarak, SBK'ın etkileri kontrol altına alınmak istenmiştir. Etkinliklere geçilmeden önce katılımcıların akademik başarı ve cinsiyetleri göz önüne alınarak karma gruplar oluşturulmuştur. Her iki grupta da haftalık etkinlikler kapsamında işbirlikli çalışmayı ve sosyo-bilimsel argümantasyonu destekleyen etkinlik çalışma kağıtları kullanılarak ders işlenmiştir.

Etkinlikler, uygulama sürecinde dersten bir hafta önce Microsoft Teams üzerinden öğretmen adaylarıyla paylaşılmış ve hem bireysel hem de takım olarak derse hazırlıklı gelmeleri sağlanmıştır. Araştırmacılar, derste o haftanın etkinliği ile ilgili gruplarda yapılan argümantasyon sürecine katılmış ve öğretmen adaylarına sorular yönelterek bilimsel akıl yürütme becerilerinin gelişmesini sağlamayı amaçlamıştır. Ayrıca, her iki grupta da iş birliğine dayalı takımlarda sürecin iyi yönetilebilmesi için araştırmacılar tarafından hazırlanan takım çalışması değerlendirme formu ile haftalık olarak kontrol sağlanmıştır. Takım içerisinde tartışmaların içerik olarak zenginliği, tüm takım üyelerinin tartışmalara etkin olarak katılması, etkili iletişim kurabilme, bireysel ve grup gelişimini izleyip gerekli değişiklik ve ilerlemeleri gösterebilme, bilimin doğası unsurlarını o haftaki konu bağlamında anlayabilme gibi kriterleri göz önünde bulundurularak haftalık takım çalışmaları değerlendirilmiştir. Takım çalışmasının tamamlanmasının ardından araştırmacılar, öğretmen adaylarının eksiklerini ve diğer grupların bakış açılarını görmeleri için genel sınıf tartışmasını başlatmış ve etkinliklerdeki sorulara verdikleri cevapları tartışmaları sağlanmıştır. Ders sonunda araştırmacılar, haftalık etkinlikle ilgili genel bir değerlendirmede bulunmuş ve gelecek haftaki etkinlikten haberdar ederek dersi tamamlamıştır.

Deney grubunda, SBK temelli bilimsel gazete haberleri kullanılmış, öğrencilerin gazete haberlerinin yüzeysel analizini yaparak metinleri bilimsellik, güvenilirlik ve bilimin doğası unsurları açısından değerlendirmeleri istenmiştir. Gazete haberlerinin yüzeysel

analizlerini yaparken öğrencilerin özellikle haberin orijinal kaynağının güvenilirliği, haberin okuyucuyu farklı bilimsel kaynaklara yönlendirip yönlendirmediği, haberin yazarının kim olduğu, objektifliği, haberde bahsedilen kurumlar ve güvenilirlikleri, uzmanlar, haberlerdeki bilimsel iddialar ve bu iddiaları destekleyen kanıtları göz önüne alarak bir değerlendirme yapmaları istenmiştir. Bu analizlerin öğrencilerin medya okuryazarlıklarını arttıracakı belirtilmektedir (Cakmakçı & Yalaki, 2012). Yüzeysel analizden sonra, haberlerdeki sosyo-bilimsel konu temelinde ikilem barındıran bir soru sorularak argüman geliştirmeleri beklenmiştir. Sosyo-bilimsel argümantasyona ek olarak, öğretmen adaylarından hangi bilimin doğası unsurlarının doğrudan ya da dolaylı olarak haberde görünür olduğunu tespit etmeleri ve haberlerden bu unsurlara ilişkin kanıtlar sunarak argüman oluşturmaları istenmiştir. Örneğin ilk etkinlikte COVID-19 aşısı hakkında Euronews ve BBC News'ten alınmış iki haber verilmiştir. Haberlerin yüzeysel analizini yaptıktan sonra öğrencilere COVID-19 aşısının zorunlu hale getirilmesine ilişkin görüşleri sorularak bir argüman geliştirmeleri ve kendileri gibi düşünmeyen kişileri ikna etmeleri istenmiştir. Ayrıca, öğrencilerden ilgili haber metinlerini inceleyerek COVID-19 aşısı geliştirme çalışmalarında bilimsel bilginin özelliklerine (değişebilirlik, öznellik, hayal gücü ve yaratıcılık, gözlem-çıkarm, ampirik temel, teori-yasa ilişkisi ve sosyo-kültürel bağlamın etkisi) dair kanıtlar aramaları beklenmiştir.

Kontrol grubunda ise gazete haberleri yerine deney grubunda kullanılan SBK hakkında teorik bilgiler içeren metinler kullanılmıştır. Bu metinler, makale ve kitaplardaki teorik bilgiler kullanılarak hazırlanmıştır. Metinleri okuduktan sonra öğrencilere, deney grubundakine benzer şekilde sosyo-bilimsel konu hakkında karar vermelerini gerektirecek bir soru sorulmuş ve karşıt görüşteki birini ikna edecek şekilde argüman geliştirmeleri beklenmiştir. Sosyo-bilimsel argümantasyondan sonra verilen sosyo-bilimsel konuda bilimin doğası unsurlarını belirleyerek gerekçelerini sunmaları istenmiştir. Bu grupta gazete haberleri kullanılmamış ve dolayısıyla öğrencilere yüzeysel haber analizleri yaptırılmamıştır. Örneğin ilk etkinlikte COVID-19 aşısının rapor edilmiş yan etkileri, toplumda özellikle mRNA aşılılarıyla ilgili yaygın olarak konuşulan etkiler (örneğin tromboz, kalp krizi, miyokardi, uzun dönem yan etkiler) ve sıkça sorulan sorulara cevaplar (mRNA aşılarının özellikleri, genleri değiştirip değiştirmediği, acil kullanım onayı, kazanılan bağışıklığın özellikleri) üzerine bir metin verilmiştir. Bu metnin sonunda öğrencilere, deney

grubundakine benzer şekilde aşının zorunlu olmasıyla ilgili görüşleri sorularak argüman geliştirmeleri ve kendileri gibi düşünmeyen kişileri ikna etmeleri istenmiştir. Sonraki sorular ise COVID-19 aşı çalışmalarında bilimin doğasının unsurlarının belirlenmesine yöneliktir.

Verilerin Analizi

Toplanan verilerin çözümlenmesi SPSS 22.0 istatistik paket programı kullanılarak gerçekleştirilmiştir. Normallik sayıltısı kontrol edildikten sonra grupları ön test BDÖ boyutları açısından kıyaslamak üzere her alt boyut için ayrı ayrı bağımsız gruplar *t*-testi yapılmıştır. Grupları son test BDÖ boyutları açısından kıyaslamak üzere normallik sağlanmadığından ÖT, SKY ve DAO puanları için Mann Whitney U testi, BBO ve BTY puanları için bağımsız gruplar *t*-testi yapılmıştır. Çok sayıda test yapıldığından, ön test ve son test BDÖ verileri için Tip 1 hatayı önlemek adına Bonferroni düzeltmesi yapılmış ve alfa değeri (0.05) bağımlı değişken sayısı olan 5'e bölünerek $p \leq 0.01$ olarak belirlenmiştir (Pallant, 2007). MANOVA bu hatayı kontrol etmede iyi bir yöntem olsa da sayıltıları sağlanamadığı için kullanılamamıştır.

Grupları ön test EFOYÖ boyutları açısından kıyaslamak üzere, ZA, BIGOB ve UBO için bağımsız gruplar *t*-testi, normallik sağlanamamasından dolayı KD boyutu için Mann Whitney U Testi yapılmıştır. Çok sayıda test yapıldığından, ön test EFOYÖ verileri için Tip 1 hatayı önlemek adına Bonferroni düzeltmesi yapılmış ve alfa değeri (0.05) bağımlı değişken sayısı olan 4'e bölünerek $p \leq 0.0125$ olarak belirlenmiştir (Pallant, 2007). Ön test BIGOB açısından gruplar arasında fark tespit edildiği için son test EFOYÖ puanları, sayıltıları kontrol edildikten sonra MANCOVA ile analiz edilmiştir.

Grupları ön test MÖBO alt boyutlarına göre kıyaslamak üzere her alt boyut için ayrı ayrı bağımsız gruplar *t*-testi yapılmıştır. Benzer şekilde, son test MÖBO alt boyutlarına ilişkin veriler de bağımsız gruplar *t*-testi ile analiz edilmiştir. EFOYÖ verilerinde olduğu gibi, ön test ve son test MÖBO verileri için Tip 1 hatayı önlemek adına Bonferroni düzeltmesi yapılmış ve alfa değeri (0.05) bağımlı değişken sayısı olan 4'e bölünerek $p \leq 0.0125$ olarak belirlenmiştir. MANOVA bu hatayı kontrol etmede iyi bir yöntem olsa da sayıltıları sağlanamadığı için kullanılamamıştır.

Bulgular

Bilimin Doğası Anlayışlarına Yönelik Bulgular

Ön test BDÖ boyutları için yapılan bağımsız gruplar *t*-testi sonuçlarına göre gruplar arasında BBO ($t(53)=0.70$, $p>0.01$), DAO ($t(53)=0.132$, $p>0.01$), ÖT ($t(53)=1.679$, $p>0.01$), SKY ($t(53)=2.500$, $p>0.01$) ve BTY ($t(53)=-0.856$, $p>0.01$) puanları açısından anlamlı farklılık olmadığı belirlenmiştir. Bu bulgulara göre, deney ve kontrol grubundaki öğrencilerin uygulamadan önce bilimin doğası anlayışlarının benzer olduğu söylenebilir. Yapılan bağımsız gruplar *t*-testi sonuçları ve betimsel istatistikler Tablo 1'de sunulmuştur.

Tablo 1. Ön test BDÖ boyutları için betimsel istatistikler ve bağımsız gruplar *t*-testi sonuçları

Bağımlı değişken	Grup	N	\bar{X}	S	sd	t	p
Bilimsel bilginin ve bilim insanının özellikleri (BBO)	Deney	28	24.57	4.08	53	0.70	0.487
	Kontrol	27	23.62	5.77			
Değişime açık olma (DAO)	Deney	28	10.00	1.86	53	0.132	0.895
	Kontrol	27	9.92	2.26			
Özellik ve Teknoloji (ÖT)	Deney	28	9.35	1.56	53	1.679	0.099
	Kontrol	27	8.62	1.64			
Sosyal Kültürel Yapı (SKY)	Deney	28	7.32	0.77	53	2.500	0.016
	Kontrol	27	6.74	0.94			
Bilimde teorilerin yeri (BTY)	Deney	28	7.00	0.86	53	-0.856	0.396
	Kontrol	27	7.18	0.73			

Anlamlılık düzeyi=0.01

Son test ÖT, SKY ve DAO puanları için yapılan Mann-Whitney U testi sonuçlarına göre gruplar arasında ÖT ($U= 361.500$, $z= -0.2899$, $p>0.01$), SKY ($U= 335.000$, $z= -1.251$, $p>0.01$) ve DAO ($U= 294.000$, $z= -2.099$, $p>0.01$) puanları açısından anlamlı bir farklılık bulunmamıştır. Bu değişkenler için yapılan Mann-Whitney U testi sonuçları ve betimsel istatistikler Tablo 2'de verilmiştir.

Tablo 2. Son test ÖT, SKY ve DAO puanları için betimsel istatistikler ve Mann-Whitney U testi sonuçları

Bağımlı Değişken	Grup	Sıra Ortalaması	Sıra Toplamı	U	z	p
Özellik ve Teknoloji (ÖT)	Deney	28.59	800.50	361.500	-0.289	0.773
	Kontrol	27.39	739.50			
Sosyo-kültürel (SKY)	Deney	29.54	827.00	335.000	-1.251	0.211
	Kontrol	26.41	713.00			
Değişime açık olmak (DAO)	Deney	31.00	868.00	294.000	-1.699	0.089
	Kontrol	24.89	672.00			

Anlamlılık düzeyi=0.01

Son test BBO ve BTY puanlarının bağımsız gruplar *t*-testi sonuçlarına göre, gruplar arasında BBO ($t(53)=1.269$, $p>0.05$) ve BTY ($t(53)=1.269$, $p>0.05$) açısından anlamlı bir farklılık bulunmamıştır. Yapılan *t*-testi sonuçları ve betimsel istatistikler Tablo 3'te sunulmuştur.

Tablo 3. Ön test BDO alt boyutlarından BBO ve BTY için betimsel istatistikler ve *t*-testi sonuçları

Bağımlı değişken	Grup	\bar{X}	S	sd	t	p
Bilimsel bilginin ve bilim insanının özellikleri (BBO)	Deney	27.78	5.01	53	1.582	0.120
	Kontrol	26.10	5.09			
Bilimde teorilerin yeri (BTY)	Deney	7.60	1.10	53	0.835	0.407
	Kontrol	7.35	1.10			

Anlamlılık düzeyi=0.01

Evrensel Fen Okuryazarlığına Yönelik Bulgular

Ön test EFOYÖ boyutlarından KD için yapılan Mann Whitney U testi sonuçlarına göre gruplar arasında anlamlı bir farklılık bulunmamıştır ($U= 324.500$, $z=-0.905$, $p>0.0125$). Mann-Whitney U testi sonuçları ve betimsel istatistikler Tablo 4'te verilmiştir.

Tablo 4. Ön test EFOYÖ boyutlarından KD için betimsel istatistikler ve Mann-Whitney U testi sonuçları

Bağımlı Değişken	Grup	N	Sıra Ortalaması	Sıra Toplamı	U	z	p
Karakter ve değerler (KD)	Deney	28	29.91	837.50	324.500	-0.905	0.366
	Kontrol	27	26.02	702.50			

Anlamlılık düzeyi=0.0125

Ön test EFOYÖ boyutlarından ZA, BIGOB ve UBO için yapılan *t*-testi sonuçlarına göre deney ve kontrol grubu arasında ZA ($t(53)=0.590$, $p>0.0125$) ve UBO ($t(53)=1.205$, $p>0.0125$) açısından anlamlı bir fark görülmezken, BIGOB ($t(53)=2.750$, $p<0.0125$) açısından deney grubu lehine anlamlı bir farklılık bulunmuştur. Yapılan *t*-testi sonuçları ve betimsel istatistikler Tablo 5'te sunulmuştur.

Tablo 5. Ön test ZA, BIGOB ve UBO için bağımsız gruplar *t*-testi sonucu

Bağımlı değişken	Grup	N	\bar{X}	S	sd	t	p
Zihin alışkanlığı (ZA)	Deney	28	55.25	4.89	53	0.590	0.557
	Kontrol	27	54.44	5.23			
Bir insan gayreti olarak bilim (BIGOB)	Deney	28	59.21	3.63	53	2.750	0.008
	Kontrol	27	55.88	5.22			
Üst biliş ve özdenetim (UBO)	Deney	28	57.46	5.22	53	1.205	0.234
	Kontrol	27	55.66	5.84			

Anlamlılık düzeyi=0.0125

Ön testlerde BIGOP açısından farklılık tespit edildiği için, son test EFOYÖ açısından grupları kıyaslamak üzere bu değişken kovaryant olarak atanarak MANCOVA testi uygulanmıştır. Analiz sonucunda bilimin sosyal-kültürel yapısı son testte evrensel fen okuryazarlığı açısından gruplar arasında istatistiksel olarak anlamlı bir farklılık görülmemektedir (Wilks' $\lambda=0.791$, $F=3.241$, $p=0.019$). Evrensel Fen Okuryazarlığı Ölçeği son-test betimsel istatistikleri Tablo 6'da sunulmuştur.

Tablo 6. Son test EFOYÖ için betimsel istatistikler ve MANCOVA sonucu

Bağımlı değişken	Grup	X	S	Wilk's lambda	F	p
Zihin alışkanlığı	Deney	58.85	3.74	0.791	3.241	0.019
	Kontrol	57.77	4.63			
Karakter ve değerler	Deney	39.71	4.42			
	Kontrol	39.62	3.94			
Bir insan gayreti olarak bilim	Deney	59.57	4.40			
	Kontrol	58.96	4.74			
Üstbilgi ve özdenetim	Deney	61.53	3.64			
	Kontrol	57.88	5.34			

Medya Okuryazarlığı Becerilerine Yönelik Bulgular

Ön test MOBÖ alt boyutları için yapılan *t*-test sonuçlarına göre gruplar arasında erişme ($t(53)=1.802$, $p>0.0125$), analiz ($t(53)=0.355$, $p>0.0125$), değerlendirme ($t(53)=-0.125$, $p>0.0125$) ve iletme ($t(53)=1.166$, $p>0.0125$) boyutları açısından anlamlı farklılık olmadığı bulunmuştur. Yapılan *t*-testi analiz sonuçları ve betimsel istatistikler Tablo 7'de sunulmuştur.

Tablo 7. Ön test MOBÖ boyutları bağımsız gruplar *t*-testi sonucu ve betimsel istatistikler

Bağımlı değişken	Grup	\bar{X}	S	sd	t	p
Erişme	Deney	46.21	5.43	53	1.802	0.077
	Kontrol	43.66	5.04			
Analiz	Deney	62.07	7.50	53	0.355	0.724
	Kontrol	61.41	6.30			
Değerlendirme	Deney	29.07	3.75	53	-0.125	0.901
	Kontrol	29.18	2.90			
İletme	Deney	49.96	7.06	53	1.166	0.249
	Kontrol	47.89	6.70			

Anlamlılık düzeyi= 0.0125

Son test MOBÖ alt boyutları için yapılan *t*-testi sonuçlarına göre gruplar arasında erişme ($t(53)=-0.885$, $p>0.0125$), analiz ($t(53)=1.110$, $p>0.0125$) ve iletme ($t(53)=0.889$, $p>0.0125$)

açısından anlamlı fark görülmezken, değerlendirme ($t(53)=2.643$, $p<0.0125$, kısmi $\eta^2=0.116$) açısından anlamlı farklılık tespit edilmiştir. Kısmi eta kare için 0.01, 0.06 ve 0.14 değerleri sırasıyla küçük, orta ve büyük etki büyüklüğünü göstermektedir (Green ve diğ., 2005). Bu veriler için elde edilen kısmi eta kare değeri (0.116), bilim haberlerini bilimin doğası öğretiminde kullanmanın fen bilimleri öğretmen adaylarının medya okuryazarlığı becerilerinden değerlendirme boyutu için orta düzeyde bir etkisi olduğunu göstermektedir. Yapılan t -testlerin sonucu ve betimsel istatistikler Tablo 8’de verilmiştir.

Tablo 8. Son test MOBÖ boyutları için bağımsız gruplar t -testi sonuçları ve betimsel istatistikler

Bağımlı değişken	Grup	\bar{X}	S	Sd	t	p	Kısmi Eta kare
Erişme	Deney	49.50	3.86	53	0.885	0.380	
	Kontrol	48.55	4.05				
Analiz	Deney	67.43	6.09	53	1.110	0.272	
	Kontrol	65.63	5.91				
Değerlendirme	Deney	32.00	2.65	53	2.643	0.011	0.116
	Kontrol	29.81	3.44				
İletme	Deney	52.89	4.28	53	0.889	0.378	
	Kontrol	51.70	5.57				

Anlamlılık düzeyi= 0.0125

Tartışma ve Sonuç

Bu çalışmada bilimin doğası öğretiminde bilim haberleri kullanmanın, fen bilimleri öğretmen adaylarının bilimin doğasını anlamalarına, evrensel fen okuryazarlıklarına ve medya okuryazarlıklarına etkisi incelenmiştir. Bilimin doğası anlayışları açısından elde edilen bulgular, SBK bağlamında bilimsel gazete haberleri kullanmanın, yalnızca SBK bağlamında bilimin doğası öğretmeye kıyasla fen öğretmen adaylarının bilimin doğası anlayışlarına etkisi olmadığını göstermiştir. Bu durum iki grupta da SBK kullanılması ile açıklanabilir. Araştırmalar SBK bağlamında yapılan tartışmaların bilimin doğası anlayışlarını geliştirdiğini göstermektedir (Adal & Çakıroğlu, 2022; Herman ve diğ., 2023; Karakaya & İrez, 2022). SBK, öğrencilerin bilimin temel değerleri ve kavramları ile etkileşimde bulunmalarına olanak tanıdığı için bilimin doğasını anlamak adına ideal bir bağlam sağlar (Khishfe & Lederman, 2006). Bu temel göz önüne alındığında, araştırmanın bulguları, gazete haberlerinin SBK bağlamında sunulmasının, bilimin doğası öğretiminde etkili bir araç olabileceğini göstermektedir (Garcia-Carmona, 2021). Her iki grupta da bilimin doğası anlayışlarının benzer düzeyde gelişmiş olması bu iddiaya kanıt olarak gösterilebilir. Benzer

şekilde, Khishfe (2022) SBK içeren senaryolarla bilimin doğası öğretimi yapılan bir grubun, sadece bilimsel içeriklerle öğretim yapılan gruba kıyasla argümantasyon becerileri ve bilimin doğası anlayışlarında daha fazla gelişme gösterdiğini bulmuştur. Bu bulgu, bu çalışmada bilimsel gazete haberlerinin SBK ile bağlantısı nedeniyle bilimin doğası anlayışlarını geliştirdiği fikrini desteklemektedir. Ayrıca gazetelerdeki bilimsel haberlerde, ilgili konu ile ilgili teorik bilginin yüzeysel olduğu görülmektedir. Kontrol grubuna verilen SBK ile ilgili teorik metinlerin içeriksel derinliği deney grubununkinden daha fazladır.

Evrensel fen okuryazarlığı açısından elde edilen bulgular SBK bağlamında bilimsel gazete haberleriyle bilimin doğası öğretiminin, yalnızca SBK bağlamında bilimin doğası öğretimine kıyasla fen bilgisi öğretmen adaylarının evrensel fen okuryazarlığına etkisi olmadığını göstermiştir. Evrensel fen okuryazarlığının alt boyutlarının (zihin alışkanlığı, karakter ve değerler, insani bir çaba olarak bilim, üst biliş ve özdenetim) SBK’da karar verme ve bilimin doğasını anlamayla doğrudan ilişkisi göz önüne alındığında grupların benzerliği daha iyi anlaşılabilir. Ayrıca her iki grupta da işbirlikli grup çalışması ve sosyo-bilimsel argümantasyon yapılmış olması, evrensel fen okuryazarlığının benzer düzeyde gelişimiyle sonuçlanmış olabilir. *Zihin alışkanlığı* boyutu etkili iletişim ve işbirliğinin yanı sıra rutin olmayan problem çözme süreçlerinin önemini, sistemli düşünme yaklaşımlarını, iddiaları desteklemek için kanıt kullanımının zorunluluğunu, model geliştirmenin kritikliğini ve bilgi yönetiminin gerekliliğini öne çıkarır (Choi ve diğ., 2011). Özellikle bireylerin ortak anlayışlar geliştirmede farklı özellikteki kişilerle iletişim ve işbirliği kurmalarını, birlikte çalışmayı, dinlemeyi ve bilgiyi beraber yorumlamayı gerektirir (Mun ve diğ., 2015). Her iki grupta da SBK bağlamında bilimin doğası unsurlarını analiz etmek ve küresel sosyo-bilimsel problemlerde karar vermek üzere yapılan tartışmalar, öğrencilerin işbirliği içinde argüman geliştirmelerine odaklanmıştır. Bu durum deney ve kontrol grubundaki öğrencilerin zihin alışkanlığı boyutu açısından benzer düzeyde etkilendiğini açıklayabilir. Evrensel fen okuryazarlığının *karakter ve değerler* boyutu ekolojik dünya görüşü (insanların doğayla iç içe olduğuna ve bu nedenle çevresel etkilerin sonucunda insan topluluklarının da etkilendiği genel bir kabul durumu) (Smith & Williams, 1999), ahlaki ve etik duyarlılık (çeşitli SBK’lardan zarar gören ve kalkınma süreçlerinin avantajlarından dışlanmış bireyler için empatiye dayanan endişeler) (Ruiz & Vallejos, 1999) ve sosyo-bilimsel hesap verebilirlik (küresel SBK’da sorumluluk duygusu) (Mueller & Zeidler, 2010) gibi değerleri içermektedir.

Her iki grupta SBK bağlamında yapılan bilimin doğası analizleri ve sosyo-bilimsel argümantasyon sayesinde öğrencilerin SBK'daki etik durumları evrensel insani değerler ışığında değerlendirmelerine yönelik tartışmalar ve karar alma süreçleri gerçekleştirilmiştir. Bu gruplarda SBK açısından bağlamlar aynı olmakla birlikte bu bağlamın sunulduğu araçlardaki farklılık (bilimsel gazete haberlerine karşılık teorik metinler), gruplardaki ahlaki ve etik duyarlılık açısından bir fark oluşturmamıştır. *Bir insan gayreti olarak bilim* boyutu bilimin doğası anlayışını ifade etmektedir (Mun ve diğ., 2015). Bu alt boyut açısından grupların benzerliği, Bilimin Doğası Ölçeği ile elde edilen bulgularla da uyumludur. Ek olarak, bilimsel gazete haberleri kullanımı fen öğretmen adaylarının üstbilis ve özdenetimini, bu tür materyallerden yararlanmayan grup ile benzer düzeyde arttırmıştır. Literatürdeki çalışmalar, SBK bağlamında yapılan öğretimin öğrencilerin evrensel fen okuryazarlıklarını arttırdığını göstermektedir (Chen & Liu, 2018). Bu çalışmada her iki grubun da evrensel fen okuryazarlığındaki artış literatürdeki bu araştırmalarla uyumludur.

Araştırmanın medya okuryazarlığına ilişkin bulguları, bilim haberleri kullanılarak bilimin doğası öğretiminin fen öğretmen adaylarının medya okuryazarlığını erişme, analiz ve iletme boyutları açısından etkilemezken, *değerlendirme* boyutu açısından orta düzeyde arttırdığını göstermiştir ($\eta^2=0.116$). Katılımcıların haberleri hem bilimin doğası unsurları hem de haberin güvenilirliği ve bilimselliği açısından değerlendirmek üzere içeriğin kalitesi, haberin objektifliği, orijinal kaynağın güvenilirliği, akademik dergilerde yayınlanıp yayınlanmadığı, muhabirin arka planı gibi unsurları gözeterek yaptığı haber analizleri, onları medya mesajının değeri hakkında bir yargıya varma konusunda geliştirmiştir. Yargıya varma, etik, ahlaki veya demokratik ilkeler gibi değer ölçüleri gözetilerek yapılır (Pérez Tornero ve diğ., 2007). Yargıya varma sürecinde bilim haberlerinin her ne kadar bilimsel içerikli olsa da haber olduğu ve haberlerin doğası gereği ticari, siyasi veya diğer amaçlarla oluşturulmuş olduğu göz önünde bulundurulduğunda, bireylerin bu haberlerdeki mesajların içeriğini, yanlı olup olmadığını ve bilimsel olarak doğruluğunu sorgulaması oldukça önemlidir (Erdem, 2018). Öğrenciler haberlerdeki mesajları kendi görüşleri olarak benimsemeden önce, onlara verilen bu ölçütler temelinde değerlendirmişlerdir. Böylece mesajların gerçekliği ve niteliğine ilişkin yargıya varmaları sağlanmıştır (Thoman & Jolls, 2005). Haberlerin SBK arasından seçilerek öğrencilerin SBK bağlamında etik ve ahlaki değerlendirmeler yapmış olmaları, yüzeysel haber analizleriyle beraber, medya

okuryazarlıklarını değerlendirme boyutunda geliştirmiş olabilir. Bu bulguya paralel olarak literatürdeki çalışmalar bilimsel gazete haberlerini fen öğretmede kullanmanın medya okuryazarlığını arttırdığını rapor etmektedir (Austin ve diğ., 2021, Cakmakçı & Yalaki, 2012). Diğer yandan medya okuryazarlığının diğer boyutları olan erişme (medya araçları ve içeriklerine fiziksel olarak erişme ve bunları uygulamaları olarak kullanma becerisi) (Perez Tornero ve diğ., 2007), analiz (medya metinlerinin yazınsal, sanatsal, politik, sosyal ve ekonomik kavramlar aracılığıyla içerdiği mesajın eleştirel bir bakış açısıyla incelenmesi) (Jolls, 2008) ve iletme (medya araçları kullanarak medya içeriği oluşturma ve bunu başkalarıyla paylaşma) (Schmidt, 2013) açısından ise deney ve kontrol grubundaki öğrencilerin benzer düzeyde gelişme gösterdiği belirlenmiştir. Ginosar ve Tal (2018) öğrencilerin bilimsel bilgi edinmede medyayı etkili bir şekilde kullanabilmeleri için rehberliğe gereksinimleri olduğu ve bu rehberliği sağlayanların fen bilgisi öğretmenleri oluşu göz önüne alınarak fen öğretmenlerinin medya okuryazarı olması gerektiğini vurgulamaktadır. Bu araştırmada elde edilen bulgular, bilim temalı gazete haberlerinin öğretmen adaylarının eğitim sürecine dahil edilmesinin, medya okuryazarlığı becerilerini geliştirici potansiyeline işaret etmektedir. Bu bulgu, öğretmen eğitim programlarında medya içeriklerinin daha bilinçli ve eleştirel bir şekilde kullanılmasına yönelik metodolojik yaklaşımların geliştirilmesi için bir temel oluşturabilir. Fen öğretmeni eğitimi programlarında bu tür içeriklerin entegrasyonu önerilmektedir.

Araştırma, SBK'ın ele alınış şeklinin öğrencilerin bilimin doğası hakkındaki SBK'ın daha etkin kullanımına yönelik stratejiler geliştirmede faydalı olabilir. SBK'da argümantasyon içeren etkinliklerin öğrencilerin bilimin doğası anlayışları ve evrensel fen okuryazarlığına olan olumlu etkilerine ek olarak, bilim haberleri aracılığıyla kullanımı yoluyla medya okuryazarlığının da geliştirilmesi söz konusu olmaktadır. Araştırma sonuçları, eğitim politika yapıcılara ve program geliştiricilere, fen eğitimi ve öğretmen eğitimi programlarında medya materyallerinin kullanımının önemini ve potansiyel etkilerini göstermektedir. Bu da öğretim stratejilerini ve politikalarını yeniden değerlendirme ve güncelleme ihtiyacını ortaya koyar.

Gelecek araştırmalarda bilimsel gazete haberleriyle bilimin doğası öğretimi, bilimsel içerik temelli bilimin doğası öğretimiyle kıyaslanabilir. Bu tip bir çalışmada SBK'ın etkisi daha da öne çıkacaktır. Grupların nicel ölçme araçları ile ölçülmüş olan bilimin doğası

anlayışları ve evrensel fen okuryazarlıkları benzer düzeyde gelişmiş olsa da nitel veriler özellikle öğrencilerin argüman kalitelerine ışık tutması açısından daha detaylı veri sağlayabilir. Buna ek olarak, bilimin doğası anlayışının derinlemesine geliştirilmesi için gazete haber analizleriyle birlikte farklı stratejilerin kullanılması ve daha uzun süreli çalışmaların yürütülmesi de önerilmektedir.

Sınırlılıklar

Bu çalışmanın sonuçlarını sınırlayan faktörler arasında uygulama süresinin ve örneklem büyüklüğünün kısıtlı olması yer almaktadır. Ayrıca, çalışma sadece Türkiye'deki belirli bir üniversitenin fen bilimleri eğitimi anabilim dalına odaklanmıştır; bu durum, tüm fen bilimleri öğretmen adaylarının genel popülasyonunu temsil etmeyebilir. Ayrıca araştırma kapsamında bilimin doğası öğretimi araştırmacılar tarafından gerçekleştirilmiştir. Bu durum çalışmada olası bir dış geçerlik tehdidi yaratmış olabilir. Araştırmacı etkisi, araştırmayı yürüten kişilerin istemeden de olsa süreçleri, katılımcıları veya performanslarının değerlendirilmesini etkilemiş olmasıyla ortaya çıkar (Gay & Airasian, 2000). Ancak araştırmacılar bu tehdidi gözetererek her iki gruba da benzer şekilde yaklaşıma çalışmışlardır. Ayrıca deney grubu öğrencilerine, özel ilgi gördükleri hissine kapılmamaları için kontrol grubundan farklı bir öğretim yapıldığı söylenmemiştir. Ancak deney ve kontrol grubu öğrencilerinin ders dışı zamanlarda iletişim kurarak dersin öğretimine ilişkin farklı yaklaşımlar hakkında bilgi almış olabilirler. Ayrıca önceden oluşturulmuş grupların kullanılması grupların başlangıç özellikleri açısından farklı olması olasılığını doğurmaktadır. Bu durum iç geçerlilik için bir tehdit oluşturabilir. Ancak katılımcıların bağımlı değişkenler açısından ön testlerle başlangıç durumları belirlenerek bu etki kontrol altına alınmıştır. Diğer yandan aynı testlerin öntest ve sontest olarak uygulanmış olması, katılımcıların test içeriğine aşina olmasına sebep olarak sontest puanlarını etkilemiş olabilir. Ancak öntestler ve sontestler arasında dokuz hafta olması bu etkinin azalması yönünde etki etmiş olabilir.

Etik Kurul Belgesi

Etik Kurul Komisyon Adı: Çukurova Üniversitesi Bilimsel Araştırma ve Yayın Etiği Kurulu

Etik Kurul Belge Tarihi ve Protokol No: 30/03/2022-19

Bilgilendirme

Bu çalışmanın bir kısmı, 22-25 Haziran 2022'de İzmir'de IX. International Eurasian Educational Research (EJER) Congress'te sunulmuştur.

Yazar Katkı Beyanı

Büşra ASLANGÖZ: Literatür taraması, kavramsallaştırma, uygulama, verilerin toplanması, işlenmesi, analizi, yorumlanması, inceleme-yazma, düzenleme.

Özgecan KIRIK: Kavramsallaştırma, metodoloji, uygulama, verilerin analizi ve yorumlanması, denetim, inceleme-yazma, düzenleme.

Kaynaklar

- Abd-El-Khalick, F., & Akerson, V. L. (2004). Learning as conceptual change: Factors mediating the development of preservice elementary teachers' views of nature of science. *Science Education*, 88(5), 785-810. <https://doi.org/10.1002/sce.10143>
- Adal, E. E., & Cakiroglu, J. (2023). Investigation of preservice science teachers' nature of science understanding and decision making on socioscientific issue through the fractal model. *Science & Education*, 32(2), 529-565. <https://doi.org/10.1007/s11191-022-00319-1>
- Aufderheide, P. (1993) *Media literacy: A report on the National Leadership Conference on media literacy*. Aspen Institute.
- Austin, E. W., P. Borah, & S. Domgaard. (2021). COVID-19 disinformation and political engagement among communities of color: The role of media literacy. *The Harvard Kennedy School Misinformation Review* 1 (7), 1–17. <https://doi.org/10.37016/mr-2020-58>
- Cakmakci, G. & Yalaki, Y. (2012). *Promoting student teachers' ideas about nature of science through popular media*. S-TEAM / NTNU.
- Chen, S. Y., & Liu, S. Y. (2018). Reinforcement of scientific literacy through effective argumentation on an energy-related environmental issue. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(12), em1625. <https://doi.org/10.29333/ejmste/95171>
- Choi, K., Lee, H., Shin, N., Kim, S., & Krajcik, J. (2011). Re-conceptualization of scientific literacy in South Korea for the 21st century. *Journal of Research in Science Teaching*, 48(6), 670–697. <https://doi.org/10.1002/tea.20424>
- Çelik, C. (2016). *Evensel fen okuryazarlık ölçeği'nin Türkçe'ye uyarlama çalışması ve öğretmen adaylarının evensel fen okuryazarlık düzeyi*. [Yüksek lisans Tezi]. Muğla Sıtkı Koçman Üniversitesi.
- Demirdöğen, B., & Aydın-Günbatar, S. (2021). Teaching nature of science through the use of media reports on COVID-19. *Science Activities*, 58(3), 98-115. <https://doi.org/10.1080/00368121.2021.1957757>
- Eastwood, J. L., Sadler, T. D., Zeidler, D. L., Lewis, A., Amiri, L., & Applebaum, S. (2012). Contextualizing nature of science instruction in socioscientific issues. *International Journal of Science Education*, 34(15), 2289-2315.
- Elliott, P. (2006). Reviewing newspaper articles as a technique for enhancing the scientific literacy of student-teachers. *International Journal of Science Education* 28 (11), 1245– 65.
- Erdem, C. (2018). *Öğretmen adayları için medya okuryazarlığı dersi öğretim programı tasarısı*. [Doktora Tezi]. Anadolu Üniversitesi Eğitim Bilimleri Enstitüsü.
- Fooladi, E. C. 2020. Between education and opinion-making. *Science & Education*, 29 (5), 1117–38. <https://doi.org/10.1007/s11191-020-00156-0>
- García-Carmona, A. (2021). Learning about the nature of science through the critical and reflective reading of news on the COVID-19 pandemic. *Cultural Studies of Science Education*, 16(4), 1015-1028. <https://doi.org/10.1007/s11422-021-10092-2>

- García-Carmona, A., & Acevedo Díaz, J. A. (2016). Learning about the nature of science using newspaper articles with scientific content. *Science & Education*, 25, 523-546.
- Gay L. R. & Airasian P., (2000), *Educational research: Competencies for analysis and application*. Prentice-Hall Inc
- Green, S.B., Sulkind, N.J., & Akey, T.M. (2000). *Using SPSS for windows: Analyzing and understanding data* (2nd ed.). Prentice-Hall, Inc.
- Ginosar, A., & Tal, T. (2018). Teaching journalistic texts in science classes: The importance of media literacy. *Journal of Science Education and Technology*, 27(3), 205-214. <https://doi.org/10.1007/s10956-017-9718-9>
- Herman, B. C., Poor, S. V., Oertli, R. T., & Schulte, K. (2023). Promoting young learners' NOS views through place-based SSI instruction. *Science & Education*, 32(4), 947-992.
- Huang, H. Y., H. L. Wu, H. C. She, and Y. R. Lin. 2014. Enhancing students' NOS views and science knowledge using Facebook based scientific news. *Journal of Educational Technology & Society*, 17 (4), 289–301.
- Jarman, R., & McClune, B. (2007). *Developing scientific literacy using news media in the classroom*. Open University Press.
- Jolls, T. and Wilson, C. (2014). The core concepts: fundamental to media literacy yesterday, today and tomorrow. *Journal of Media Literacy Education*, 6(2), 68-78.
- Karakaya, E., & İrez, O. S. (2022). The relationship between understanding the nature of scientific knowledge and reasoning and decision making in socioscientific issues. *Hacettepe University Journal of Education*, 37(4), 1329-1358.
- Khishfe, R. (2022). Nature of Science and Argumentation Instruction in socioscientific and scientific contexts. *International Journal of Science Education*, 44(4), 647-673.
- Khishfe, R. & Abd-El-Khalick, F. (2002). The influence of explicit and reflective versus implicit inquiry-oriented instruction on sixth graders' views of nature of science. *Journal of Research in Science Teaching*, 39(7), 551-578. <https://doi.org/10.1002/tea.10036>
- Khishfe, R., & Lederman, N. (2006). Teaching nature of science within a controversial topic: Integrated versus nonintegrated. *Journal of Research in Science Teaching*, 43(4), 377–394. <https://doi.org/10.1002/tea.20137>
- Kolstø, S. D. (2001). 'To trust or not to trust,...'-pupils' ways of judging information encountered in a socio-scientific issue. *International Journal of Science Education*, 23(9), 877-901. <https://doi.org/10.1080/09500690010016102>
- Kolstø, S. D., Bungum, B., Arnesen, E., Isnes, A., Kristensen, T., Mathiassen, K., ... & Ulvik, M. (2006). Science students' critical examination of scientific information related to socioscientific issues. *Science Education*, 90(4), 632-655. <https://doi.org/10.1002/sce.20133>
- Köseoğlu, F., Atasoy, B., Kavak, N., Akkuş, H., Budak, E., Tümay, H., Kadayıfçı, H., Taşdelen, U., (2003). *Yapılandırıcı öğrenme ortamı için: Bir fen ders kitabı nasıl olmalı*. Asil Yayın Dağıtım.
- Kurt, A. A., & Kürüm, D. (2010). Medya okuryazarlığı ve eleştirel düşünme arasındaki ilişki: Kavramsal bir bakış. *Mehmet Akif Ersoy Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, (2), 20-34. <https://doi.org/10.20875/sb.92802>
- Lederman, N. G. (1992). Students' and teachers' conceptions of the nature of science: a review of the research. *Journal of Research in Science Teaching*, 29, 331-359.
- Lederman, N. G. (2007). Nature of science: Past, present, and future. In S. K. Abell & N. G. Lederman (Eds.). *Handbook of research on science education* (pp. 831– 879). Lawrence Erlbaum Associates.

- Lederman, N. G., Abd-El-Khalick, F., Bell, R. L., & Schwartz, R. S. (2002). Views of nature of science questionnaire: Toward valid and meaningful assessment of learners' conceptions of nature of science. *Journal of Research in Science Teaching*, 39(6), 497–521. <https://doi.org/10.1002/tea.10034>
- Lin, H. S., & Chen, C. C. (2002). Promoting preservice chemistry teachers' understanding about the nature of science through history. *Journal of Research in Science Teaching*, 39(9), 773-792. <https://doi.org/10.1002/tea.10045>
- McComas, W., Clough, M. P. & Almazroa, H. (1998) The role and character of the nature of science in science education, in W. McComas (ed.) *The Nature of Science in Science Education: Rationales and Strategies*. Kluwer Academic.
- Milli Eğitim Bakanlığı [MEB] (2005). *İlköğretim fen ve teknoloji dersi (4 ve 5. sınıflar) öğretim programı*. T.C. Milli Eğitim Bakanlığı Talim Terbiye Kurulu Başkanlığı.
- Mueller, M. P., & Zeidler, D. L. (2010). Moral-ethical character and science education: Ecojustice ethics through socioscientific issues (SSI). In D. Tippins, M. Mueller, M. van Eijck, & J. Adams (Eds.), *Cultural studies and environmentalism: The confluence of ecojustice, place-based (science) education, and indigenous knowledge systems* (pp. 105–128). Springer.
- Mun, K., Shin, N., Lee, H., Kim, S. W., Choi, K., Choi, S. Y. & Krajcik, J. S. (2015). Korean secondary students' perception of scientific literacy as global citizens: Using global scientific literacy questionnaire. *International Journal of Science Education*, 37(11), 1739-1766. <https://doi.org/10.1080/09500693.2015.1045956>
- Murcia, K. (2009). Science in the news: An evaluation of students' scientific literacy. *Teaching Science*, 55(3), 40-45.
- Norris, S. P., L. M. Phillips, & C. A. Korpan. 2003. University students' interpretation of media reports of science and its relationship to background knowledge, interest, and reading difficulty. *Public Understanding of Science*, 12 (2), 123–45.
- Norris, S. P., & Phillips, L. M. (1994). Interpreting pragmatic meaning when reading popular reports of science. *Journal of Research in Science Teaching*, 31(9), 947-967. <https://doi.org/10.1002/tea.3660310909>
- Oliveras, B., Márquez, C., & Sanmartí, N. (2013). The use of newspaper articles as a tool to develop critical thinking in science classes. *International Journal of Science Education*, 35(6), 885-905. <https://doi.org/10.1080/09500693.2011.586736>
- Özgelen, S. (2013). Bilimin doğası ölçeğinin geliştirilmesi. *Kastamonu Üniversitesi Kastamonu Eğitim Dergisi*, 21(2), 711- 736.
- Pallant, J. (2007). *SPSS survival manual: A step by step guide to data analysis using SPSS for Windows*. Open University Press
- Pérez Tornero, J. M., Celot P. & Varis T. (2007). *Current trends and approaches to media literacy in Europe*. European Commission.
- Ruiz, P. O., & Vallejos, R. M. (1999). The role of compassion in moral education. *Journal of Moral Education*, 28(1), 5–17. <https://doi.org/10.1080/030572499103278>
- Schmidt, H. C. (2013). Media literacy education from kindergarten to college: A comparison of how media literacy is addressed across the educational system. *Journal of Media Literacy Education*, 5(1), 295-309. <https://doi.org/10.23860/jmle-5-1-3>
- Shamos, M. H. (1995). *The myth of scientific literacy*. Rutgers University Press.
- Shibley, I. A. (2003). Using newspapers to examine the nature of science. *Science & Education*, 12 (7), 691–702. <https://doi.org/10.1023/A:1025687424931>



- Smith, G. A., & Williams, D. R. (1999). *Ecological education in action: On weaving education, culture, and the environment*. State University of New York Press.
- Thoman, E., & Jolls, T. (2005). *Literacy for the 21st century: An overview and orientation guide to media literacy education. Part I: Theory*. Center for Media Literacy. www.medialit.org/cml-medialit-kit
- Wellington, J. (1991). Newspaper science, school science: Friends or enemies?. *International Journal of Science Education*, 13(4), 363–372. <https://doi.org/10.1080/0950069910130401>
- Zeidler, D. L. (2014). Socioscientific issues as a curriculum emphasis: Theory, research and practice. In: N. G. Lederman & S. K. Abell (Eds.), *Handbook of research on science education* (Vol. 2, pp. 697–726).
- Zeidler, D. L., & Sadler, T. D. (2008). Social and ethical issues in science education: A prelude to action. *Science & Education*, 17, 799-803. <https://doi.org/10.1007/s11191-007-9130-6>

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article/Araştırma Makalesi

Classroom Teachers' Views on Environmental Education

Seda ÖZTÜRK¹  Ahmet Turan ORHAN*² 

¹ Sivas Cumhuriyet University, Sivas, Turkey, sedaylmz5801@gmail.com

² Sivas Cumhuriyet University, Sivas, Turkey, aturanorhan@cumhuriyet.edu.tr


* Corresponding Author: aturanorhan@cumhuriyet.edu.tr

Article Info

Received: 03 April 2024

Accepted: 09 September 2024

Keywords: Classroom teacher, environment, environmental education, science education, environmental self-efficacy

 10.18009/jcer.1464325

Publication Language: Turkish

Abstract

The objective of this study is to investigate classroom teachers' perspectives on environmental education. The study employed a phenomenological design, which is a qualitative research method. The research study comprised 45 classroom teachers from public primary schools in Sivas province during the spring semester of the 2022-2023 academic year. The participants were selected based on maximum diversity and volunteerism. The data obtained from the research was analyzed using MAXQDA 2020 software program. The research results indicate that classroom teachers mostly emphasize the recognition and protection of the environment, as well as the creation of environmental awareness, in their definitions of environmental education. Considering the results of the study, it is recommended that classroom teachers receive in-service training on environmental education, that classroom teachers use more environmental practices related to everyday life and in which students are active, and that environmental education be included in various courses.



To cite this article: Öztürk, S., & Orhan, A.T. (2024). Sınıf öğretmenlerinin çevre eğitimine yönelik görüşleri. *Journal of Computer and Education Research*, 12 (24), 476-504. <https://doi.org/10.18009/jcer.1464325>

Sınıf Öğretmenlerinin Çevre Eğitimine Yönelik Görüşleri

Makale Bilgisi

Geliş: 03 Nisan 2024

Kabul: 09 Eylül 2024

Anahtar kelimeler: Sınıf öğretmeni, çevre, çevre eğitimi, fen eğitimi, çevre öz-yeterliliği

 10.18009/jcer.1464325

Yayın Dili: Türkçe

Öz

Bu araştırmanın amacı, sınıf öğretmenlerinin çevre eğitimine yönelik görüşlerinin incelenmesidir. Araştırmada nitel araştırma yöntemlerinden fenomenoloji deseni kullanılmıştır. Araştırmanın çalışma grubunda, 2022-2023 eğitim öğretim yılı bahar döneminde Sivas ilinde resmi ilkokullarda görev yapan maksimum çeşitlilik ve gönüllülük esası sağlanarak oluşturulmuş 45 sınıf öğretmeni yer almaktadır. Araştırmadan elde edilen verilerin çözümlenmesinde MAXQDA 2020 yazılım programı kullanılmıştır. Araştırma sonuçlarına göre, sınıf öğretmenlerinin çevre eğitimi tanımlamaları içinde en çok çevreyi tanıma ve koruma çabası ile çevre farkındalığı oluşturulmasının vurgulandığı görülmektedir. Araştırmanın sonuçları dikkate alındığında, sınıf öğretmenlerine çevre eğitimine yönelik uygulamalı hizmet içi eğitimler verilmesi, sınıf öğretmenlerinin günlük hayatla ilişkili ve öğrencinin aktif olduğu çevre uygulamalarını daha fazla kullanması ve farklı derslerde çevre eğitime yer verilmesi önerilmektedir.

Summary

Classroom Teachers' Views on Environmental Education

Seda ÖZTÜRK¹  Ahmet Turan ORHAN*² 

¹ Sivas Cumhuriyet University, Sivas, Turkey, sedaylmz5801@gmail.com

² Sivas Cumhuriyet University, Sivas, Turkey, aturanorhan@cumhuriyet.edu.tr

* Corresponding Author: aturanorhan@cumhuriyet.edu.tr

Introduction

The most important part of the interaction in nature is man. Humans are in constant interaction with the environment and are constantly changing the environment in their struggle for life. These changes, which upset the balance of the natural order, have led to environmental problems. Environmental problems have now taken on a global dimension, and it is clear that the whole world is looking for solutions to the damage they are causing to life.

In order to provide qualified environmental education, it is very important to emphasize applied environmental education and to include field trips, observations and different activities (Keleş et al., 2013; Sikhosana, 2022). Teachers, who play an important role in shaping students' environmental perceptions, should be provided with comprehensive environmental education. For a strong environmental education to take place, teachers should have positive environmental attitudes and perceptions and adopt a student-centred approach (Kefeli et. al., 2018). In addition, a systematic and holistic approach to teacher training in environmental education should be adopted, teachers' competencies in delivering environmental education should be enhanced (Can & Özdemir, 2022; Kaya & Elster, 2019).

Teachers play a crucial role in providing quality education. They should not only lecture but also serve as role models and guides for students (Saracaoğlu & Yenice, 2009). High self-efficacy beliefs are essential for teachers as they positively impact the education and training process of students. Therefore, the success of the teacher is directly linked to the success of the student (Aydın, 2008).

The weight of environmental education in programs is crucial, and teachers must possess the necessary knowledge and positive attitudes towards the environment (Sikhosana, 2022). The effective implementation of environmental and sustainability

concepts in the classroom by teachers plays a vital role (Jung & Santos, 2022; Reddy, 2021). The views and attitudes of classroom teachers have a significant impact on the learning environment and the successful implementation of environmental education. Therefore, this study aims to examine the views of classroom teachers on environmental education, given their crucial role in this field.

Method

The study employed phenomenology design, a qualitative research method, with data sources consisting of groups that have experienced the phenomenon under investigation and can reflect on it (Yıldırım & Şimşek, 2021). The research was conducted with a study group of 45 classroom teachers working in public primary schools in Sivas province, using the maximum diversity sampling method, a purposeful sampling method. The study employed the 'Semi-Structured Interview Form', a set of open-ended questions developed by the researcher, to collect qualitative data. The data was analyzed using content analysis techniques to determine the environmental education views of classroom teachers. To ensure anonymity, teachers were given code names (T1, T2...) instead of their real names. Qualitative data was analyzed using MAXQDA 2020 software program, which facilitates data analysis, evaluation, and interpretation.

Results

Following the interviews, teachers' concepts in environmental education were divided into eight subcategories: 'developing a positive attitude', 'consciousness', 'sustainability', 'creating environmental awareness', 'providing a livable environment', 'sensitivity', 'recognizing and protecting the environment', and 'cleaning'.

The issues experienced in providing quality environmental education were also addressed. There are 14 sub-categories as "insufficiency in environmental trips and practices", "inability to provide qualified education", "indifferent parent profile", "indifferent student profile", "not being able to overcome the knowledge level", "insufficient in-service trainings", "difficulties in daily life", "not giving students the opportunity", "insufficiency of criminal sanctions", "negative roles and models", "lack of budget and materials", "insufficiency in positive environmental practices", "lack of time" and "lack of awareness of people".

The duties and responsibilities of classroom teachers are divided into six subcategories: creating awareness, improving oneself, cooperating with parents, being a role model, conducting research, and preparing activities.

Concerning the learning outcomes that qualified environmental education should create in students, the teachers' opinions about the learning outcomes that qualified environmental education should create in students were divided into six subcategories: "being willing to solve environmental problems", "voluntary participation in environmental practices", "protecting the environment and not harming it", "recognizing the environment", "being sensitive to the environment" and "relating to everyday life".

The opinions of the class teachers about the activities and strategies they used to provide a more qualified environmental education were collected in two categories: "Environmental education practices" and "Thoughts to emphasize about environmental education practices". Regarding teachers' subject knowledge and strategies used, subject knowledge was divided into 2 subcategories as: "I think my subject knowledge is sufficient", "I do not think my subject knowledge is sufficient". It was divided into 2 subcategories.

Regarding the suggestions for providing more qualified environmental education: "Teacher development should be supported", "Awareness-raising efforts should be increased", "Materials should be produced", "Teachers and parents should work together", "Teachers and parents should participate in training", "Projects should be developed", "Guidance should be provided", "Education should start at an early age", "Applied education should be provided", "Parental awareness should be raised" and "Technology should be used".

Discussion and Conclusion

In the context of environmental education, the most prominent definition is the recognition and protection of the environment. Kimaryo (2011) similarly concluded in their study that primary school teachers' definitions of environmental education often included expressions of environmental recognition and protection.

The teachers emphasized the challenges they faced in providing quality environmental education. Kimaryo's (2011) study found that classroom teachers face

challenges in environmental education due to a lack of resources, time, and overcrowded class sizes.

The duties and responsibilities of classroom teachers include preparing activities and raising awareness. Keleş et al. (2013) conducted a study which found that teachers believe applied environmental education should be provided, and that excursions, observations and various environmental education activities should be carried out.

The study found that teachers conducted different in-class and out-of-class activities, with classroom teachers showing a preference for recycling, tree planting, and activities involving waste materials. Artun and Özsevgeç (2015) argued in their study that environmental education should be based on practical application rather than simply transferring knowledge. They concluded that teachers should adopt a student-centred approach to environmental education.

Classroom teachers believed that their knowledge of the subject was adequate for teaching environmental education. Çalık (2009) suggests that the use of various strategies in environmental education can lead to more effective and lasting learning.

The study found that classroom teachers prioritise the implementation process, in-service training, and parent cooperation in providing quality environmental education. Additionally, teachers expect students to participate in activities, apply what they have learned, and take responsibility. The study suggests that parents should receive training to provide quality environmental education and guide their children in this direction. Demir and Yalçın (2014) conducted a study which found that environmental education achievements were insufficient. The study also highlighted the importance of creating a program based on constructivism with an interdisciplinary approach for effective environmental education.

Regarding environmental education, it is suggested that classroom teachers receive applied in-service training, regular parent information seminars are held, environmental education is integrated into various courses and disciplines, and classroom teachers provide more opportunities for active environmental practices rather than solely theoretical knowledge.

Giriş

Doğadaki etkileşimin en önemli parçası insandır. İnsanlar çevre ile sürekli bir etkileşim halinde olup vermiş oldukları yaşam mücadelesinde çevreyi sürekli olarak değiştirmektedir. Doğal düzenin dengesini bozan bu değişimler çevre sorunlarını beraberinde getirmiştir. Çevre sorunları günümüzde küresel boyuta ulaşmış olup canlı yaşamına verdiği zararlardan dolayı tüm dünyanın çözüm arayışına girdiği görülmektedir.

Çevre sorunları “İnsanın çeşitli faaliyetleri sonucu, çevreyi oluşturan canlı ve cansız bütün varlıklar üzerinde meydana gelen, hayatı olumsuz etkileyen problemler ve bozulmalar bütünü” olarak tanımlanabilir (Erten, 2004). Günümüz dünyasının en büyük problemlerinden birini çevre sorunları oluşturmaktadır. Etkileri artan bu sorun, tüm dünyayı tehdit etmektedir. Özellikle Sanayi Devrimi sonrasında doğal çevredeki olumsuz etkiler oldukça artmış ve tehlikeli boyutlara ulaşmıştır (Görmez, 2015). Çevre sorunlarının neden olduğu küresel ısınma, iklim değişiklikleri, buzulların erimesi, şiddetli yağışlar ya da kuraklık gibi sorunlar ulusal bir boyuttan çıkıp küresel bir sorun düzeyine ulaşmıştır (Haşiloğlu & Karasu, 2019).

Yaşadığımız dünyada insan nüfusunun hızla artması, sanayileşme ile doğal çevrenin olumsuz etkilenmesi, insanların doğaya karşı bilinçsiz tutum ve davranışları doğal çevrenin olumsuz etkilenmesine ve çeşitli çevre sorunlarına yol açmıştır. Doğanın kendini yenilemesine fırsat verilmediği için doğal kaynaklar azalmaya başlamış, bu durum da birçok olumsuzluğu beraberinde getirmiştir. Eğitimciler canlı ve cansız tüm varlıkları etkileyen çevre sorunlarının çözümü için en etkili yolun çevre eğitimi olduğunu düşünmektedirler (Makki ve diğ., 2003; Mosotwane, 1991; Uzun & Sağlam, 2006). Çevre sorunları insanların yapmış oldukları faaliyetlerden dolayı ortaya çıktığı için çözümünün de bilinçli yetiştirilen insanlar sayesinde olacağı düşünülmektedir. Bu durum da çevre eğitiminin önemini ortaya koymaktadır (Sürmeli, 2017).

Çevre eğitimi kavramı disiplinler arası bir kavramdır. Bu sebeple çevre eğitime farklı tanımlamalar yapılmıştır (Tutar & Kurt, 2019). Çevre eğitimi, çevre sorunlarının çözümüne yönelik olumlu davranışların kazandırılması ve çevre farkındalığının oluşturulması olarak tanımlanır (Çevre ve Şehircilik Bakanlığı, 2004). Dikmen’e (1993) göre çevre eğitimi hayat boyu süren ve çevrenin nasıl korunması gerektiği bilincini oluşturmayı

hedefleyen bir süreçtir. Akçay'a (2006) göre çevre eğitimi insanların çevresi ile ilgili olumlu tutumların, değerlerin ve kavramların kazandırılmasıdır.

Çevre eğitiminin erken dönemlerde başlamasının ileriki yıllarda bireylere verilen çevre eğitimi üzerinde önemli bir etkisi vardır. Bu nedenle çevre sorunlarının çözümü ve önlenmesi konusunda erken yaşta eğitime başlanması ve çevre bilincinin oluşturulması gerekmektedir (Akintunde & Akintunde, 2023). Günümüzde çevre eğitimi ile çevre bilincinin oluşturulması küresel bir sorumluluk haline gelmiştir (Yücel & Morgil, 1999). Çevre bilincinin oluşması nitelikli bir çevre eğitimi ile ilişkilidir (Esen & Esen, 2018). Çevre bilincinin ve duyarlılığının geliştirilmesi için çevre eğitimine gereken önemin verilmesi gerekmektedir (Çevre ve Şehircilik Bakanlığı, 2004).

Nitelikli bir çevre eğitimi verilebilmesi için uygulamalı çevre eğitimi üzerinde durulması, gezi, gözlem ve farklı etkinliklere yer verilmesi oldukça önemlidir (Keleş ve diğ., 2013). Öğrencilerin çevre algılarının şekillenmesinde önemli rol oynayan öğretmenlerin kapsamlı bir çevre eğitimi alması gerekmektedir. Güçlü bir çevre eğitiminin gerçekleşebilmesi için öğretmenlerin çevre tutum ve algılarının olumlu yönde olması ve öğrenci merkezli bir yaklaşımı benimsemeleri gerekmektedir (Kefeli et. al., 2018). Ayrıca çevre eğitimi ile ilgili sistematik ve bütüncül öğretmen yetiştirme yaklaşımı benimsenmeli ve öğretmenlerin çevre eğitimi verebilme konusunda yeterlikleri artırılmalıdır (Can & Özdemir, 2022; Kaya & Elster, 2019).

Nitelikli bir eğitim verilebilmesi konusunda öğretmenlerin yeri oldukça önemlidir. Öğretmenler yalnızca ders anlatmakla kalmayıp öğrencilere rol model ve rehber olması gerekmektedir (Saracaoğlu & Yenice, 2009). Öğretmenlerin öz yeterlik inancının yüksek olması oldukça önemlidir. Bu durum öğrencilerin eğitim öğretim sürecine olumlu olarak yansımaktadır. Dolayısıyla öğretmenin başarısı öğrencinin başarısını etkilemektedir. (Aydın, 2008).

Programlar içerisinde çevre eğitimin ağırlığının görülmesi ve öğretmenlerin çevreye yönelik gerekli bilgiye ve olumlu tutumlara sahip olmaları önemlidir (Sikhosana, 2022). Öğretmenlerin çevre ve sürdürülebilirlik kavramlarının sınıfta etkili bir şekilde uygulaması hayati bir role sahiptir (Jung & Santos, 2022; Reddy, 2021). Sonuç olarak, sınıf öğretmenlerinin görüş ve tutumları, öğrenme ortamının şekillendirilmesinde ve çevre eğitiminin başarılı bir şekilde uygulanmasını etkiler.

Çevre eğitiminde sınıf öğretmenlerinin önemini dikkate alarak bu araştırmada, sınıf öğretmenlerinin çevre eğitimine yönelik görüşlerinin incelenmesi amaçlanmıştır. Araştırmanın problem cümlesi “Sınıf öğretmenlerinin çevre eğitimine yönelik görüşleri nasıldır?” şeklinde olup araştırmadaki alt problemler şunlardır:

1. Sınıf öğretmenlerinin çevre eğitimi tanımlamaları nasıldır?
2. Sınıf öğretmenlerine göre nitelikli bir çevre eğitimi verilmesi konusunda yaşanan problemler nelerdir?
3. Sınıf öğretmenlerine göre nitelikli bir çevre eğitimi verilebilmesi konusunda sınıf öğretmenlerinin görev ve sorumlulukları nelerdir?
4. Sınıf öğretmenlerine göre nitelikli bir çevre eğitiminde öğrenciler üzerinde oluşması gereken öğrenme çıktıları (bilgi, beceri vb.) nelerdir?
5. Sınıf öğretmenlerinin çevre eğitimi uygulamaları nelerdir ve bu uygulamalar hakkında vurgulamak istedikleri düşünceler nelerdir?
6. Sınıf öğretmenlerinin almış olduğu eğitimler (hizmet öncesi, hizmet içi) çevre ile ilgili alan bilgisi (çevre konuları, çevre sorunları vb.) değerlendirmeleri nasıldır?
7. Sınıf öğretmenlerinin nitelikli bir çevre eğitimi verilebilmesi konusunda önerileri nelerdir?

Yöntem

Araştırma Modeli

Araştırmada nitel araştırma yöntemlerinden fenomenoloji deseni kullanılmıştır. Fenomenolojinin veri kaynağı, araştırmanın veri kaynakları araştırılan olguyu yaşayan ve onu yansıtabilecek olan gruptur (Yıldırım & Şimşek, 2021). Fenomenoloji deseni, gündelik yaşantıda farkında olduğumuz olguların ayrıntılı olarak araştırılmasında kullanılır (Creswell, 2017).

Çalışma Grubu

Araştırmanın çalışma grubunu Sivas ilinde resmi ilkokullarda görev yapan 45 sınıf öğretmeni oluşturmaktadır. Araştırmada amaçlı örnekleme yöntemlerinden maksimum çeşitlilik örnekleme yöntemi kullanılmıştır. Maksimum çeşitliliğin amacı problemin farklı boyutlarını ortaya koymak ve çeşitlilik gösteren durumlar arasında ortak yönlerin olup olmadığını bulmaya çalışmaktır (Yıldırım & Şimşek, 2021). Araştırmada öğretmenlerin

kıdemleri, okulların çalıştıkları yerleşim birimleri dikkate alınmıştır. Ayrıca araştırmamanın katılımcıları Sivas ili merkez okullarında, ilçe merkezlerinde ve köylerdeki ilkokullarda görev yapan toplam 45 öğretmendir. Çalışma grubunu oluşturan 45 öğretmenlere ait demografik bilgiler Tablo 1’de verilmiştir.

Tablo 1. Çalışma grubunda yer alan öğretmenlerin demografik özellikleri

Değişken		N
Cinsiyet	Kadın	22
	Erkek	23
Kıdem	0-10 Yıl	4
	11-20 Yıl	17
	21 Yıl ve Üzeri	24
Okuttuğu Sınıf Düzeyi	1. Sınıf	9
	2. Sınıf	11
	3. Sınıf	12
	4. Sınıf	13
Öğrenim Düzeyi	Lisans	39
	Lisansüstü	6
Çalıştığı Yerleşim Birimi	Şehir	30
	İlçe	10
	Köy	5

Tablo 1’e bakıldığında sınıf öğretmenlerinin 22’sinin kadın, 23’ünün erkek olduğu ve öğretmenlerinin 30’unun il merkezinde, 10’unun ilçe merkezinde, 5’inin ise köy okullarında çalıştığı görülmektedir.

Veri Toplama Araçları

Araştırmada, araştırmacı tarafından geliştirilen ve açık uçlu sorulardan oluşan “Yarı Yapılandırılmış Görüşme Formu” nitel veriler için kullanılmıştır. Nitel araştırmalarda yarı yapılandırılmış görüşmeler bir konuyu detaylı incelemek istendiği zaman kullanılan veri toplama tekniğidir (Harrell & Bradley, 2009). Literatür taraması sonucu oluşturulan yarı yapılandırılmış görüşme soruları için üç sınıf öğretmeni ile pilot çalışma gerçekleştirilmiştir. 11 açık uçlu sorudan oluşan yarı yapılandırılmış görüşme formu 3 alan eğitimi uzmanı ve 1 dil uzmanı yardımı ile 7 açık uçlu soruya dönüştürülmüştür. Her bir öğretmen ile yaklaşık 30 dakika görüşme yapılmıştır. Görüşme sonunda elde edilen veriler yazıya aktararak çözümleme için hazır hale getirilmiştir.

Görüşme Süreci

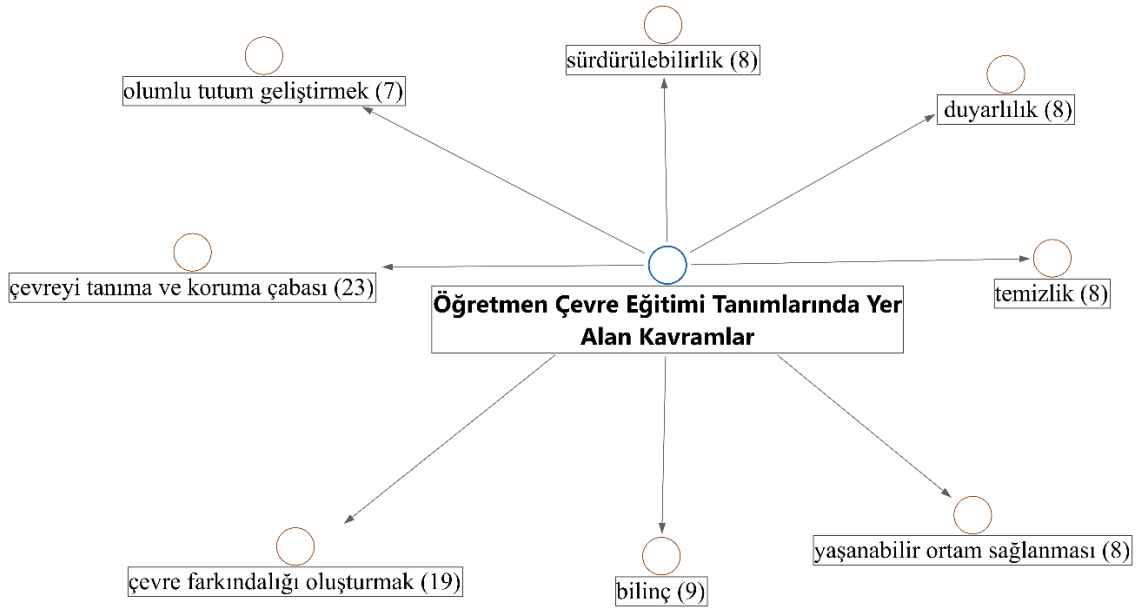
Araştırmanın yapılabilmesi için Milli Eğitim Müdürlüğü'nden gerekli izinler alınmıştır. Araştırmanın nitel verileri için 45 sınıf öğretmeni ile yarı yapılandırılmış görüşmeler yapılmıştır. Sınıf öğretmenlerinden katılım izni de alınarak görüşmeler ses kaydına alınmıştır.

Verilerin Analizi

Sınıf öğretmenlerinin çevre eğitimi görüşlerini belirlemeyi amaçlayan araştırmanın verilerinin çözümlenmesinde içerik analizi tekniği kullanılmıştır. İçerik analizinde temel amaç, verileri kavramlar ve temalar halinde gruplandırarak okuyucuya daha anlaşılır bir hale sunmaktır (Yıldırım & Şimşek, 2021). Ses kaydı alınan görüşmeler araştırmacı tarafından yazıya aktarılmıştır. Görüşme verileri iki araştırmacı tarafından kodlanmıştır. Araştırmacılar tarafından kodlar benzerlik ve farklılıklarına göre ayrılmış ve alt temaları belirlenmiştir. Daha sonra alt temalardan birbiriyle ilişkili olanlar birleştirilerek ana temalar oluşturulmuştur. İki araştırmacı tarafından oluşturulan kodlar arasındaki tutarlılık [Görüş birliği / (Görüş birliği + Görüş ayrılığı) x 100] formülü kullanılarak hesaplanmıştır (Miles & Huberman, 1994). Kodlayıcılar arası uyum %95 olarak hesaplanmıştır. Araştırmanın güvenilirliğinin %70'in üzerinde hesaplanması güvenilir olduğunu göstermektedir (Miles & Huberman, 1994). Araştırmada öğretmenlere isimlerinin yerine kod isimler (Ö1, Ö2...) verilmiştir. Nitel verilen analizinde nitel verileri analiz etmeye, değerlendirmeye ve yorumlamaya yardımcı olan MAXQDA 2020 yazılım programı kullanılmıştır.

Bulgular*Öğretmenlerin Çevre Eğitimi Nasıl Tanımladıklarına Yönelik Görüşlerine İlişkin Bulgular*

Çalışma grubunu oluşturan öğretmenlerle yapılan görüşmelerde öğretmenlere çevre eğitimi nasıl tanımladıkları sorulmuştur. Öğretmen görüşlerinden hareketle Şekil 1'de öğretmenlerin çevre eğitimi nasıl tanımladıklarına ilişkin görüşlerinin kategorilerini gösteren model yer almaktadır.



Şekil 1. Öğretmenlerin çevre eğitimini nasıl tanımladıklarına ilişkin görüşlerinin kategorilerini gösteren model

Şekil 1 incelendiğinde gelen cevaplar doğrultusunda öğretmenlerin çevre eğitiminde yer alan kavramlara ilişkin olarak; “olumlu tutum geliştirmek”, “bilinç”, “sürdürülebilirlik”, “çevre farkındalığı oluşturmak”, “yaşanabilir ortam sağlanması”, “duyarlılık”, “çevreyi tanıma ve koruma çabası” ve “temizlik” şeklinde 8 alt kategoriye ayrılmıştır. Öğretmen görüşleri aşağıdaki örneklerle ifade edilmiştir;

“Çevrenin korunabilmesi için bireylerde bilgi ve becerilerin geliştirilmesi ve çevrenin korunabilmesinde gerekli hassasiyetin gösterilmesi ve bu sürecin sağlıklı yürütülmesi adına verilen eğitimidir.” (Ö2).

“İnsanların yaşadıkları çevreyi daha iyi tanımaları ve çevreyi korumayı, onunla uyumlu yaşamayı hedefleyen tüm etkinlikleri kapsayan eğitimidir.” (Ö26).

“Çocukların çevreye duyarlılığını artırmak için farkındalık oluşturmaktır.” (Ö8).

“Çevre eğitimi çevreye duyarlı olmak, yerlere çöp atmamak, ağaç dallarını kırmamak, yeşile çimene basmamaktır. Çevre zaten yaşadığımız her yer sadece doğa anlamında değil apartmanlarımız da çevremizi oluşturuyor. Atıkları atmamak ve doğayı korumaktır.” (Ö44).

“İçerisinde yaşadığımız çevrenin en sağlıklı ve konforlu şekilde kullanımını ve geleceği aktarımını sağlamak için yapılan eğitim olarak tanımlıyorum.” (Ö15).

“Çevre bilincini geliştirmek, çevreye karşı duyarlılığı artırmak” (Ö40).

“Çevreye zarar vermemek ve çevreyi kirletmemek olarak tanımlıyorum.” (Ö23).

“Çevreyi korumak ve çevre konusunda farkındalık oluşturmak odaklı çocukların çok yönlü gelişmesini sağlayan eğitimidir.” (Ö11).

“İnsanların ve tüm canlıların içinde yaşadıkları çevreyi korumaları, daha sağlıklı yaşamaları, gelecek kuşaklara sağlıklı bir çevre bırakabilmeleri ve nesillerinin devamını sağlamak için gösterdiği çaba ve gayretlerin tümüne çevre eğitimi denir.” (Ö22).

Öğretmenlerin Nitelikli Bir Çevre Eğitiminin Verilebilmesi Konusunda Yaşanan Problemlere Yönelik Görüşlerine İlişkin Bulgular

Çalışma grubunu oluşturan öğretmenlerle yapılan görüşmelerde öğretmenlere nitelikli bir çevre eğitimin verilebilmesi konusunda yaşanan problemler sorulmuştur. Öğretmen görüşlerinden hareketle Şekil 2’de öğretmenlerin nitelikli bir çevre eğitimin verilebilmesi konusunda yaşanan problemlere ilişkin görüşlerinin kategori ve alt kategorilerini gösteren model yer almaktadır.



Şekil 2. Öğretmenlerin nitelikli bir çevre eğitimin verilebilmesi konusunda yaşanan problemlere ilişkin görüşlerinin kategori ve alt kategorilerini gösteren model

Şekil 2 incelendiğinde gelen cevaplar doğrultusunda nitelikli bir çevre eğitimin verilebilmesi konusunda yaşanan problemlere ilişkin olarak; “çevre gezisi ve uygulamalardaki yetersizlik”, “nitelikli eğitim verilememesi”, “ilgisiz veli profili”, “ilgisiz öğrenci profili”, “bilgi basamağını aşamamak”, “hizmet içi eğitimlerin yetersiz olması”, “günlük hayattaki zorluklar”, “öğrencilere fırsat verilmemesi”, “ceza yaptırımların yetersizliği”, “olumsuz rol ve modeller”, “bütçe ve materyal eksikliği”, “olumlu çevre uygulamalarındaki yetersizlik”, “zaman yetersizliği” ve “insanların bilinçsiz olması” olarak 14 alt kategoriden oluşmaktadır. Öğretmen görüşleri aşağıdaki örneklerle ifade edilmiştir;

"Öğrencilerin soyut zekâyâ ulaşmaları 10 yaşlarını buluyor.1.sınıfta öğrencilere bu konuları soyut olarak anlatmak pek mümkün değil. Mecburen içlerine girebilecekleri bir yakın çevre ve bitki ve hayvanlarla alakalı bir uğraş gerekiyor. Ancak okulumuzun fiziki şartları pek müsait değil. Sadece soyut olarak verilen bilginin de kalıcı olacağını da düşünmüyorum zaten" (Ö24).

"Veli ve öğrenciye eğitim olarak veriyoruz ancak dönüt yok yani geri dönüşü olmuyor. Uygulamaya geçmiyor maalesef. Benmerkezci birey yetiştiriyoruz bu nedenle kendisi dışındaki durumları çok önemsemiyor. Prens ve prensesler yetiştiriyoruz ve sorumluluk almak istemiyor ve uygulamak gibi bir derdi olmuyor. Bazı veliler özellikle aşırı korumacı oluyor ve bu velilerin çocuklarına sorumluluk vermek başarısız oluyor" (Ö41).

"Öğrencilerin gereken önemi vermemesi" (Ö37).

"Alan ve saha gezisi, uygulamalı yaşamları çok önemlidir. Ancak bunun için mali olarak yeterli bir bütçe yok. Veli profili de aynı şekilde yeterli değil. Eğitimi mümkün mertebe görsellerle anlatmaya çalışıyoruz. Akıllı tahtadan faydalanıyoruz. Ama yaparak yaşayarak görmeleri daha faydalı olacaktır." (Ö1).

"Çevre eğitiminin verilmesi için çocukların dışarı çıkması gerekiyor. Öğrenciler için bu eğitim biraz soyut kalıyor. Diğer problemlerden biri de çevrede durumun kontrol edilememesi, etkinlikler için fazla zaman harcanması da dezavantajlı oluyor. (Ö33).

"Öğrencinin çevre eğitimi ile ilgili öğrendiği bilgileri hayata geçirememesi. Velinin bu konuda öğrenciye rol model olmaması," (Ö13).

"Bazı aile bireylerinin ve yetişkinlerin çevre duyarlılığı konusunda olumsuz davranışlar sergilemeleri. Öğrencilerin de bu olumsuzlukları örnek alabilmeleri" (Ö21).

"Öğrenme hangi alanda yapılıyorsa o ortamda olması lazım. Çevre eğitimini kapalı bir sınıf ortamında vermek pek mümkün değil ancak bir farkındalık ya da ön bilgi oluşturulabilir. Ancak çevre eğitimini çocuğa vereceksek mutlaka doğal çevrede olması gerekiyor. Denizle, kirlilikle ya da ormanlarla alakalı bir eğitim verilecekse çocuğun yerinde görmesi gerekiyor. Sınıf ortamında verimli olacağını düşünmüyorum. Sanal bir müzeyi gezdirebiliriz akıllı tahtadan ama bir arkeoloji müzesine gitmekle bir olmaz." (Ö14).

"Çevre eğitimi müfredatta yoğun bir şekilde yer alıyor. Ancak uygulamada bazı sıkıntılarımız oluyor. Zaman ve mekân yetersizliği gibi sebeplerden dolayı" (Ö30).

"Etkili bir planlama yok. Sadece ders olarak verilmenin yanı sıra okul dışında da destekleyici etkinlikler olmalıdır. Yapılan etkinliğin düzenli ve periyodik olması gerekmektedir. En büyük eksikliğin ailelerde olduğunu düşünüyorum. Verilen eğitim evde uygulanmayınca hiçbir anlam ifade etmiyor. Velinin iş birliği içinde olması gerekiyor. Toplumun dönüşebilmesi için okullar çok önemlidir. Öğretmen olarak sorumluluk ve yaptırımımız olmalıdır. Öğretmenlik mesleğinin itibarını düzeltecek çalışmalar yapılmalıdır. Saygı için biraz yetkinin artırılması gerekiyor. Okul dışında bile öğretmenin müdahale yetkisi olmalıdır. Aileler üzerinde de etkinimizin olması lazım." (Ö4).

"Öğretmenin yaşadığı en büyük sıkıntı iyi örnek olmaması çevrede. Ailelerin yeteri kadar çevre eğitimi önem vermemesi öğretmenin verdiği eğitimin uygulanabilir olmamasından kaynaklı kalıcı bir bilgi edinmemesi. Öğretmenin çevre eğitimini veriyor çocuğa. Ama çocuk ceviz günlük hayatına çıktığı zaman bu çevre verilen çevre eğitiminin uygulanmadığını gördüğü zaman bu

eğitim havada kalıyor. Askıda kalıyor. Yani somut bir şeyi görmediği için çocuk bu eğitim sadece söz teorik bir bilgi olarak dayalı olmuyor galiba. Aileler açısından mı veliler açısından veliler açısından zaten en büyük problem belli. Maalesef çevre bilinci birçok veli de yok. Pikniğini yapıyor. Bütün yaptığı malzemeyi, bütün şeyi buraya bırakıyor, geliyor. Bu çocuğa kalıcı çevre eğitimi veremezsiniz. Edindiği teorik bilgili, yaşadığı günlük bilgi arasındaki tutarsızlık oluyor. Biraz daha böyle kitabi bir bilgi olarak ama çocuk onun hayatına adapte edemiyor maalesef. Öğretmen diyor ki çöpleri çöp kutusuz artık. Tamam, güzel ama belli çöpi kalmıyor. Atıyor. Ya da okulda dikkat ediyor. Eve gidiyor durum çok farklı" (Ö15).

"Derse ayrılan sürenin yetersiz olması, öğretmenin çabası ile sınırlı kalması, uygulamaya dönük etkisinin olmaması" (Ö2)

"Öğrenciler açısından değerlendirirsek nitelikli bir çevre eğitiminde öğretilenlerin uygulanması açısından toplumun öğrencilere doğru örnek olması, gereken imkanların sağlanması gerekir. Örneğin geri dönüşümün önemini anlatıyoruz. Çocuğun mahallesinde veya okulunda geri dönüşüm kutusu olmazsa anlattığımız konu hayata geçirilemez. Devlet politikası olarak topyekûn çevre eğitimi verilmeli ve destek olunmalı." (Ö27).

"Uygulama yapılmaması" (Ö19).

"Çocuklar açısından aileler bu konuda fazla bilinçli olmadığından dolayı sıkıntı yaşanıyor. Ancak okulda ciddi bir çevre eğitimi veriliyor. Kazanımlarda da yer aldığı için çevre eğitimi verilmeye çalışılıyor. Duyarlı bir öğretmen derslerinde daha çok yer verir." (Ö302).

"Veli ve öğrenciye eğitim olarak veriyoruz ancak dönüt yok yani geri dönüşü olmuyor. Uygulamaya geçmiyor maalesef. Benmerkezci birey yetiştiriyoruz bu nedenle kendisi dışındaki durumları çok önemsemiyor. Prens ve prensesler yetiştiriyoruz ve sorumluluk almak istemiyor ve uygulamak gibi bir derdi olmuyor. Bazı veliler özellikle aşırı korumacı oluyor ve bu velilerin çocuklarına sorumluluk vermek başarısız oluyor" (Ö41).

"Öğrencilerin belirli ve sınırlı bir çevreyle ilişki içerisinde olmaları, uygulamalı gezi ve gözleme dayalı fırsatların olmayışı." (Ö28).

"Velilerin eğitime isteksiz olması, şartları ve duyarsızlığı" (Ö18).

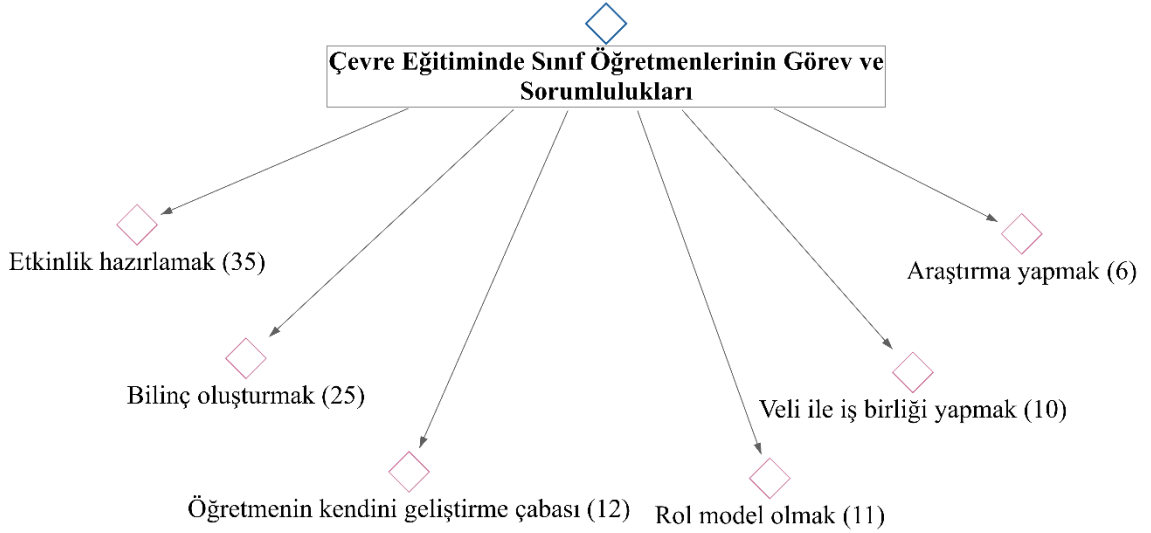
"Ekonomik nedenlere bağlı olarak çevreyi tanıyamamaları ve çocuklarına tamamlamaları" (Ö39).

"İş yoğunluğu nedeniyle eğitime katılamama" (Ö20).

"Velinin gerekli eğitim alabilme imkânlarının kısıtlı olması" (Ö2).

Öğretmenlerin Nitelikli Bir Çevre Eğitiminin Verilebilmesi Konusunda Sınıf Öğretmenlerine Düşen Görev ve Sorumluluklara Yönelik Görüşlerine İlişkin Bulgular

Çalışma grubunu oluşturan öğretmenlerle yapılan görüşmelerde öğretmenlere nitelikli bir çevre eğitimin verilebilmesi konusunda sınıf öğretmenlerine düşen görev ve sorumluluklar sorulmuştur. Öğretmen görüşlerinden hareketle Şekil 3'te öğretmenlerin nitelikli bir çevre eğitimin verilebilmesi konusunda sınıf öğretmenlerine düşen görev ve sorumluluklara ilişkin görüşlerinin kategorilerini gösteren model yer almaktadır.



Şekil 3. Öğretmenlerin nitelikli bir çevre eğitiminin verilebilmesi konusunda sınıf öğretmenlerine düşen görev ve sorumluluklara yönelik görüşlerinin kategorilerini gösteren model

Şekil 3 incelendiğinde gelen cevaplar doğrultusunda sınıf öğretmenlerinin görev ve sorumlulukları; “bilinç oluşturmak”, “öğretmenin kendini geliştirme çabası”, “veli ile iş birliği yapmak”, “rol model olmak”, “araştırma yapmak” ve “etkinlik hazırlamak”, “şeklinde 6 alt kategoriye ayrılmıştır. Öğretmen görüşleri aşağıdaki örneklerle ifade edilmiştir;

“Öğretmenler bilgileri okuldan başlayarak yakın çevreden uzak şekilde vermeye çalışıyorlar. Sınıf öğretmenleri bunu en iyi yapacak öğretmenlerdir. Uygulama yaptırabilirler.” (Ö15).

“Öğretmen çevre eğitimi konusunda öncelikle örnek teşkil etmeli, uygulamaya dönük etkinlikler yapılmalı, çevre koruma vakıfları ile iş birliği yapılmalı, velilere de çevre eğitimi konusunda seminerler verilmeli, okuldaki çevre etkinliklerine velilerin de katılımı sağlanmalıdır.” (Ö21).

“Çevre eğitimi sadece sözel değil uygulamalı olmalıdır.” (Ö7).

“Sınıf öğretmenleri bu konu hakkında sürekli durmaları gerekiyor. Teorik bilgilerden ziyade yaparak yaşayarak, uygulama alanı bularak gerçekleştirecekler ki daha faydalı bir eğitim verilebilsin. Örneğin temiz bir çevre ile temiz olmayan çevreyi gösterecek karşılaştırma yapacak yani yaşam haline getirilmesi gerekiyor. Çocukları uygulamaya dâhil edilmesi gerekiyor.” (Ö35).

“Öncelikle o çevre eğitimi kendilerinin alması gerekmektedir. Öğrencilere örnek olması gerekmektedir.” (Ö320).

“Öğretmen veli ile iş birliği içerisinde çalışması, öğrencilere sorumluluk üstlenebileceği etkinlikler düzenlemeli, veli ve öğrencilerin bilinçlenmesini sağlamalıdır.” (Ö36).

“Çocukların sınıfı kendi evleri gibi düşünmelerini sağlamamız gerekiyor. En güzel temizlik aslında kirlenmemektir. Bu bilinci çocuklarda oluşturmamız gerekiyor. Böyle olursa aslında çok bir sorun kalmıyor.” (Ö3).

“Yeniliklerin bilinmesi ve müfredatta yer verilerek ders şeklinde anlatması olabilir.” (Ö28).

“Çevre eğitimi kapsamında eğitimlere katılıp öğrencilere bu eğitim kapsamında etkinlik düzenlemesi gerekir.” (Ö20).

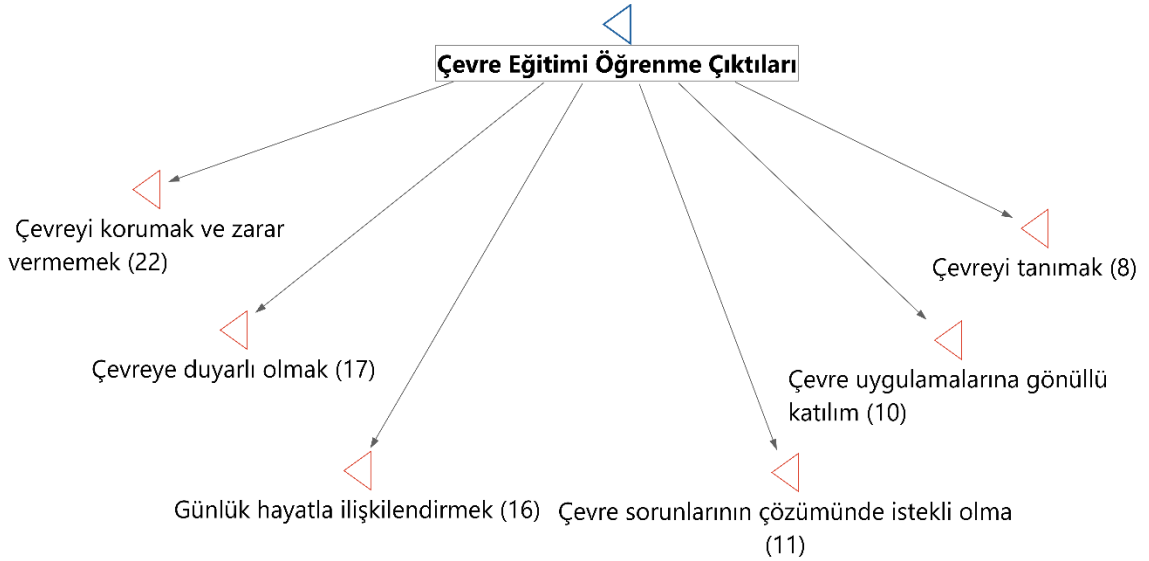
“Öğretmen çevre eğitimi konusunda öncelikle örnek teşkil etmeli, uygulamaya dönük etkinlikler yapılmalı, çevre koruma vakıfları ile iş birliği yapılmalı, velilere de çevre eğitimi konusunda seminerler verilmeli, okuldaki çevre etkinliklerine velilerin de katılması sağlanmalıdır.” (Ö21).

“Alanlarda ve gelişip değişen çevre şartlarına göre kendilerini yetiştirmeleri gerekmektedir.” (Ö5).

“Sınıf öğretmenleri sene başında çevre eğitimi için okulun çevresini tanıtıcı dokümanları hazırlamalıdır.” (Ö29)

Öğretmenlerin Nitelikli Bir Çevre Eğitiminin Öğrenciler Üzerinde Oluşturması Gereken Öğrenme Çıktılarına Yönelik Görüşlerine İlişkin Bulgular

Çalışma grubunu oluşturan öğretmenlerle yapılan görüşmelerde öğretmenlere nitelikli bir çevre eğitiminin öğrenciler üzerinde oluşturması gereken öğrenme çıktıları sorulmuştur. Öğretmen görüşlerinden hareketle Şekil 4’te öğretmenlerin nitelikli bir çevre eğitiminin öğrenciler üzerinde oluşturması gereken öğrenme çıktılarına ilişkin görüşlerinin kategorilerini gösteren model yer almaktadır.



Şekil 4. Öğretmenlerin nitelikli bir çevre eğitiminin öğrenciler üzerinde oluşturması gereken öğrenme çıktılarına ilişkin görüşlerinin kategorilerini gösteren model

Şekil 4 incelendiğinde gelen cevaplar doğrultusunda öğretmenlerin nitelikli bir çevre eğitiminin öğrenciler üzerinde oluşturması gereken öğrenme çıktılarına ilişkin olarak; “çevre sorunlarının çözümünde istekli olma”, “çevre uygulamalarına gönüllü katılıma”, “çevreyi korumak ve zarar vermemek”, “çevreyi tanımak”, “çevreye duyarlı olmak” ve “günlük hayatla ilişkilendirmek” şeklinde 6 alt kategoriye ayrılmıştır. Öğretmen görüşleri aşağıdaki örneklerle ifade edilmiştir;

"Öğrencilerin çevre bilgisi anlamında çok fazla eksiklerinin olduğunu düşünmüyorum ancak bunun uygulama noktasında sıkıntılar var. Bunu da iyi örneklerle aşabiliriz. Bu örnekleri daha sık paylaşabiliriz onure edebiliriz. Olumlu pekiştireçler oluşturabiliriz." (Ö34).

"Çevreyi temiz tutmak, çevreyi kirletenleri uyarmak, kirli çevre gördüğünde yapması gerekenleri bilmek" (Ö32).

"Çevrede bulunan yol, bina, park vb. tanıma, çevredeki unsurları tanıma" (Ö12).

"Çevreye duyarlılık, çevreye olumlu tutum geliştirme" (Ö11).

"Nitelikli bir çevre eğitimi ile öğrencilerin hem geleceklerinde olması gereken bir doğal çevre bilinci hem de koruma adına beceri sahibi olmalarıdır." (Ö5).

"Öğrenciler aldıkları eğitimi davranış haline getirmelidir. Hayatına aktarması gerekir yani. Çevreye doğaya zarar vermemeli ve korumalıdır." (Ö4).

"Çocuk öncelikle doğayı tahrip etmemelidir. Çevre eğitimi alan çocuk çevreye en ufak zarar vermemeli ve kirletmemelidir. Zarar verenlere karşı korumayı da bilmelidir. Son olarak da çevreyi geliştirebilmek için çalışmalar yapabilmelidir." (Ö14).

"Nitelikli bir eğitim çocuklar üzerinde etki bırakmalıdır, yaşantısında uygulayabilmeli çevresindekilere örnek olabilmelidir." (Ö22).

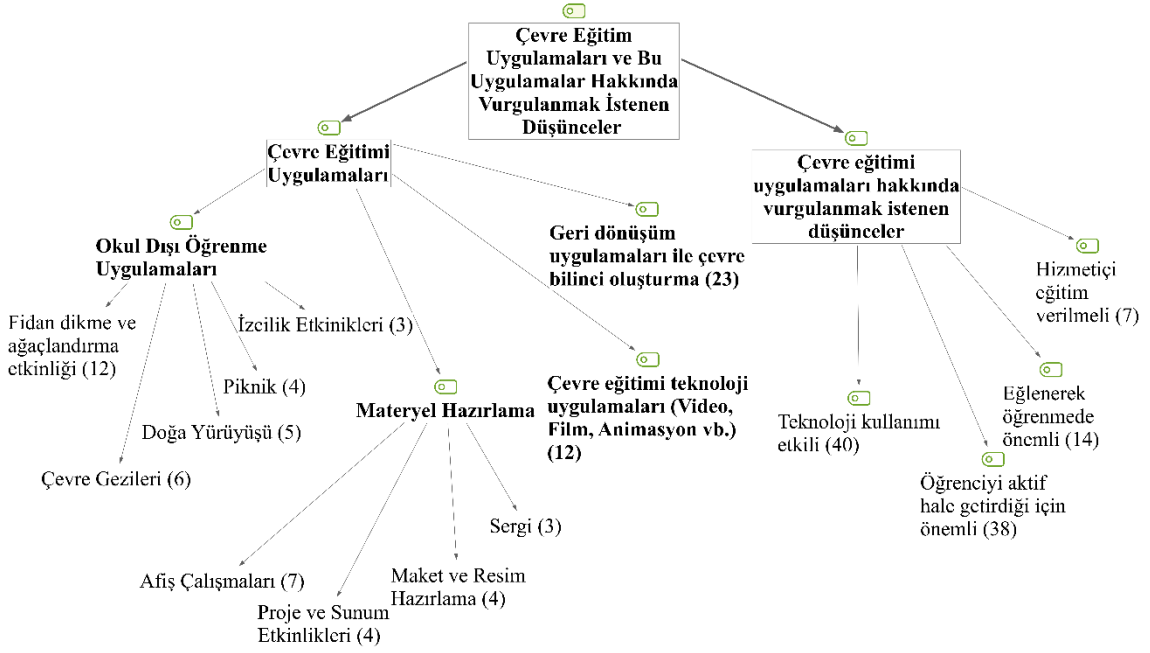
"Çöpünü yere atmıyorsa, çevreye karşı bilinçsiz olanları uyarıyorsa, geri dönüşüm konusunda hassassa, ağaca, hayvana kısaca doğaya karşı saygılıysa yeterli becerileri kazanmış demektir." (Ö26).

"Öğrencilerin yeşile ve ormana karşı duyarlılığının artması, tasarruf yapması, atık ayrıştırmaya ve geri dönüşüme önem vermesi, doğayı koruması, doğayı korumaya yönelik projeler geliştirmesi" (Ö18).

"Bireysel duyarlılık gösterme, doğa çevre konusunda harekete geçme ve istedik davranış gösterme, akran uyarısında bulunma" (Ö16).

Öğretmenlerin Çevre Eğitimi Uygulamaları ve Önemi Hakkında Vurgulanmak İstenen Düşüncelerine İlişkin Görüşlerine Yönelik Bulgular

Çalışma grubunu oluşturan öğretmenlerle yapılan görüşmelerde öğretmenlere çevre eğitim uygulamaları ve öğretim stratejileri sorulmuştur. Öğretmen görüşlerinden hareketle Şekil 5'te öğretmenlerin çevre eğitim uygulamaları ve öğretim stratejileri ilişkin görüşlerinin kategorilerini gösteren model yer almaktadır.



Şekil 5. Öğretmenlerin çevre eğitimi uygulamaları ve önemi hakkında vurgulanmak istenen düşüncelerine ilişkin görüşlerinin kategorilerini gösteren model

Şekil 5 incelendiğinde gelen cevaplar doğrultusunda sınıf öğretmenlerine daha nitelikli bir çevre eğitimi verilebilmesi için yaptıkları etkinlikler ve stratejilerine ilişkin görüşleri “çevre eğitim uygulamaları” ve “çevre eğitimi uygulamaları hakkında vurgulanmak istenen düşünceler” olmak üzere iki kategoride toplanmıştır. Bu kategorilerden “çevre eğitimi uygulamaları” kendi içinde “okul dışı öğrenme uygulamaları”, “materyal hazırlama”, “çevre eğitimi teknoloji uygulamaları”, “geri dönüşüm uygulamaları ile çevre bilinci oluşturma” olmak üzere dört kategoriye ayrılmıştır. Okul dışı öğrenme ortamları, “fidan dikme, ağaçlandırma etkinliği”, “çevre gezileri”, “izcilik etkinlikleri”, “doğa yürüyüşü”, “piknik” olmak üzere beş alt kategoriye ayrılmıştır. Materyal hazırlama “sergi”, “proje ve sunum etkinlikleri”, “afiş çalışmaları” ve “maket ve resim hazırlama” olmak üzere dört alt kategoriye ayrılmıştır. Öğretmen görüşlerine ilişkin örnek ifadeler aşağıdaki gibidir;

“Yakın çevre gezileri yapılabilir.” (Ö18).

“Öğrencilerle ilgili pil toplama, atık yağ toplama, atık kâğıt, plastik şişe, cam vb. toplama etkinliği yapılmaktadır.” (Ö22).

“Yaptığımız etkinlikler ağaçlandırma çalışması, atık toplama gibi çalışmalar olup genelde sınıf içi etkinlikler şeklinde vermeye çalışıyoruz.” (Ö4).

“Genellikle internet ve akıllı tahtadan yararlanıyoruz. Bunun yanında çevre ile ilgili resim çalışmaları, afiş çalışmaları yaptırıyoruz.” (Ö33).

"Özellikle sınıf temizliği ve enerji tasarrufu, sokakta, evde ve özellikle yeşil alanların korunması ve temiz tutulması." (Ö38).

"Doğa olaylarını anlatan birçok etkinlikler yapıyoruz. Afişler hazırlayarak dikkat çekmeye çalışıyoruz. Grup etkinliklerinin okul dışı etkinliklerinin bu anlamda oldukça faydalı olduğunu düşünüyorum. Projelerle yaparak yaşayarak öğrenme fırsatı bulur ve her öğrenciye hitap eden çalışmalar yapılmış olur." (Ö31).

"Geri dönüşüm konusu sınıfımda öncelik verdiğim konulardan biridir. Kartonlarla geri dönüşüm kutuları oluşturduk. Plastikler plastik kutulara cam atıklar cam kutularına gibi özellikle uygulamalı olarak atılarak davranış kalıpları oluşturulmaya çalışıldı." (Ö9).

"Çevre eğitimi okul dışı öğrenme ortamlarına da uygulanmalıdır." (Ö21).

"Grup etkinlikleri çok güzel oluyor. Beyin fırtınası yapıyorlar aslında birinin aklına gelmeyen diğerinin aklına geliyor ve birbirlerini tamamlıyorlar. Farklı fikirlerin ortaya çıkmasını da sağladığı için oldukça yararlı oluyor." (Ö3).

"Grup içi etkinlikler çevre bilincini motive etmek için daha faydalı olabilmektedir." (Ö4).

"Dijital uygulamalar, videolar, web2 uygulamaları sayesinde çocuklara çevre problemlerini götürmeden sınıf ortamında gösterilmesi açısından çok faydalı oluyor. Okyanus ve hava kirliliği videoları, insanların doğayı nasıl tahrip ettiğini gösteriyor. Ayrıca çizgi filmlerle de öğrencilere doğayı sevmek korumak için yapılabilecekler eğlenceli biçimde öğretiliyor." (Ö26).

Şekil 5 incelendiğinde "çevre eğitimi uygulamaları hakkında vurgulanmak istenen düşünceler" kategorisi; "öğrenciyi aktif hale getirdiği için önemli", "eğlenerek öğrenmede önemli", "hizmet içi eğitim verilmeli" ve "teknoloji kullanımı etkili" olmak üzere dört kategoriden oluşmaktadır. Öğretmen görüşlerine ilişkin örnek ifadeler aşağıdaki gibidir;

"Konuları yetiştirmeye çalışırken zaman ayırmak pek mümkün olmuyor. Bu gibi etkinlikleri genelde sene sonuna bırakıyoruz. Daha pratik şeylere yönelmeye çalışıyoruz." (Ö1).

"Öğrencilere çevre eğitimini alan insanların duyarlılığını ortaya koyan filmler, animasyonlar izletiyorum. Duyarlı olan ve olmayan insanların farkını daha iyi anlıyor. Mesela ağaç dikmeyi ve korumayı uygulamalı yapıyoruz." (Ö2).

"Teknolojinin kullanımı gayet uygun ve güzel ama çevreye verdiği zararlar düşünüldüğünde daha dikkatli ve sınırlı kullanmak esas olmalıdır." (Ö38).

"Eğitimin, niteliğini ve çeşidini artırarak daha zevkli hale getirir." (Ö45).

"Bireysel farklılıkları düşündüğümüzde bazı çocuklar gerçekten doğaya karşı çok hassaslar. Duygusal zekâsı baskın olan çocuklar daha dikkatli ve daha hayvan sever olduklarını görüyoruz. Hareketli bir yapısı olan çocuklar da hareket odaklı oldukları için etraflarına değil sadece harekete odaklanıyorlar. O yüzden bu şekilde farklılıklar olabiliyor." (Ö28).

"Bireysel farklılıkları dikkate alarak farklı etkinlikler tasarlamamız gerekir." (Ö7).

“Çocukların en büyük ilgi odağı olduğu için faydalı olduğunu düşünüyorum. Ancak bu konuda da öğretmenlerimiz yetersiz. Öğretmenlerimizi teknolojiden uzak olma noktasında çok eleştiriyorum.” (Ö15).

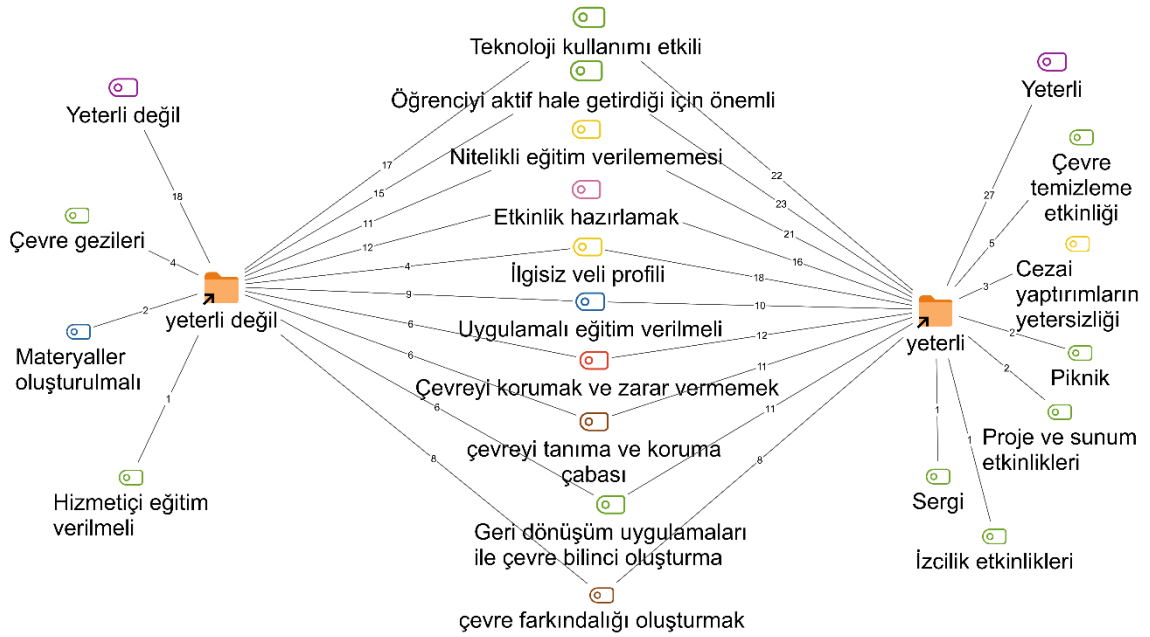
“Teknoloji yeni nesil için önemli illa olması gerekiyor. Çok fazla kullanıldığı için etkin kullanılması gerekir. Çevre bilincini oluşturmak için birçok içerik hazırlanabilir.” (Ö32).

“Özellikle sınıfta akıllı tahta bulununca çok büyük kolaylık sağlıyor.” (Ö29).

“Faydalı olduğunu düşünüyorum. Teknolojiyi takip etmek önemlidir. Yerinde gidip göremediğimiz yerleri akıllı tahtadan açarak daha kalıcı hale gelmesini sağlamaya çalışıyoruz.” (Ö4).

Öğretmenlerin Alan Bilgisi Hakkındaki Görüşlerine İlişkin Bulgular

Çalışma grubunu oluşturan öğretmenlerle yapılan görüşmelerde öğretmenlere alan bilgisi ve kullandığı stratejiler sorulmuştur. Öğretmen görüşlerinden hareketle Şekil 6’te öğretmenlerin alan bilgisi ve kullandığı stratejiler hakkındaki görüşlerinin kategorilerini gösteren model yer almaktadır.



Şekil 6. Öğretmenlerin alan bilgisine ilişkin görüşlerinin kategorilerini gösteren model

Şekil 6 incelendiğinde gelen cevaplar doğrultusunda öğretmenlerin alan bilgisi ve kullanılan stratejilere görüşlerine ilişkin olarak alan bilgisi; “Alan bilgimin yeterli olduğunu düşünüyorum.”, “Alan bilgimin yeterli olduğunu düşünmüyorum.” şeklinde 2 alt kategoriye ayrılmıştır. Öğretmen görüşleri aşağıdaki örneklerle ifade edilmiştir;

“Sınıf içi atık malzemelerden etkinlik yaptırıyorum. Yeterli olduğunu düşünüyorum.” (Ö43).

“Yeterli olduğunu düşünüyorum. Ancak daha farklı ve uygulamalı eğitimler alınması da faydalı olacaktır.” (Ö7).

"Çevre konusuna çok önem veriyorum. Yeterli olduğunu düşünüyorum." (Ö23).

"Son yıllarda almış olduğum hizmet içi eğitimler, uzaktan eğitim ile almış olduğumuz seminerler, okulumuzda uygulamış olduğumuz eğitimler çevre konuları ve çevre sorunları ile ilgili daha çok bilinçlenmemizi sağladı. Çevre sorunlarını azaltma noktasında gerek kendi evimde gerek okulda almam gereken önlemleri biliyorum ve uygulamaya çalışıyorum." (Ö13).

"Çevre sorunları ve çevre eğitimi ile ilgili yeterli bilgiye sahip olduğumu düşünüyorum." (Ö10).

"Yeterli olduğunu düşünmüyorum. Milli eğitimin verdiği eğitimlerin faydalı olduğunu düşünmüyorum. Kişi bunu benimsemediği, problem edinmediği sürece orada aldığı eğitimin faydalı olduğunu düşünmüyorum. Merakı varsa kendi kendini geliştirebilir. Aldığım eğitimi faydalı olduğunu düşünmüyorum. Verilen eğitimlerin niteliği çok önemlidir." (Ö15).

"Çevre duyarlılığı noktasında hizmet içi eğitimlerin artarak devam etmesi gerektiğine inanıyorum. Şu anda yeterli olduğu kanaatinde değilim." (Ö9).

"Yeterli olduğunu düşünmüyorum. Farkındalık oluşması için öğretmenlerin de eğitimden geçirilmesi lazım. Bu eğitimlerin de uygulamalı olması lazım. Öğretmenler daha bilinçli olurlarsa öğrenciler üzerinde daha fazla dururlar. Çevre sorunlarına çözümler bulmak ve gelecek nesillere daha yaşanılabilir bir çevre bırakmak için dikkat edilmesi gereken önemli bir konu olduğunu düşünüyorum. Orta seviyede olduğunu düşünüyorum. Tam olarak yeterli bulmuyorum. Çünkü daha bilinçli olmak lazım." (Ö35).

"Uygulamalı eğitim konusunda bazen sıkıntı yaşıyorum." (Ö32).

"Çoğunlukla farklı yöntemler kullanamıyoruz imkânlar biraz kısıtlı kalıyor." (Ö3).

"Farklı stratejiler kullanılabilir yeterli olduğunu düşünmüyorum." (Ö15).

"Almış olduğum çevre eğitimini ve materyallerinin yeterli olduğunu düşünmüyorum. İnsan çevre konusunda kendini yetiştirerek gözlem yaparak olumlu olumsuzlukları karşılaştırarak belirli seviyede eğitime sahip olmalıdır." (Ö22).

"Almış olduğumuz eğitimler okul dışını fazlasıyla kapsarken vermek zorunda olduğum müfredat maalesef bunu karşılayamamaktadır." (Ö5).

"Özellikle uygulamalı dersler çevre temizliği, fidan dikimi, akvaryumda balık besleme, bitki yetiştirme gibi öğrencilere sorumluluk alma ve sorumluluğun gereğini yerine getirme davranışı kazanmalarını destekliyorum. Videoları da bu konuda faydalı buluyorum. Belediyeden gelen geri dönüşüm konusunda çalışanları da sınıfta konul olarak almak çok faydalı oluyor." (Ö26).

"Uygulamalı eğitimlerin faydalı olduğunu düşünüyorum. Çevre eğitimi ile ilgili genel olarak uygulamalı etkinlikler seçmeye çalışıyorum." (Ö19).

"Çevre ile ilgili eğitim verilecekse mutlaka yaparak yaşayarak eğitim verilmesi gerekiyor. Uygulamalı etkinlik yaptırmanız gerekiyor. Anlatma ile olabilecek bir şey değil. Görmeler, yaşamaları lazım." (Ö1).

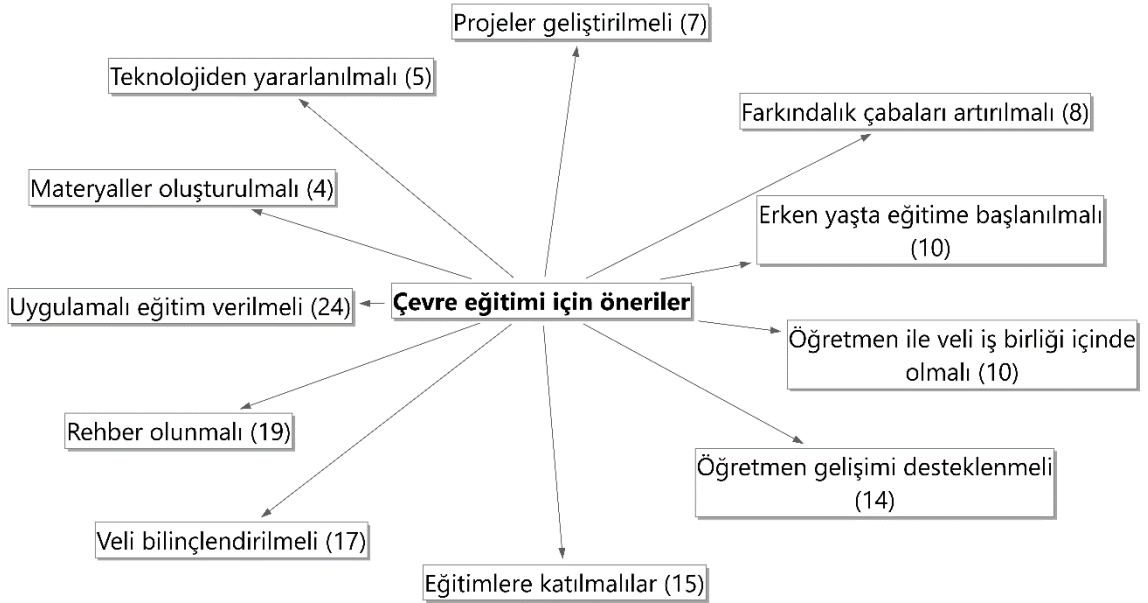
"Eğitim sürecine öğrencileri dâhil ettiğim için ve süreçte oyunsal yöntemleri tercih ettiğimden dolayı daha etkili olduğunu düşünüyorum." (Ö2).

"Uygulamaya dayalı etkinlikler yapmaya çalışıyorum yeterli olduğunu düşünüyorum." (Ö41).

"Daha çok uygulamaya dayalı stratejiler kullanıyorum." (Ö36).

Nitelikli Bir Çevre Eğitiminin Verilebilmesi İçin Öğretmen Önerilerine İlişkin Bulgular

Çalışma grubunu oluşturan öğretmenlerle yapılan görüşmelerde öğretmenlere beceri temelli fen sorularının daha nitelikli olabilmesi için önerileri sorulmuştur. Öğretmen görüşlerinden hareketle Şekil 7'de öğretmenlerin öğretmenlere beceri temelli fen sorularının daha nitelikli olabilmesi için önerilerine ilişkin kategori ve alt kategorilerini gösteren model yer almaktadır.



Şekil 7. Nitelikli çevre eğitiminin verilebilmesi için öğretmen önerilerine ilişkin kategorileri gösteren model

Şekil 7 incelendiğinde sınıf öğretmenlerinin daha nitelikli bir çevre eğitimi verilebilmesi için önerilerine ilişkin olarak; "öğretmen gelişimi desteklenmeli", "farkındalık çabaları artırılmalı", "materyaller oluşturulmalı", "öğretmen ve veli iş birliği içinde olmalı", "eğitilmelere katılmalılar", "projeler geliştirilmeli", "rehber olunmalı", "erken yaşta eğitime başlanılmalı", "uygulamalı eğitim verilmeli", "veli bilinçlendirilmeli" ve "teknolojiden yararlanılmalı" olmak üzere 11 alt kategoriden oluşmaktadır. Öğretmen görüşlerine ilişkin örnek ifadeler aşağıdaki gibidir;

"Okullarda uygulama alanları yetersiz yani uygun ortamlar yok. Birinci görev bu anlamda bakanlıklara düşüyor. Veliler çocuklarını doğadan ve köy ortamlarından uzak tutmamalıdır. Öğretmenler de uygulamaya dayalı eğitimler vermelidir." (Ö24).

"Öğretmenlerin iyi bir çevre eğitiminden geçmesi sonucunda var olan çevreye duyarlılığının en üst düzeye ulaşması için görsel materyal, yazılı materyal, video, afiş vb. noktasında desteklenmelidir. Bu sayede öğrencide farkındalık oluşturması bu farkındalığın öğrenci, veli ve

tüm toplumun katmanlarının içselleştirerek çevreye duyarlı davranışlarıyla örnek olan toplum inşa etmek olarak vizyon oluşturmak" (Ö9).

"Seminer ve güncel teknolojiler takip edilmeli" (Ö16).

"Çevre eğitimi ile ilgili toplantılar yapıp, bilgilendirmeler yapılmalı, çevre eğitimi konusu ile etkinlikler veli ve öğrenci iş birliği ile gerçekleştirilmelidir" (Ö11).

"Öğrenci için de öğretmen ve veli el ele verip öğrenciye gerekli desteği sağlaması gerektiğini düşünüyorum." (Ö36).

"Ülke olarak ortak projeler yürütüp toplumun hepsi için farkındalık oluşturacak çalışmalar yapılmalıdır. Veli eğitimlerine önem verilmelidir. Öğretmenler için daha nitelikli eğitimler verilmelidir. Öğrenciler de görev ve sorumluluklarını yerine getirmelidir." (Ö4).

"Öğretim teknolojileri ve dijital içeriklerin daha aktif kullanılması gerekir. Çevrede uygulama alanları oluşturulmalı." (Ö12).

"Öğretmenler hizmet içi eğitimlere katılmalı, farkındalık oluşturmaya çalışmalı" (Ö34).

"Öğretmenler öncelikle gerekli donanıma sahip olmalı rol model olmalıdır. Öğrenciler verilen görev ve sorumlulukları yerine getirmeli sürece aktif olarak katılmalıdır. Veliler de gerekli bilince sahip olmalı ve çocuklarının öğrenmelerini doğru bir şekilde desteklemelidir." (Ö39).

"Veliler için de seminer verilebilir. Veliler okulda toplanıp bilgi verilebilir. Ya da bilgilendirme videoları veli gruplarında paylaşılabilir." (Ö30).

"Aktif katılımın sağlanacağı etkinlikler yapılmalı ve herkes sürece dâhil edilmelidir." (Ö25).

"Öğretmenler gerçekten çevre bilincine sahip insanlar olmalı, davranış olarak rol model olması gerekmektedir. Örnek olmaları lazım öğrenciler de öğretmenlerini gözlemleyerek davranış edinmeleri sağlansın." (Ö36)

"Öğrenciler de etkinliklere aktif katılım sağlamalıdır." (Ö34).

"Ülke olarak ortak projeler yürütüp toplumun hepsi için farkındalık oluşturacak çalışmalar yapılmalıdır. Veli eğitimlerine önem verilmelidir. Öğretmenler için daha nitelikli eğitimler verilmelidir. Öğrenciler de görev ve sorumluluklarını yerine getirmelidir." (Ö14).

"Öğrenciler ve veliler bu faaliyetleri desteklemeli ve katılım sağlamalıdır." (Ö3).

"Öğrendiklerini hayat boyu kullanacağı davranışlara dönüştürmelidirler." (Ö5).

"Derslerde öğrendiklerini günlük yaşamda uygulamalıdır." (Ö45).

"Çevre eğitimi etkinliklerine katılmalı" (Ö20).

"Okullarda uygulama alanları yetersiz yani uygun ortamlar yok. Birinci görev bu anlamda bakanlıklara düşüyor. Veliler çocuklarını doğadan ve köy ortamlarından uzak tutmamalıdır. Öğretmenler de uygulamaya dayalı eğitimler vermelidir." (Ö24).

"Çevre ile ilgili öğrenci ve veliyle çöp toplama etkinliği yapılabilir. Ağaçlandırma çalışmaları yapılabilir. Bu etkinlikler kalıcı öğrenmeleri sağlar. Veliler de bu konuda bilinçli olarak çocuklara rehber olmalıdırlar." (Ö33).

“Öğrenciler ve veliler kendilerine peşin katkı getiremeyecek şeyleri çok da yapmak istemiyorlar. Kolay oluşacak bir bilinç değil. Toplumun bütün olarak bilinçlenmesi gerekir ki faydalı olunsun. Genel olarak toplumun her kesimi bu konuda sorumluluk hissetmelidir.” (Ö31).

“Öğrenci için de öğretmen ve veli el ele verip öğrenciye gerekli desteği sağlaması gerektiğini düşünüyorum.” (Ö36).

“Verilen eğitimlerde veli, öğretmen ve öğrenci iş birliği içinde olmalıdır.” (Ö19).

“Velilere yönelik eğitimlere katılmalıdırlar.” (Ö40).

“Veliler için de seminer verilebilir. Veliler okulda toplanıp bilgi verilebilir. Ya da bilgilendirme videoları veli gruplarında paylaşılabilir.” (Ö30).

“Duyarlılık farkındalık da aileden geldiği için ailelerin bu konuda bilinçli olmaları gerekiyor.” (Ö44).

“Çocuklarınıza güvenin ve sorumluluk verin.” (Ö12).

Tartışma, Sonuç ve Öneriler

Sınıf Öğretmenlerin çevre eğitiminde yer alan kavramlara ilişkin olarak; “olumlu tutum geliştirmek”, “bilinç”, “sürdürülebilirlik”, “çevre farkındalığı oluşturmak”, “yaşanabilir ortam sağlanması”, “duyarlılık”, “çevreyi tanıma ve koruma çabası” ve “temizlik” şeklinde 8 alt kategoriye ayrılmıştır. Bu kategorilerden çevreyi tanıma ve koruma çabası en çok öne çıkan tanımlama olmuştur. Benzer şekilde Kimaryo (2011) araştırmasında sınıf öğretmenlerinin çevre eğitimi tanımlamalarının çoğunda çevrenin tanınması ve korunması ifadelerine yer verdiği sonucuna ulaşmıştır.

Nitelikli bir çevre eğitimin verilebilmesi konusunda yaşanan problemlere ilişkin olarak; “çevre gezisi ve uygulamalardaki yetersizlik”, “nitelikli eğitim verilememesi”, “ilgisiz veli profili”, “ilgisiz öğrenci profili”, “bilgi basamağını aşamamak”, “hizmet içi eğitimlerin yetersiz olması”, “günlük hayattaki zorluklar”, “öğrencilere fırsat verilmemesi”, “cezaî yaptırımların yetersizliği”, “olumsuz rol ve modeller”, “bütçe ve materyal eksikliği”, “olumlu çevre uygulamalarındaki yetersizlik”, “zaman yetersizliği” ve “insanların bilinçsiz olması” olarak 14 alt kategoriden oluşmaktadır. Öğretmenler yaşadıkları problemlerin daha çok ezberci eğitim sisteminden kaynaklandığını düşünmektedir. Aynı zamanda ilgisiz veli ve öğrenci profili de önemli problemler arasında görülmektedir. Sınıf öğretmenleri daha nitelikli bir çevre eğitimi verme konusunda öğrencinin aktif olduğu ve yaparak yaşayarak öğrenme fırsatının olduğu uygulamalı eğitimler yapılması gerektiğini belirtmişlerdir. Sınıf öğretmenleri öğrencilerin nitelikli bir çevre eğitimi aldığını düşünmemektedir. Öğretmenler

velilere verilen eğitimlerin yetersiz olduğunu düşünmektedirler. Kimaryo'nun (2011) çalışmasında sınıf öğretmenleri çevre eğitiminde kaynak yetersizliği, zaman ve sınıf mevcutlarının kalabalık olması gibi sebeplerden dolayı problemlerle karşılaştıklarını belirtmiştir. Şimşekli'nin (2004) çalışmasında öğretmenlerin öğrencilere çevre konularında dikkat çekici etkinliklerin uygulandığını ancak okulların çevre eğitimi duyarlılığının yetersiz olduğu sonucuna ulaşmıştır.

Sınıf öğretmenlerinin görev ve sorumlulukları; "bilinç oluşturmak", "öğretmenin kendini geliştirme çabası", "veli ile iş birliği yapmak", "rol model olmak", "araştırma yapmak" ve "etkinlik hazırlamak", "şeklinde 6 alt kategoriye ayrılmıştır. Bu kategorilerden etkinlik hazırlamak ve bilinç oluşturmak ön plana çıkmaktadır. Sınıf öğretmenleri nitelikli bir çevre eğitiminin verilebilmesi konusunda öğretmene düşen en önemli görevin uygulamalı farklı etkinlikler planlamak olduğunu öğrenciyi sürece dahil edilmesi gerektiğini ve bilinç oluşturmak için bilgilendirme yapılması gerektiğini belirtmişlerdir.

Keleş ve diğerleri (2013) tarafından yapılan çalışmada öğretmenlerin, uygulamalı çevre eğitimi verilmesi gerektiği ve gezi, gözlem ve farklı çevre eğitimi etkinliklerinin yapılması gerektiği yönünde görüş belirttiklerini tespit etmişlerdir. Ayaz ve arkadaşlarının (2021) öğretmen adayları ile etkinlik temelli olarak gerçekleştirdikleri çalışmalarında, öğretmen adaylarının daha fazla keyif aldıkları, konuların bu şekilde daha kalıcı olduğu, çevre bilinçlerinin arttığı, çevre dostu birçok davranışı günlük hayatlarında uyguladıkları ve etkinlik temelli çevre eğitiminin öğretmen adaylarını bilişsel, duyuşsal ve davranışsal açıdan olumlu yönde etkilediği tespit edilmiştir.

Sınıf öğretmenleri nitelikli bir çevre eğitiminin öğrenciler üzerinde oluşturması gereken öğrenme çıktılarına ilişkin olarak; "çevre sorunlarının çözümünde istekli olma", "çevre uygulamalarına gönüllü katılıma", "çevreyi korumak ve zarar vermemek", "çevreyi tanımak", "çevreye duyarlı olmak" ve "günlük hayatla ilişkilendirmek" şeklinde 6 alt kategoriye ayrılmıştır. Bu kategorilerden çevreye duyarlı olmak, öğrendiklerini günlük hayatla ilişkilendirmek, çevreyi korumak ve çevreye zarar vermemek öğretmenlerin çevre eğitimi konusunda öğrencilerde görmek istedikleri en önemli çıktılar olmuştur. Sınıf öğretmenleri öğrencilerin çevre sorunlarının çözümüne aktif olarak katılıp sorumluluk almaları gerektiğini belirtmişlerdir.

Sınıf öğretmenlerine daha nitelikli bir çevre eğitimi verilebilmesi için yaptıkları etkinlikler ve stratejilerine ilişkin görüşleri “çevre eğitim uygulamaları” ve “çevre eğitimi uygulamalarının önemi hakkında vurgulanmak istenen düşünceler” olmak üzere iki kategoride toplanmıştır. Bu kategorilerden “çevre eğitimi uygulamaları” kendi içinde “okul dışı öğrenme uygulamaları”, “materyal hazırlama”, “çevre eğitimi teknoloji uygulamaları”, “geri dönüşüm uygulamaları ile çevre bilinci oluşturma” olmak üzere dört kategoriye ayrılmıştır. Okul dışı öğrenme ortamları, “fidan dikme, ağaçlandırma etkinliği”, “çevre gezileri”, “izcilik etkinlikleri”, “doğa yürüyüşü”, “piknik” olmak üzere beş alt kategoriye ayrılmıştır. Materyal hazırlama “sergi”, “proje ve sunum etkinlikleri”, “afiş çalışmaları” ve “maket ve resim hazırlama” olmak üzere dört alt kategoriye ayrılmıştır. “Çevre eğitimi uygulamaları hakkında vurgulanmak istenen düşünceler” kategorisi ise; “öğrenciyi aktif hale getirdiği için önemli”, “eğlenerek öğrenmede önemli”, “hizmet içi eğitim verilmeli” ve “teknoloji kullanımı etkili” olmak üzere dört kategoriden oluşmaktadır. Bu kategorilere bakıldığında öğretmenlerin sınıf içi ve sınıf dışı farklı etkinlikler yaptığı görülmektedir. Özellikle geri dönüşüm, ağaç dikme ve atık malzemelerle yapılan etkinlikleri sınıf öğretmenleri tarafından daha çok tercih edilmiştir. Sınıf öğretmenleri daha nitelikli bir çevre eğitiminde yapılması gereken etkinliklerin öğrencinin katılım gösterebileceği uygulamalı etkinlikler olması gerektiğini ancak bu konuda farklı sebeplerden dolayı sıkıntı yaşadıklarını belirtmiştir. Sınıf öğretmenlerinin büyük bir çoğunluğu çevre eğitimi verirken teknoloji kullanımının önemli ve etkili olduğunu belirtmişlerdir.

Artun ve Özsevgeç, (2015), yaptığı çalışmasında çevre eğitim sürecinin bilgi aktarım sürecinden farklı olarak uygulamaya dayalı olması gerektiğini savunmuştur. Öğretmenler öğrenci merkezli bir anlayışla çevre eğitimi vermeliler sonucuna ulaşmıştır. Güler (2009), çalışmasında öğretmenler çevre eğitimi sonucunda farklı bilgiler edindiklerini ve yeterlilik düzeylerinin arttığını ifade etmişlerdir. Ayrıca çevre duyarlılığı oluşturma konusunda farklı etkinliklerin uygulanabileceği sonucuna ulaşmıştır.

Sınıf öğretmenlerinin alan bilgisi ve kullanılan stratejilere görüşlerine ilişkin olarak alan bilgisi; “Alan bilgimin yeterli olduğunu düşünüyorum.”, “Alan bilgimin yeterli olduğunu düşünmüyorum.” Şeklinde 2 alt kategoriye ayrılmıştır. Kullanılan stratejiler “Farklı stratejiler kullanıyorum”, “Farklı stratejiler kullanmıyorum” şeklinde 2 alt kategoriye ayrılmıştır. Bu kategorilere bakıldığında sınıf öğretmenlerinin, çevre eğitiminde alan

bilgilerinin yeterli olduğunu düşündükleri belirlenmiştir. Çalık'a (2009) göre çevre eğitiminde farklı stratejilerin kullanılmasının daha etkili ve kalıcı öğrenmeyi sağlayacağı belirtilmektedir.

Sınıf öğretmenlerinin daha nitelikli bir çevre eğitimi olması için önerileri; “öğretmen gelişimi desteklenmeli”, “farkındalık çabaları artırılmalı”, “materyaller oluşturulmalı”, “öğretmen ve veli iş birliği içinde olmalı”, “eğitime katılmalı”, “projeler geliştirilmeli”, “rehber olunmalı”, “erken yaşta eğitime başlanmalı”, “uygulamalı eğitim verilmeli”, “veli bilinçlendirilmeli” ve “teknolojiden yararlanmalı” olmak üzere 11 alt kategoriden oluşmaktadır. Bunlardan uygulamalı eğitim vermeli, veli ile iş birliği yapmalı ve hizmet içi eğitim almalı kategorileri sınıf öğretmenlerinin çevre eğitimi konusunda en önemli gördükleri öneriler olmuştur. Sınıf öğretmenleri nitelikli bir çevre eğitimin verilmesinde en çok uygulama sürecinin, hizmet içi eğitimlerin ve veli iş birliğine önem verdikleri sonucuna ulaşmıştır. Sınıf öğretmenleri öğrencilerin etkinliklere katılım göstermelerini, öğrendiklerini uygulamalarını ve sorumluluk almalarını beklediği sonucuna ulaşmıştır. Nitelikli çevre eğitimi verilebilmesi konusunda velilerin öncelikle eğitim alması gerektiği ve çocuklarını da bu doğrultuda yönlendirerek rehber olması gerektiği sonucuna ulaşmıştır. Demir ve Yalçın (2014) yaptığı bir araştırmada çevre eğitimi kazanımlarının yetersiz olduğunu belirtmiştir. Aynı araştırmada etkili bir çevre eğitimi için disiplinler arası bir yaklaşımla yapılandırıcılığın temelinde bir program oluşturulmanın önemini belirtmiştir.

Sınıf öğretmenlerinin çevre eğitimine yönelik görüşlerinin dikkate alındığında; sınıf öğretmenlerine uygulamalı hizmet içi eğitimler verilmesi, düzenli olarak veli bilgilendirme seminerleri yapılması, çevre eğitimine farklı ders ve disiplinlerde yer verilmesi ve sınıf öğretmenlerinin teorik bilgiden daha çok öğrencinin aktif olduğu çevre uygulamalarına daha fazla fırsatlar oluşturması önerilebilir.

Bilgilendirme

Bu çalışma, birinci yazarın ikinci yazar danışmanlığında hazırladığı yüksek lisans tezinden üretilmiştir.

Etik Kurul Belgesi

Etik Kurul Komisyon Adı: Sivas Cumhuriyet Üniversitesi Bilimsel Araştırma ve Yayın Etiği Sosyal ve Beşerî Bilimler Etik Kurulu

Etik Kurul Belge Tarihi ve Sayı No: 30/11/2022 ve 235595

Yazar Katkı Beyanı

Seda ÖZTÜRK: Alanyazın taraması, kavramsallaştırma, metodoloji, veri toplama formunun hazırlanması ve geliştirilmesi, verilerin toplanması, işlenmesi, analizi, yorumlanması, denetim, inceleme-yazma ve düzenleme.

Ahmet Turan ORHAN: Alanyazın taraması, kavramsallaştırma, metodoloji, veri toplama formunun hazırlanması ve geliştirilmesi, verilerin toplanması, işlenmesi, analizi, yorumlanması, denetim, inceleme-yazma ve düzenleme.

Kaynaklar

- Akçay, İ. (2006). *Farklı ülkelerde okul öncesi öğrencilerine yönelik çevre eğitimi*. Yayımlanmamış Yüksek Lisans Tezi. Uludağ Üniversitesi, Bursa.
- Akintunde, E. & Akintunde, C. (2023). Acquisition and use of environmental education in solid waste management practices. *Journal of STEAM Education*, 6(2), 143-160.
- Ayaz, E., Doruk, Z., & Sarıkaya, R. (2021). Effect of activity-based environmental education on the environmental identities of classroom pre-service primary school teachers. *Review of International Geographical Education*, 11(1), 277-295.
- Aydın, N. (2008). *Sınıf öğretmeni adaylarının ve öğretmenlerinin çevre eğitimine yönelik öz yeterlik inançları üzerine sınıf düzeyi, kıdem ve değer yönelimlerinin etkisi*. Yayımlanmamış Yüksek Lisans Tezi. Adnan Menderes Üniversitesi, Aydın.
- Can, H. & Özdemir, A. (2022). *Examining preservice teachers' environmental knowledge and self-efficacy beliefs regarding environmental education*. Yayımlanmamış Doktora Tezi. Eskişehir Osmangazi Üniversitesi, Eskişehir.
- Creswell, J. W. (2017). *Nitel araştırmacılar için 30 temel beceri* (3.baskı). (H. Özcan, Çev.). Anı Yayıncılık.
- Çalık, M. (2009). *Environmental education in context, an international perspective on the development of environmental education*. Sense Publishers.
- Çevre ve Şehircilik Bakanlığı (2004). *Türkiye çevre atlası*. (XVIII. Çevre eğitimi, s. 452-457). ÇED ve Planlama Genel Müdürlüğü Çevre Envanteri Dairesi Başkanlığı, Ankara.
- Demir, E. & Yalçın, H. (2014). Türkiye'de çevre eğitimi, *Türk Bilimsel Derlemeler Dergisi*, 7(2), 7-18.
- Dikmen, S. (1993). İlköğretim kurumlarında çevre için eğitim. *Çevre eğitimi* (s. 21-33). Türkiye Çevre Vakfı Yayını.
- Erten, S. (2004). Çevre eğitimi ve çevre bilinci nedir? Çevre eğitimi nasıl olmalıdır? *Çevre ve İnsan Dergisi, Çevre ve Orman Bakanlığı Yayın Organı*. Sayı 65/66.
- Görmez, K. (2015). *Çevre sorunları*. Nobel Yayıncılık.
- Güler, T. (2009). Ekoloji temelli bir çevre eğitiminin öğretmenlerin çevre eğitimine karşı görüşlerine etkileri. *Eğitim ve Bilim*, 34(151), 30-43.
- Harrell, M. C., & Bradley, M. A. (2009). *Data Collection Methods Semi-Structured Interviews and Focus Groups*. RAND Corporation.
- Haşiloğlu, M.A & Karasu, İ. (2019). *Çevre eğitimi*. M. Kurt (Ed.). Eğiten Kitap Yayıncılık.
- Jung, C. D., & Dos Santos, L. M. (2022, February). *Incorporating environmentally-responsive EFL pedagogy in English-as-a-foreign language classrooms: paving the way for global impact*. In IOP conference series: Earth and environmental science (Vol. 987, No. 1, p. 012017). IOP Publishing.

- Kaya, V.H. & Elster, D. (2019). Study on the main dimensions affecting environmental literacy, and environmental perceptions influencing science literacy. *International e-Journal of Educational Studies (IEJES)*, 3 (6), 70-77. <https://doi.org/10.31458/iej.512201>
- Kefeli, N., Taş, E. & Yalçın, M. (2018). Kelime oyunları ile fen öğretiminin öğrencilerin çevreye yönelik tutumuna etkisi. *International e-Journal of Educational Studies (IEJES)*, 2 (3), 44-52
- Keleş, Ö., Varnacı Uzun, F. & Uzun, N. (2013). Investigation of changes of pre-service teachers' opinions about environmental education with drawing analysis. *TOJSAT*, 3(2), 46-57.
- Kimaryo, L. A. (2011). *Integrating environmental education in primary school education in Tanzania: Teachers' perceptions and teaching practices*. Abo Akademi University Press http://www.doria.fi/bitstream/handle/10024/67481/kimaryo_lydia.pdf
- Makki, M., Abd-El-Khalick, F., & Boujaoude, S. (2003). Lebanese secondary school students environmental knowledge and attitudes. *Environmental Education Research* 9(1), 21-34.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis*. SAGE Publications.
- Mosothwane, M. (1991). *An assessment of Bostwana preservice teachers environmental content knowledge, attitude towards environmenta education and concern environmental quality*. University of Georgia.
- Reddy, C. (2021). Environmental education, social justice and teacher education: enabling meaningful environmental learning in local contexts. *South African Journal of Higher Education*, 35(1), 161-177.
- Saracaoğlu, S. A., & Yenice, N. (2009). Fen bilgisi ve sınıf öğretmenlerinin öz-yeterlik inançlarının bazı değişkenler açısından incelenmesi. *Eğitimde Kuram ve Uygulama*, 5(2), 244-260.
- Sikhosana, L. (2022). Reflections on the integration of environmental education by a primary school teacher. *International e-Journal of Educational Studies*, 6 (12), 246-254. <https://doi.org/10.31458/iej.1198123>
- Sürmeli, H. (2017). Fen öğretiminde çevre eğitimi. M Ergun (Ed.). *Fen bilimleri öğretiminde yeni yaklaşımlar*, (s. 189-215). Nobel Yayıncılık.
- Şimşekli, Y. (2004). Çevre bilincinin geliştirilmesine yönelik çevre eğitimi etkinliklerine ilköğretim okullarının duyarlılığı. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 17(1), 83-92.
- Tutar, M., & Kurt, M. (2019). *Çevre eğitimi. Sürdürülebilir çevre eğitimi açısından ilköğretim ve okul öncesi öğretim programının değerlendirilmesi*. M. Kurt (Ed.). Eğiten Kitap Yayıncılık.
- Uzun, N., & Sağlam, N. (2006). Environmental attitude scale for high school students. *Journal of Hacettepe Education Faculty*, 30(30), 240-250.
- Yıldırım, A., & Şimşek, H. (2021). *Sosyal bilimlerde nitel araştırma yöntemleri* (12. Baskı). Seçkin Yayıncılık.
- Yücel, A.S., & Morgil, F. İ. (1999). Çevre eğitiminin geliştirilmesi. *Balıkesir Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, 1(1), 76-89.

Research Article

The Relationship between Bullying, Organizational Silence and Sports Behaviors of Secondary School Students

Çetin TAN^{1,*}  Aysel KIZILKAYA^{2*}  Neşe YAĞMURLU³ 

¹ Fırat University, Elazığ, Türkiye, cettan889@hotmail.com

² Fırat University, Elazığ, Türkiye, ayselkizilkaya@hotmail.com

³ Fırat University, Elazığ, Türkiye, neseayagmurlu@outlook.com


* Corresponding Author: ayselkizilkaya@hotmail.com

Article Info

Received: 31 March 2024

Accepted: 22 June 2024

Keywords: Bullying, secondary school students, sports, organizational silence

 10.18009/jcer.1458744

Publication Language: English

Abstract

This research was conducted to examine the perceptions of bullying, organizational silence and sports of secondary school students. According to the results of the research, the vast majority of the participants (75%) stated that they broke the rules at school. First of all, almost half of the participants stated that they prefer not to be exposed to bullying. Participants stated that they tried to explain the situation in general to those they thought were superior. In addition, resorting to physical violence, using psychological superiority and being patient are among the opinions expressed. It was determined that there were the same behaviors in the reactions given to them or given by themselves in the face of these behaviors. In the study, when the participants showed a bullying attitude to their friends, they stated that they would generally intervene and apply solutions in different ways in their own way.



To cite this article: Tan, Ç., Kızilkaya, A., & Yağmurlu, N. (2024). The relationship between bullying, organizational silence and sports behaviors of secondary school students. *Journal of Computer and Education Research*, 12 (24), 505-522. <https://doi.org/10.18009/jcer.1458744>

Introduction

People, who are a social being, after meeting their basic physiological needs while continuing their lives, first of all, trust; they want to be respected, understood, have an environment where they can have healthy relationships, feel like they belong somewhere, and realize themselves (Kılıç, 2009). Especially in this period, it is important for young people to approve or reject their behavior by their environment (Demir, et al., 2005; Kayıran, 2023). Adolescents can experience difficult situations for their families, friends, teachers and even themselves with the change in mood during this period. The rapid development in this period affects students socially and psychologically, for better or for worse. Young people who experience negative things during adolescence may have difficulty in establishing positive relationships in society later on (Şahin, et al., 2010). It can be said that these negativities also bring about antisocial behaviors, desire for isolation, aggression and

bullying behaviors. Bullying; it is defined as a person who physically or psychologically disturbs, intimidates and threatens the people around him without any reason (Çinkır, 2006). In order for the movement to be bullying, there must be a particular inequality of power. The bully must be confronted by a victim whom he or she can easily crush (Olweus, 1997). In this case, it is expected that the bullied party will not be able to defend and protect himself (Pişkin, 2002).

Olweus (1994) divided bullying into 3 types. These;

- 1) Physical bullying (pushing, vandalism, kicking, etc.)
- 2) Verbal bullying (teasing, swearing, etc.)
- 3) Exclusion (cyberbullying, exclusion from the group, spreading gossip and slander, etc.).

Of these types of bullying, "exclusion" is not directly directed to the person but is indirectly stated as harming the person, while physical bullying and verbal bullying are characterized as direct bullying directly to the person (Olweus, 1994).

According to the European Community European Social Fund, bullying;

- Physical bullying
- Disruptive bullying
- Sexual bullying
- Behavioural bullying
- Emotional bullying
- Verbal bullying
- It has divided it into groups as stealing and hiding bullying (Akt. Koç, 2006).

Bullying behavior occurs in various areas where we live jointly or individually. Accordingly, there is a relationship between the type of bullying and the area where it occurs. People are bullied on the road, in the neighborhood, at work, at school and even in the gardens of their homes (Öksüz, et al., 2012). However, as a result of the researches, school canteens and cafeterias were stated as the places where the most bullying behavior was seen as changing rooms (Parault, et al., 2007). Based on this situation, it is seen that bullying behaviors, especially those that occur at school, occur more in places where adults or teachers cannot see them (Craig, et al., 2000). What can be done to prevent bullying behavior in schools, what precautions can be taken? What are the ways to reduce these behaviors? It is known that social and sporting activities are especially important in preventing bullying and other negative behaviors in schools.

The importance of social and sports activities in preventing bullying and other negative behaviors at school is known. Mahoney (2000) conducted a study on adolescents and stated that social and sports activities reduced bullying and aggressive behaviors. It has been suggested that the social relations of the students participating in these activities also develop positively and support the positive behaviors of the students. The fact that students participated in dance and sports activities at school again showed that bullying and negative behaviors were minimized (Parault, et al., 2007).

In addition to the researches that indicate the importance of sports on bullying behavior, the results of the research that concludes that sports reveal more bullying behavior are also reached. For example; It has been suggested that adolescent female athletes tend to bully more than their peers (Volk & Lagzdins, 2009). In another study, it is stated that 26% of students, especially in judo and football branches, are exposed to different types of bullying (Collot, et al., 2010). According to Jachyna (2013), bullying behaviors are often displayed in gym locker rooms that adults don't usually see. In particular, it is suggested that students who do not perform well enough in team sports and fall behind than their other friends are more likely to be bullied (D'Escury & Durink, 2009). In another study, it was conducted with secondary school students and no difference was seen in the bullying tendency of sedentary and sports students (Öz, et al., 2011). Asma, et al. (2019) found that students who played sports were away from the stress of the lesson and protected from bad habits, and it was stated that students who played sports at all grade levels showed less bullying behavior than students who did not do sports.

As mentioned in the relevant literature, a definite relationship between bullying tendency and sports habit has still not been found and the results of the study have emerged differently from each other. Studies were generally conducted with quantitative methods and no research was conducted using only qualitative methods. While creating the research questions, questions were chosen that included organizational silence. The attitudes of students towards bullying are also related to their silence. For this purpose, the following research questions were asked.

- 1- Do you break the rules at school? What are the rules you break?
- 2- What is your attitude towards people you don't like?
- 3- Have you been bullied? How was bullying done?
- 4- What do you do when you are bullied?

5- What is your attitude towards those you think you are superior to on issues with which you disagree?

6- What do they do to annoy your friends or to make you angry - what is the reward?

7- How has sports changed your reaction to the events you have experienced in your life?

8- What do you do when your friend is bullied?

Method

Research Model

This research is a qualitative research conducted to examine the perceptions of bullying, organizational silence and sports of secondary school students and has been prepared in the phenomenology (phenomenology) design. Qualitative research attempts to explain the causes of group and human behavior. The aim of a qualitative research; to try to explain the causes and effects of human behavior and how they are affected by the events in their social environment (Arslan, 2012). The phenomenon science approach is a scientific research design that is used at the basis of all qualitative research and is aimed at enabling people to reflect their own life world and actions (Merriam, 2009).

Study Group

In this study, the study group consisted of 9th, 10th and 11th grade students attending secondary education in Malatya. 12th class students do not come to school frequently due to the university exam and are not included as participants in the research in order not to interfere with the exam studies. Purposeful sampling method was chosen in the study. Since those who do sports and those who do not are taken into consideration when creating the research group, the purposeful sampling method was used. 10 of the students were selected from the students who did not do sports and 10 of them were selected from the students who continued to participate in sports. The distribution of students according to some demographic characteristics is indicated in the table below.

Table 1. Demographics of participants

Variables		f	%
Gender	Male	10	50
	Woman	10	50
Class	9th grade	7	35
	10th grade	10	50
	11th grade	3	15

The state of doing sports	Students who do not play sports	10	50
	Students playing sports	10	50

Data Collection Tool and Data Collection

In the study, a semi-structured interview form prepared to measure the tendency of secondary school students to bully, organizational silence and the effect of sports on these behaviors was used. It has been stated that the semi-structured interview form is more suitable in educational studies due to the flexibility and standardity it provides (Türnüklü, 2000). After scanning the literature, a semi-structured interview form was created. The created interview form was shared with two field experts and after the necessary corrections were made, it was finalized. Then, the interview form was applied to three students. After the pilot study, the interview form was applied to the participants other than these three.

In the first part of the two-part structured interview form, 3 questions including the demographic characteristics of the participants are included. In the second part of the interview form, 8 open-ended questions are included.

The data were taken in the 2022-2023 academic year and were interviewed outside the classroom at the school where the students were educated. Students were informed that participation in the study was not compulsory and was voluntary. The students were given brief information about the research and interviewed alone to avoid distraction. The interviews were conducted in the school's science laboratory to ensure a quiet environment. In order to ensure the comprehensibility of the research questions, brief briefings were provided while asking some questions (e.g., what is bullying?).

Analysis of Data

In the study, content and descriptive analysis were used in the analysis of the data. In order to ensure the validity of the research, expert opinion was obtained, participant confirmation was provided and direct quotations were included. In addition, the data collection tool and process are described. The data analysis process is explained and the features of the working group are included. For the reliability of the research, it was ensured that data loss was prevented by using a recording device. A direct presentation of the findings was made and the consistency between the data was checked (Patton, 2014; Türnüklü, 2000). In addition, the consensus among experts for the external reliability of

the research was examined. In the evaluation, the formula of Miles and Huberman (1994) (reliability = consensus / consensus + disagreement) was used. The reliability coefficient specific to this study was calculated as 0.91. It can be said that this research is reliable since the reliability coefficient is greater than .70.

Finding

This section is presented in six headings in line with the research questions. In this part of the research, the findings of the results of the research questions and the interpretations of the findings are included.

In the study, participants were asked "Do you break the rules in school? What are the rules you break?" question has been asked. Participant opinions are given below in Table 2.

Table 2. Breaking the rules

Theme	Code
Breaking the rules	Failure to comply with dress code
	Running away from school
	Defiling the school
	Speaking in class
	Slang and abusive speech
	Don't get involved in a fight
	Follow the rules

In the study, participants were asked whether they broke the rules. The vast majority of respondents (75%) said they broke the rules at school. The participants who stated that they followed the school rules were also female students. The rules that are broken in school are mostly rules such as not following the dress code and running away from school. Verbatim excerpts from the participants' opinions are given below.

"I don't like wearing a school uniform in general. That's why this rule is broken so much, not just me, but almost all my friends." K6 "I run away from school every now and then, except during exam times, and I wear very little school clothes anyway. I can't expect everyone to do the same things, but the people I've already run away from school and interviewed are my friends at school." K14 "When I see that my friends are throwing garbage on the floor at school and not picking it up, I don't hesitate to throw garbage on the floor. Anyway, even if there is too much to clean all kinds of schools, nothing will happen." K8 "When we're bored with class, we can't stop talking. Either I make my friends talk or they make me talk." K18 "I'm a little too slang and abusive when I speak. It's unpleasant to talk like that inside the school, but I can't get used to it." K11 "No, I don't break school rules. I pay attention to the fact that my father is also a teacher. I'm not in a position to break the rules anyway." K3

In the study, participants were asked the question, "What is your attitude towards people you don't like?" Participant opinions are given below in Table 3.

Table 3. Attitude towards unloved people

Theme	Code
Attitude towards unloved people	Be respectful
	Don't ignore
	Don't try to annoy
	Lack of sincerity
	I'd be tough
	Not being polite

In the study, participants were asked how they behaved towards people they did not like. Some of the participants stated that they were respectful and ignored, while others stated that they tried to annoy, acted harshly and did not act politely. Verbatim excerpts of the participants are given below.

"If I have to speak respectfully, without being too interlocutory, I will. After speaking, I keep my respect and walk away." K5 "I always ignore people I don't like, my attitude doesn't change even if I'm in the same environment by necessity, I act like I don't have a conversation." K4 "I try to make them angry by doing things they don't like. I never have people I don't like, so that's how I act." K6 "I don't be sincere with them. When there is a person I don't like and he wants to come to me, if he tries to be by my side, I make excuses for not being intimate and walk away. I don't want to stand next to someone I don't like for a minute." K15 "I usually get a little too people I don't like. I make it clear in every way that I don't like it. I make it clear that I don't want him." K19 "I don't mean to be kind to people I don't like. I can make it clear in rough every way that I don't like them. I even do things they don't like, and I make them nervous." K20

In the study, participants were asked "Have you been bullied? How was bullying done?" question has been asked. Participant opinions are given below in Table 4.

Table 4. Bullying

Theme	Code
Bullying	Verbal bullying
	Cyberbullying
	Physical bullying

In the study, participants were asked whether they had been bullied before. They were asked how the bullying was done. 95% of the participants have been bullied. The majority of this bullying behavior is verbal bullying. In addition, there are also participants who are exposed to a small amount of cyberbullying and physical bullying behavior. Excerpts from the participants are given below.

"Yes, I did, they excluded me a lot, they made fun of me. Because I was a brunette, because I wore glasses, my friends made fun of me in elementary school and middle school. I started to feel so ugly, and that was their purpose." K5 "When I was in middle school, my friends used to make fun of me all the time for being overweight. I was very upset at that time because of this situation I had suffered. I started playing sports and I became very weak, but I don't do the same to anyone. I was very upset when I was subjected to this behavior." K4 "I experience this kind of behavior a lot on social media. There are curses and insults. I'm blocking them, and they're attacking again from somewhere else." K11 "I got into a bit too many fights. When I was in the 9th grade, I was very involved in the fight of the upper classes and they beat me up a lot because I was small. At that time, because I was so young in age and physique, I was so scared and couldn't complain to anyone." K20

In the study, participants were asked the question, "What do you do when you are bullied?" Participant opinions are given below in Table 5.

Table 5. Attitude towards bullying

Theme	Code
Attitude towards bullying	Non-contact
	Issue a warning
	Don't fight back
	Get help from someone strong
	Retreat
	Notify a contact person

In the study, participants were asked what they would do if they were bullied. First of all, almost half of the participants stated that they prefer not to be exposed to bullying. Apart from this, there are also different opinions such as verbally warning, responding, getting help from a strong person. Some excerpts from the participants' opinions are given below.

"When faced with bullying, I try not to be the addressee. For this reason, I leave the environment and take care not to be in the same place. I do my best not to communicate." K9 "When I encounter such a situation, I give a warning, I warn that what he is doing is wrong. I certainly wouldn't get into an argument." K1 "If I encounter such a problem, I will do the same thing to the other party. I will get recompense from me and try to get revenge. K19 "I tell a strong person I trust in situations like this, and if it's not going to solve the problem, I find someone else strong." K3 "If I'm stronger than them, which I usually don't. If I'm being bullied by people stronger than me, I'd rather withdraw." K18 "In this case, I immediately went to the manager and told him. Since it is in the school, I prefer to tell the administrators and authorized people about this attitude. They solve this problem immediately." K16

In the study, participants were asked the question, "What is your attitude towards the people you think you are superior to on the issues you disagree with?" Participant opinions are given below in Table 6.

Table 6. Attitude towards incomprehensible issues

Theme	Code
Attitude towards incomprehensible issues	Trying to explain
	Physical violence
	Using psychological superiority
	Don't be patient

In the study, participants were asked how they would behave on issues with which you disagreed with those you thought you were superior to. Participants stated that they tried to explain the situation in general. In addition, resorting to physical violence, using psychological superiority and being patient are among the opinions expressed. Participant opinions are given below.

"I usually try to explain it by talking. I try to express myself by speaking. If he doesn't understand, I'll try to explain anyway." K19 "If I'm superior to the other person, of course I try to explain it verbally first. If we don't get along, I may not be able to control my nerves and resort to physical violence." K2 "I never use physical force, I prefer to pressure psychologically. I think psychological pressure is worse and more effective than physical violence. That's why I use this feature." K5 "Even if I'm superior, I try to explain it to him somehow. I prefer to patiently tell it again and again. Sometimes I think being patient without taking advantage of it can help." K8

In the study, participants were asked the question, "What would they do to annoy your friends or to make you angry – what would be the reward?" Participant opinions are given below in Table 7.

Table 7. Irritating behaviors

Theme	Code
Irritating behaviors	Don't get kidnapped
	Nickname
	Don't play a joke
Attitudes towards behavior	Issue a warning
	Reacting verbally
	Respond with the same behavior
	Break a relationship

In the study, participants were asked what they did to annoy your friends or to annoy you, and how they responded. It turned out that the participants generally had the same things done to them as they did themselves. Joking, nicknames and making jokes are included in these behaviors. It was determined that there were the same behaviors in the reactions given to them or given by themselves in the face of these behaviors. It was determined that warning, reacting verbally, responding with the same behavior and cutting

the relationship were the behaviors that were done in response. Excerpts from the participants are given below.

"I usually annoy my friends by playing with tiki by touching, I make a hand joke. They usually make fun of me on a joke. I don't get too angry, I don't care. If I have a very angry memory, I'll do what they did." K18 "With friends, there are usually nicknames. We can nickname and make fun of each other. But once I saw my friend get very upset, and I never did it again. If something like this is done, I will be very upset and I will cut off my relationship with that person." K3 "When we hang out with friends, there's usually no problem because we hang out jokingly. Sometimes when I get too angry, I get angry, I warn. I state that the attitude is wrong. That's how we handle it." K4 "We joke with each other a lot. Sometimes we miss the dose, in which case I react by talking to my friends. Sometimes our voices can be raised, but somehow we get it done by talking." K13

In the study, participants were asked the question *"How has sports changed your reaction to the events you have experienced in your life?"*. Participant opinions are given below in Table 8.

Table 8. Changing reactions

Theme	Code
Changing reactions	Reduction of stress
	Ensuring self-control
	Increased self-confidence
	A solution other than violence
	Establishing physical superiority
	Keeping focus
	Being a source of morale

In the study, participants stated that sports changed their reactions to the events they experienced in their lives. This question was answered by the participants who did the sport. Reducing stress, achieving self-control, increasing self-confidence, and having a solution other than violence are some of the participatory views. Excerpts from the participants are given below.

"After I started playing sports, I noticed that the stress in my life decreased. I'm obsessed with fewer things, I'm less stressed. A sense of relief came." K1 "Before sports, when I was angry about something, I had different reactions. After my sport, I learned to maintain self-control. If you don't know how to maintain self-control over the opponent, you lose. I brought that into my normal life." K2 "I was extremely timid before I started playing sports. I was incredibly reluctant to talk to people. With the sport, my self-confidence increased. I can behave very comfortably in all the environments I enter and I can communicate easily." K13 "Before I played sports, I honestly thought that there could be a physical solution to everything. I was very aggressive, but after sports I realized that everything can be solved more easily, that violence is not the only solution." K10 "Before I went to the gym, I couldn't focus on classes at all. I used to talk in lectures all the time. It would prevent my friends from listening to lectures. Now with the sport I do (shooting) I can focus better." K8 "When I wasn't doing sports, I was obsessed with little things. But

playing sports is very good for me. I'm very happy. It's a great source of morale for me."
K16

In the study, participants were asked the question, "What do you do when your friend is bullied?" Participant opinions are given below in Table 9.

Table 9. Attitude exhibited

Theme	Code
Attitude exhibited	Trying to protect
	Trying to solve the problem
	Responding physically
	Taking a stand according to the bullying
	Notifying the person in charge
	Not intervening

In the study, when the participants showed a bullying attitude to their friends, they stated that they would generally intervene and apply solutions in different ways in their own way. They have produced solutions to the problem in various ways, such as trying to protect their friend, trying to solve the problem, responding physically, taking a stand according to the bullying. Verbatim excerpts of the participants are given below.

"When I see a bad attitude towards my friend, I try to protect him no matter what the end is. I wouldn't leave it alone in any way." K3 *"I try to calm things down, then try to figure out what's wrong. I will look for a common solution to the problem between them."* K10 *"If the other person uses physical force, it will definitely pay off. I respond physically. I won't leave him alone."* K9 *"I take a stand according to the bullying they do, the response varies according to the situation. And according to which side is superior."* K20 *"If it's something I can't interfere with, I'll tell the principal if I'm at school, and any of my elders if I'm outside."* K15 *"I never interfere, I never interfere as a third person. I always prefer to stay away from such things."* K12

Discussion and Conclusion

This research was conducted to examine the perceptions of bullying, organizational silence and sports of secondary school students. In the study, participants were first asked if they had broken the rules. The vast majority of respondents (75%) said they broke the rules at school. The participants who stated that they followed the school rules were also female students. The rules that are broken in school are mostly rules such as not following the dress code and running away from school. When the gender of those who did not break the rules was examined, it was determined that the female students were narrated to the rules. In another study of high school students, the top five behaviors in which their students violated

school rules; talking to friends in class, calling friends nicknames, talking without permission from the teacher during the lesson, waiting in front of the class door despite ringing the class bell, cheating in the exam (Öztürk & Göksoy, 2022). According to another study in the literature, it was determined that there was an increase in violating school rules as the grade level increased. Similar to this study, it is seen that male students violate school rules more than female students and the rate of behavior contrary to school rules increases (Kuş & Karatekin, 2009). In the research conducted by Ayas and Pişkin (2011), it was concluded that male students are bullied more than female students. Based on the research results, it can be said that male students who violate the rules the most are also bullied the most. In the research conducted by Seçer et al., (2006), it was determined that middle and upper age children formed an awareness about social rules such as not running in the school corridor and not leaving the books scattered in the library. It turns out that they accept that these rules depend on authority.

In the study, participants were asked how they behaved towards people they did not like. Some of the participants stated that they were respectful and ignored, while others stated that they tried to annoy, acted harshly and did not act politely. It was also determined that the attitude of the participants who did not do sports was harsher towards people they did not like. Accordingly, it can be said that the behavior of students who do sports towards society is more conscious than students who do not do sports. In the study conducted by Çiriş (2014) for secondary school students, it was found that the positive social behaviors of the students who were interested in sports were higher than those who were not interested in sports and that there were significant differences between the two groups. In a study, Yıldırım (2011) compared the social ability levels of students who did not do sports with students who engaged in team sports and personal exercise. It found that there was a significant difference in the total scores of the students' social skills and in the sub-dimensions of affective expressionism, affective sensitivity, social expressionism, social sensitivity and social control in favor of individual and team sportsmen.

In the study, participants were asked whether they had been bullied before. They were asked how the bullying was done. 95% of the participants have been bullied. The majority of this bullying behavior is verbal bullying. In addition, there are also participants who are exposed to a small amount of cyberbullying and physical bullying behavior. It was found that bullying behaviors were more common among participants who did not play sports.

Mehmet et. al., (2019) conducted a study on secondary school students and similar to the results of this study, it was understood that the group that did sports had significantly lower bullying tendency scores than the group that did not do sports. In addition, it was seen that the tendency to bullying decreased more according to the frequency of sports. It was concluded that the level of not being unresponsive to bullying behavior was higher in students who played sports more often (Yıldırım, 2022).

In the study, participants were asked what they would do if they were bullied. First of all, almost half of the participants stated that they prefer not to be exposed to bullying. Apart from this, there are also different opinions such as verbally warning, responding, getting help from a strong person. Those who play sports do not act reactively in the face of bullying done to them. He prefers to spend more calmly and not interlocate. In other words, it has been determined that they prefer to remain silent. In a study conducted by Burnukara and Uçantok (2012), a significant portion of the students stated that they told the teacher or their family that they were bullied, while the majority of the students interviewed stated that they did not react to the bullying. This result also suggests that students who are not involved in bullying in any way do not significantly support students who are being bullied. In other words, a great power is watching its friends be bullied. In the same research, it was stated that adolescents used more behaviors such as ignoring bullying, telling bullies to stop it, asking for help from an adult person and giving up the struggle, while crying, getting help from friends and running away were less successful. According to these results, it can be thought that the reason why bullying behavior continues for centuries is due to the silent behavior of the people who are bullied.

In the study, participants were asked how they would behave on issues on which they disagreed towards those they thought were superior. Participants stated that they tried to explain the situation in general. In addition, resorting to physical violence, using psychological superiority and being patient are among the opinions expressed. Here, too, it was determined that the participants who played sports were more moderate and did not use their superiority. Although the research has personal superiority, it has been concluded that athletes prefer to remain silent. The results obtained in another study support the view that participation in sports in the research sample reduces the bullying tendencies of the students. Regular participation in sports activities has many physical, social, emotional and psychological benefits for children and young people. Children especially during

adolescence; it is important to be directed to sports in order to protect them from bad habits, to use their energy correctly, to increase their social development and self-confidence (Anokye, et al., 2012).

In the study, participants were asked what they did to annoy their friends or to make you angry, and how they responded. When the word "bullying" was used instead of "annoying" in the question, it was thought that the participants could not give subjective answers considering that they were high school level. The main purpose of this question, which is asked to the participants, is to reveal whether the participants exhibit bullying behavior. It turned out that the participants generally had the same things done to them as they did themselves. Joking, nicknames and making jokes are included in these behaviors. In the research, it was seen that the bullying behaviors exhibited in this way were more common in 9th grade students. It was determined that there were the same behaviors in the reactions given to them or given by themselves in the face of these behaviors. It was determined that giving warnings, reacting verbally, responding with the same behavior and breaking the relationship were the behaviors that were done in response. Young (2007) found in a study conducted in high school students that the most common type of bullying was verbal bullying. It was determined that the students who were bullied exhibited behaviors such as demoralization, restlessness and revenge as a reaction against it. The reason for this is considered as the student's orientation process to the school. In addition to this study, a study also showed that students in the 9th grade experienced more bullying and victimization, and that students were less bullied and victimized towards the upper grades. Towards the senior year, students are more attuned to school and develop friendship relationships (Wreath & Stars, 2019).

In the study, participants stated that sports changed their reactions to the events they experienced in their lives. This question was answered by the participants who did the sport. Reducing stress, achieving self-control, increasing self-confidence, and having a solution other than violence are some of the participatory views. As can be seen from these results, self-confidence increases, but at the same time the self-control of the individual is ensured. In the study, it is thought that the behavior of the athlete participants to be quieter than the other participants is related to this. Especially during adolescence; It is important to be directed to sports in order to be protected from bad habits, to use their energy correctly, to increase their social development and self-confidence. In another study, it was concluded

that sedentary students had lower levels of both internal and external self-confidence than athlete students (Özbek, et al., 2017). According to Zorba (2012), regular exercise helps to improve self-esteem, increase self-confidence, etc. in individuals and increase positive results. Since sports activities are an application that requires regular work, superior technique, aesthetics and competition within the framework of individuals' own abilities, they affect the personality image and harmony of the student (Akgül, et al., 2012; Bozyiğit, et al., 2023).

In the study, when the participants showed a bullying attitude to their friends, they stated that they would generally intervene and apply solutions in different ways in their own way. They have produced solutions to the problem in various ways, such as trying to protect their friend, trying to solve the problem, responding physically, taking a stand according to the bullying. While athletes exhibit calmer behavior when bullying about themselves, it has been determined that this calm attitude is replaced by a more protective attitude when their friends are bullied. Participants who did not play sports were found to exhibit mostly non-interference behavior when their friends were bullied. Şakar and Kızılkaya Namlı (2023), on the other hand, in a study conducted with athletes, revealed that unlike this research, athletes who are pressured and wanted to be intimidated also exhibit an attitude of silence because they think that they do not care and do not cause unrest. In this study, it is thought that students who do not do sports want to prefer to stay away from their friends in order not to get into trouble and not to experience unrest when their friends are bullied. As can be seen from the results of the study, while the athlete participants assimilated the bullying behavior for themselves, they did not do it for their friends.

Ethical Committee Permission Information

Name of the board that carries out ethical assessment:

Firat University Ethics Committee of the Institute of Educational Sciences

The date and number of the ethical assessment decision: 09.02.2024 / 21992

Author Contribution Statement

Çetin TAN: Literature review, conceptualization, implementation, data analysis, translation, and writing.

Aysel KIZILKAYA: Literature review, conceptualization, methodology, data analysis, and writing.

Neşe YAĞMURLU: Literature review, conceptualization, implementation.

References

- Adler, A.L. (2014). *An examination into bullying in the adolescent sport context*. Master Thesis, Queen's University, School of Kinesiology and Health Studies, Ontario, Canada.
- Akgül, S., Göral, M., Demirel, M. & Üstün, U. D. (2012). Investigation of the reasons for primary school students to participate in intra-school and inter-school sports activities in terms of various variables, *Dumlupınar University Journal of Social Sciences*, 1(32), 13-22.
- Anokye, N. K., Trueman, P., Green, C., Pavey, T. G. & Taylor, R. S. (2012). Physical activity and health related quality of life. *BMC Public Health*, 12(624), 1-8.
- Arslan, M. (2012). *Research methods and techniques. Lecture Notes*, Harran University,
- Asma, M., Gürsel, N. & Çamlıyer, H. (2019). Examination of students' bullying behavior tendencies in terms of participation in sports. *CBU Journal of Physical Education and Sports Sciences*, 14 (1), 23-40.
- Ayas, T., & Pişkin, M. (2011). Lise öğrencileri arasındaki zorbalık olaylarının cinsiyet, sınıf düzeyi ve okul türü bakımından incelenmesi. *İlköğretim Online*, 10(2), 550-568.
- Bozyigit, E., Tosun, A., & Sonmezoglu, U. (2023). Sport sciences students' socially responsible leadership perceptions. *International e-Journal of Educational Studies*, 7 (14), 381-392. <https://doi.org/10.31458/iejes.1255966>
- Burnukara, P. & Uçanok, Z. (2012). Peer bullying in primary and middle adolescence: where it occurs and ways of coping. *Turkish Psychological Writings*, 15(29), 68-82.
- Collot D'Escury, A. & Dudink, A. (2010). Bullying beyond school: Examining the role of sports. In S. Jimerson, S. Swearer, & D. Espelage (Eds.), *Handbook of bullying in school: An international perspective* (pp. 235-248). Routledge.
- Craig, W. M., Pepler, D. & Atlas, R. (2000). Observations of bullying in the playground and in the classroom. *School Psychology International*, 21(1), 22-36.
- Çelenk, T. E. A., & Yıldızlar, O. (2019). Study of peer bullying and victimization in high school students. *Journal of Health and Life Sciences*, 1(2), 24-31.
- Çinkır, S. (2006). Bullying in schools: Types, effects and prevention strategies. I. *Violence and School Symposium*, MoNE and Unicef Cooperation, Istanbul.
- Chirish, V. (2014). *Comparison of social skill levels of university students with and without Sports*, Master's Thesis, Gazi University.
- D'Escury, A. L. C., & Dudink, A. C. (2009). *Bullying beyond school: Examining the role of sports*. In *Handbook of Bullying in Schools* (pp. 235-247). Routledge.
- Demir, N.Ö., Baran, A.G., & Ulusoy, D. (2005). Relationships of adolescents with friend-peer groups and deviated behaviors in Turkey: Ankara sample. *Bilig*, 32, 83-108.
- Genç, G. (2007). Peer bullying and management in general high schools. <http://onlinelibrary.wiley.com/doi/10.1111/j.1469-7610.1994.tb01229.x/pdf>
- Jachyna, P. (2013). Boy's bodies: Speaking the unspoken. *Sport, Education and Society*, 18(6), 842-846.

- Karaman-Kepekçi, Y. & Çinkır, G. (2006). Bullying among Turkish high school students. *Child Abuse and Neglect*, 30(2), 193-204.
- Kayıran, D. (2023). Peer bullying experiences and management strategies of preschool teachers. *International e-Journal of Educational Studies*, 7 (15), 648-656. <https://doi.org/10.31458/iejes.1336321>
- Kılıç, N. (2009). *Primary 6, 7, 8. prediction of bullying levels of class students (District center example of Cihanbeyli district of Konya province)*. Master's Thesis, Gazi University, Ankara.
- Koç, Z. (2006). *Estimation of bullying levels of high school students*, PhD thesis. Gazi University, Ankara.
- Mahoney, J. L. (2000). School extracurricular activity participation as a moderator in the development of antisocial patterns. *Child Development*, 71(2), 502-516.
- Merriam, S. B. (2009). *Qualitative research* (Third Edition). A Wiley Imprint.
- Miles, M. B. & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. SAGE
- Olweus, D. (1994). Bullying at school: Basic facts and effects of a school based intervention program. *J Child Psych Psychiatry*, 35, 1171-1190.
- Olweus, D. (1997). Bully/victim problems in school: Facts and intervention. *European Journal of Psychology of Education*, 12, 495-510.
- Öksüz, Y., Çevik, C., Sümen, Ö. Ö., Baba, M. & Güven, E. (2012). Examination of bullying behavior in primary schools where teaching practice is carried out. *The Journal of Academic Social Science Studies*, 5 (1), 205-229.
- Öz, A.Ş., Kırmoğlu, H. & Temiz, A. (2011). Investigation of bullying tendencies and coping styles of primary school stage II students according to their sports status in terms of sports and special education. *Selcuk University Journal of Physical Education and Sports Science*, 13(2), 237-245.
- Özbek, S., Yoncalık, M. T., & Alıncak, F. (2017). Comparison of self-confidence levels of athlete and sedentary high school students (Kırşehir Province Example). *Gaziantep University Journal of Sports Sciences*, 2(3), 46-56.
- Öztürk, Z., & Göksoy, S. (2022). Vocational and technical anatolian high school students' views on alienation from school and their attitudes towards vocational education. *Journal of National Education*, 51(234), 1357-1380.
- Parault, S. J., Davis, H. A., & Pellegrini, A. D. (2007). The social contexts of bullying and victimization. *The Journal of Early Adolescence*, 27(2), 145-174.
- Patton, M.Q. (2014). *Qualitative study and evaluation methods*. Pegem Publishing.
- Pişkin, M. (2002). School bullying: Its definition, types, factors with which it is associated and measures that can be taken. *Theory & Practice*, 2(2), 531-562.
- Seçer, Z., Çağdaş, A., & Seçer, F. (2006). Distinguishing moral and social rules in the school environment of children. *Pamukkale University Journal of Faculty of Education*, 20, 69-81.

- Şahin, M., Sarı, S. V., Özer, Ö. & Er, S. H. (2010). High school students' views on cyberbullying behavior and exposure. *Süleyman Demirel University Faculty of Arts and Sciences Journal of Social Sciences*, 21, 257-270.
- Şakar, M., & Kızılkaya Namlı, A. (2023). Reflections of power distance on organizational silence in sports organizations. *Journal of Ahi Evran University Kirsehir Faculty of Education*, 24(1), 256-294.
- Türnüklü, A. (2000). A qualitative research technique that can be used effectively in educational research: Interviewing. *Educational Administration in Theory and Practice*, 24, 543-559.
- Volk, A. A., & Lagzdins, L. (2009). Bullying and victimization among adolescent girl athletes. *Athletic Insight*, 11(1), 12-25.
- Yıldırım, S. (2011). *Comparison of social skill levels of secondary school students who perform team and individual sports as licensed and secondary school students who do not do sports*. Master's Thesis, Abant İzzet Baysal University, Bolu.
- Yıldırım, A. (2022). *Bullying tendencies of students studying at sports high school and the role of sports in coping with bullying (Aydın province example)* Master's thesis, Aydın Adnan Menderes University.
- Zorba, E. (2012). *Lifelong sport for all*. Neyir Publications.

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article

Investigation of Gifted Students' Errors Related to Height and Diagonal Concepts in Geometry Teaching

Gülşah SALTİK AYHANÖZ¹  Solmaz Damla GEDİK ALTUN^{2,*} 

¹ Niğde Akşemsettin Science and Art Center, Niğde, Turkey gulsah@windowslive.com

² Nevşehir Hacı Bektaş Veli University, Nevşehir, Turkey sdgedik@nevsehir.edu.tr


* Corresponding Author: sdgedik@nevsehir.edu.tr

Article Info

Received: 19 April 2024

Accepted: 09 September 2024

Keywords: Gifted students, geometry, error, height, diagonal

 10.18009/jcer.1470685

Publication Language: English

Abstract

The aim of this study was to examine the errors of gifted students regarding the concepts of height and diagonal in Geometry. Eighteen gifted students studying at a Science and Art Center in central Anatolia participated in the study. A knowledge test consisting of 5 questions was prepared to collect data. The knowledge test was applied to gifted students. Descriptive analysis method was used to analyze the data in the study. The data obtained in line with the responses of the students to the knowledge test used as a data collection tool were classified under categories in line with the purpose of the study by coding the errors in the solutions of the questions. According to the data obtained, it was concluded that the concept of diagonal and height, which constitute the basis of many subjects in geometry education of gifted individuals, should be emphasized more.



To cite this article: Saltık-Ayhanöz, G. & Gedik-Altun, S.D. (2024). Investigation of gifted students' errors related to height and diagonal concepts in geometry teaching. *Journal of Computer and Education Research*, 12 (24), 523-548. <https://doi.org/10.18009/jcer.1470685>

Introduction

Geometry is a branch of mathematics that examines the relations, measurements and properties of points, angles, surfaces and objects (Turkish Language Society [TLS], 2022). Geometry has an important place in the elementary mathematics curriculum. Geometry is not only a field of meaningless shapes and rules. In geometry teaching, it is aimed that students gain the skills of reasoning, proving, problem solving, critical thinking, identifying facts and using definitions (National Council of Teachers of Mathematics [NCTM], 2000). Therefore, it is very important to teach the definitions of geometric concepts and their relationships with each other. NCTM (2000) emphasized the importance of students knowing the definitions of geometric concepts, the properties of geometric objects and forming geometric relationships with them. Geometry is mostly seen by students as a

collection of rules, shapes and symbols. Meaningful relationships cannot be established between the concepts used in this field, and teachers have problems in making students comprehend the subjects in geometry lessons (Konyalıoğlu, 2013). This situation makes it difficult to achieve the desired goals in mathematics education in the 21st century. As a matter of fact, there are studies in the literature (Fazlı & Avcı, 2022) showing that students continue the wrong and incomplete learning they experienced in primary school years at the secondary education level.

In order for students to achieve the desired goals in geometry teaching, meaningful learning is required. Many national and international publications emphasize the importance of meaningful learning in mathematics teaching, that is, the structuring of knowledge in the mind (Ministry of National Education [MoNE], 2018). When new information is encountered in the process of meaningful learning, the individual needs to go through some mental processes such as recall, evaluation, comparison, and association in order to make sense of this information in his/her mind (Yanık, 2016). Some negativities that occur during students' construction of knowledge in their minds cause errors and concept deficiencies in individuals (Şahin et al., 2023).

Height and diagonal are frequently used concepts in geometry teaching, which is a sub-branch of mathematics. Height is the line segment connecting the point where the perpendicular drawn from any corner of a triangle to the opposite edge or extension cuts the extension or edge and this corner (Cunningham & Roberts, 2010). The definition of height given in the literature as "the perpendicular drawn from the corner to the base of a triangle" is considered as an incomplete definition. A student who adopts the second definition is likely to have difficulties in finding the height of the acute-angled corner of an obtuse triangle. When it is called the perpendicular to the base, what the student is looking for in the triangle will be the base and incorrect learning will occur (Bütüner, 2017). Students' drawing the height incorrectly and not being able to locate it will cause difficulty for students in subjects where the concept of height should be known (Gürefe & Gültekin, 2016). The definition of diagonal is defined in the literature as the line segment connecting any two non-adjacent vertices in a polygon (Çoker & Karaçay, 1983). Knowing the definitions and properties of geometric concepts such as height and diagonal is very important in terms of creating geometric relationships between these concepts and learning geometry. A problem encountered in this fundamental subject will spread to all geometry subjects. The

foundations of the concept of "diagonal", which is the subject of geometry, are laid in the 3rd grade mathematics course of primary school. The concept of diagonal is included in the curriculum again in the 5th and 6th grade mathematics courses. In the 7th grade mathematics course curriculum, there is a learning outcome as "Identification of the concept of diagonal by students". The teaching and drawing of the concept of "height" is included in the measurement sub-learning area in the 6th grade in the curriculum (MONE, 2018). For this reason, the fact that students have learned these concepts incorrectly and incompletely in these classes may cause them to have difficulties in these subjects and in subsequent subjects that are based on these subjects in their later educational life.

Individuals with Special Talents

Gifted children, who have rich vocabulary, advanced verbal skills, extraordinary thinking skills, fluency, leadership capacity, creativity and high-level problem-solving skills compared to their peers, have been considered important for societies throughout history (Sak, 2011). Bringing the talents of all individuals to the best level is considered very necessary today. This understanding of education has made the education of gifted individuals more important. Ataman (2003) stated that the education programs prepared for students with normal development are not suitable for gifted students, they get bored at school because they learn fast and lose their motivation. The ability of gifted individuals to receive education appropriate to their abilities plays an important role in identifying and recognizing their giftedness and educating them according to their abilities (Siegle, 2001). Gifted individuals need special education, and students with special talents in the field of general ability need special education, especially in mathematics education. When the needs of children in need of special education are not met, inequality emerges, which is seen as a problem in the sociology of education. The education of gifted students constitutes an important step in ensuring equality of opportunity in education (MoNE, 1991:15). In this context, errors and misconceptions in mathematics education of gifted students, especially in the subjects that constitute the basis and are frequently used, are an important factor that should be taken into consideration in learning environments, so they need to be identified. It is imperative to intervene in students' misconceptions and misconceptions because it is not possible for students to overcome them with their own efforts (Zembar, 2015, p. 3).

Today, it is considered very necessary to optimize the talents of all individuals. This understanding of education has led to a greater emphasis on the education of gifted

individuals. Giftedness is generally defined for students in three groups. These groups are classified as those who have talent in areas such as sports, music, and art, those who have talent in an academic subject, and those who have versatile talents (Taber, 2017). Since the Geometry learning domain includes shape and space concepts, it contributes significantly to the development of students' intuitive thinking and visual perception, and to their reflective and critical view of the situations around them (Türnüklü et al., 2017). In addition, Geometry can be expressed as a learning area that allows students to recognize, analyze and evaluate their environment in a realistic way; consists of a set of intuition, knowledge and concepts; and has many meaningful relationships between these sets. These statements reveal that the skills that the Geometry course provides students with are supportive in developing the talent areas of gifted students. MONE (2018) stated that meaningful learning should be realized in order for students to use the relationships in Geometry in a meaningful way. In order to realize the meaningful learning mentioned in the mathematics curriculum, it is necessary to identify the errors and learning difficulties that students make about geometric concepts (Arabacı & Kanbolat, 2023; Öçal, 2017).

Importance of Research

In a study conducted with pre-service teachers, it was found that the participants had poor content knowledge of the concepts of height, diagonal and angle (Cunningham & Roberts, 2010; Gutierrez & Jaime, 1999). Similar results were found in another study conducted with students (Monaghan, 2000). In another study, it was found that pre-service teachers made errors in drawing the heights of triangles (Gutierrez & Jaime, 1999). In another study, it was found that few students were able to correctly define the height and perpendicular center of a triangle (Hızarcı et al., 2006). In addition, Cunningham and Roberts (2010) found that pre-service teachers often had the idea that you cannot draw a diagonal outside a polygon. When the literature was examined, no study was found in which the errors of gifted students about height and diagonal were identified. Therefore, it was necessary to conduct such a study.

Purpose of the Study

When Turkey's international achievement in geometry is analyzed, Turkish students scored below the international average in TIMSS 2019. Turkey ranked 22nd among 39 countries in the geometry learning domain (Mullis et al., 2019). Studies have shown that students have below-average achievement in geometry learning domain. In the light of the

research conducted and the results of TIMSS 2019, considering that the errors encountered by the students have a positive effect on the success of the students, it was aimed to conduct a study on the concepts of height and diagonal in the geometry learning domain to determine the errors of the students. In this way, by identifying students' errors, it will be possible to eliminate the deficiencies that cause these errors and provide students with a healthy education. The results of this study will enable mathematics teachers to have information about errors and to improve their teaching techniques accordingly. It is thought that the study to be conducted with gifted students will also be a guide for primary school students. In this context, the aim of the study is to determine the errors of gifted students in height and diagonal topics and the problem statement of the research is determined as "What are the errors of gifted students in height and diagonal topics?".

Method

Research Design

In this study, it was tried to determine the content knowledge of gifted students about the concepts of height and diagonal. In this study, qualitative research methods were used and case study design was utilized. In case studies, data are analyzed through in-depth examination of one or more special cases (Yıldırım & Şimşek, 2013). In addition, the errors of individuals regarding the concepts of height and diagonal were identified as a case. This design was defined by Yin (1984) as a design in which there is a single unit of analysis, a well-formulated theory is tested, and unique and contradictory situations are studied. In line with the above, it can be said that this study is a case study. With this method, answers to questions such as "what", "how" and "why" were sought and the data obtained were presented in the findings section.

Sample

The study was conducted with 18 gifted students at Akşemseddin Science and Art Center in Niğde province in the 2022-2023 academic year. Criterion sampling provides the opportunity to work with people, situations or events with the qualities determined in relation to the problem in a research (Yıldırım & Şimşek, 2016). Easily accessible criterion sampling method, one of the qualitative sampling methods, was included in the sampling method. It is important that students volunteer in order to maximize the efficiency of the product that emerges in practical studies. In this context, student selection for the study was

based on volunteerism. The students participating in the study were coded as K_1, K_2, \dots, K_{18} and these codes were used in the presentation of the data.

Data Collection Tool

In order to collect the data in the study, the researchers prepared a 5-question knowledge test including the concepts of height and diagonal for gifted students. For these 5 questions, studies on these concepts were utilized (Altıntaş & İlgün, 2017; Bütüner, 2017; Cunnigham & Roberts, 2010; Gutierrez & Jaime, 1999). In the first question, students were asked to define the concepts of "height and diagonal". In the second question, students were asked to find the diagonals of the given geometric figures. In the third question, students were asked to find the heights of the given geometric figures. In the fourth and fifth questions, students were expected to answer questions such as whether the lines indicated by dashed lines indicate height and diagonal, and if not, why not.

Data Analysis

Descriptive analysis is the presentation of research data to the reader with direct quotations, adhering to its original form without any changes (Miles & Huberman, 1994). In this type of analysis, qualitative data are processed by adhering to a predetermined framework, findings are defined, and then the defined findings are interpreted (Yıldırım & Şimşek, 2016). In this study, in line with the responses of gifted students to the knowledge test used as a data collection tool, the data were coded according to the answers to the questions and classified according to the predetermined categories for the purpose of the study. In the evaluation of these definitions, the definitions made for this concept in the literature were taken into consideration. These definitions are given in Table 1.

Table 1. Definitions of diagonal and height concepts

Diagonal	A line drawn between two vertices that are not consecutive in a polygon or not on the same plane in a polyhedron (MoNE, 2023).
Height	The line segment joining the point where the perpendicular drawn from any corner of a triangle to the opposite edge or extension cuts the edge or extension and this corner is called the height of that edge. (MoNE, 2018, p. 80). The line segment joining a corner of a triangle with the point where the perpendicular drawn from any corner to the opposite side or extension intersects the side or extension. (Cunnigham & Roberts 2010)

Descriptive analysis method was used to analyze the data in the study. The data obtained in line with the answers given by the students to the achievement test used as a

data collection tool were classified under categories in line with the purpose of the study by coding the errors in the solutions of the questions. After all questions were evaluated, the results were categorized. The results were then evaluated by two experts in the field. A complete harmony was achieved during the analysis. After the data analysis process was completed, the data were presented in tables and interpreted. At the bottom of all categories, the answers given by the students were supported with direct quotations. Then, the data frequencies obtained from the students' responses were calculated and the reason statements were analyzed.

Reliability and Validity

The validity of this study was tried to be ensured by reporting the data obtained from the study in detail. One of the ways to ensure validity in qualitative studies is to report the data in detail (Yıldırım & Şimşek, 2016). In order to ensure the internal validity of the research, attention was paid to organizing the findings meaningfully and consistently, using data triangulation, clearly identifying the weaknesses and limitations of the research, and clarifying unclear facts. In addition, a conceptual framework was created by reviewing the relevant literature during the preparation of the data collection tools to be used to ensure internal validity in the research. In this way, while conducting descriptive analysis on the data obtained, it was tried to provide the scope to include the relevant concepts. In order to ensure the external validity of the study, the research process; determination of the participants, activity environments and selection, implementation of the practices, evaluation and data analysis were explained in detail. In addition, in order to ensure the external validity of the study, research problems and results were presented consistently and a detailed and rich narrative was used (Gül & Sözbilir, 2015). Students' personal information was kept confidential in the presentation of the findings. Qualitative data were coded and analyzed by two researchers to ensure the internal validity of the data. The consistency of the coding made by the researchers in the analysis of the data was checked.

In order to ensure internal reliability in the reliability dimension of the research, the data were given in descriptive ways and direct quotations. In addition, in order to ensure the reliability of the study, it was stated that the names of the students would not be used in any way. A classroom environment where students could feel comfortable during the application was created and no time limit was imposed for students to give their answers in detail. For the purpose of the study, the research was carried out by giving the necessary time to the

students in the appropriate time period. In this way, more accurate answers were tried to be obtained from the students.

In order to ensure external reliability, data collection tools were explained in detail and associated with the conceptual framework in the selection of data sources. The reliability of the research was calculated using Miles and Huberman's (1994) reliability formula by determining the number of agreement and disagreement in the comparisons. According to Miles and Huberman (1994), consensus among coders is expected to be at least 80%. Inter-coder reliability was calculated by dividing the number of codes agreed upon by the researchers by the total number of agreed and disagreed codes. The average reliability was calculated as 86% by determining the consensus and disagreement between the researchers.

Finding

This section presents the findings obtained from the analysis of gifted students' responses to the questions and their explanations about the reasons for these responses. In this direction, the data obtained from the students' answers were grouped according to the framework determined as "True, Partially True, Partially False, False and No Answer" and frequency values were calculated and the values for each question are presented in tables below. In addition, students' answers to the questions were supported with explanations and direct quotations. The first question of the data collection tool is given below as the definitions of the given geometric terms.

Question 1: Define the geometric terms given below.

Diagonal:

Height:

The answers given by the students regarding this question are categorized according to codes and given in Table 2 and Table 3.

Table 2. Answers related to the diagonal in question 1

Codes	Pre-Service Teachers	F	%
True	K ₈ , K ₁₀ , K ₁₅	3	%17
Partially Correct	K ₁ , K ₂ , K ₃ , K ₄ , K ₅ , K ₉ , K ₁₁ , K ₁₃ , K ₁₆ , K ₁₇ , K ₁₈	11	%61
Partially False		0	
False	K ₁₂ , K ₁₄	2	%11
No Answer	K ₆ , K ₇	2	%11

Table 3. Answers related to the diagonal for question 1

Codes	Pre-Service Teachers	F	%
True		0	
Partially Correct	K ₁ , K ₂ , K ₃ , K ₄ , K ₅ , K ₇ , K ₈ , K ₁₁ , K ₁₅ , K ₁₇ , K ₁₈	11	%61
Partially False		0	
False	K ₉ , K ₁₀ , K ₁₂ , K ₁₃ , K ₁₆	5	%28
No Answer	K ₆ , K ₁₄	2	%11

When the data in Table 2 are analyzed, it is seen that 3 students were able to correctly define the diagonal expression asked in the first question and 11 students were able to define it partially correctly. While 2 students defined it incorrectly, 2 students did not make any definition. In the first question, students were asked to define diagonal. Diagonal is defined as the line drawn between non-consecutive vertices of a polygon or between two vertices of a polyhedron that are not on the same plane. Taking this definition into account, the answers of the students were analyzed. The number of students who were able to define correctly in accordance with the given definition was 3. It was observed that the students who gave correct answers took into account that the number of sides of polygons must be 4 or more in order for them to have diagonals, and that they also took into account the lines drawn from non-neighboring vertices. The 11 students who defined it partially correctly were observed to consider the line segments connecting non-neighboring vertices. The 2 students who defined it incorrectly defined it as a line segment connecting opposite sides of a given shape. They did not take into account that the vertices should not be neighboring. One of the students also emphasized that the diagonals should be drawn on the inside of the shape. The definitions given by some students for this question are given below with direct quotations.

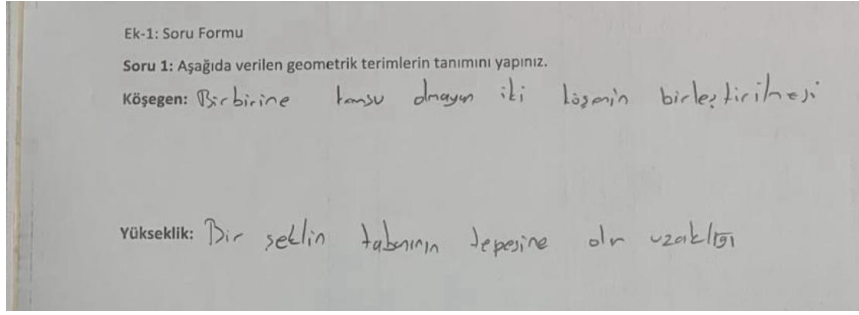


Figure 1. Student K3's answer to the first question

The response of the student coded K3 is as follows:

Diagonal: Two vertices that are not adjacent to each other.

Height: The distance from the base to the top of a shape.

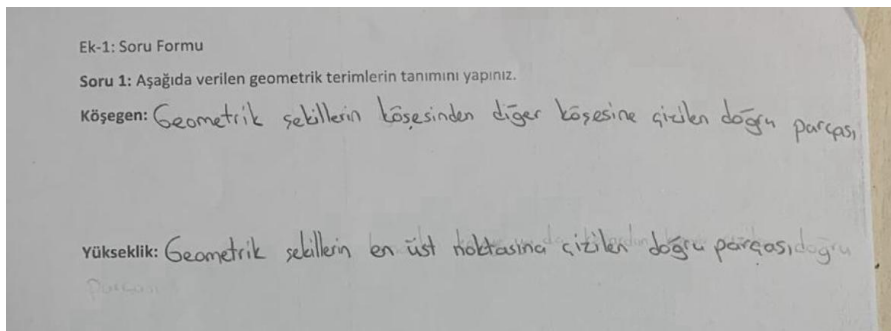


Figure 2. Student K12's answer to the first question

The response of the student coded K12 is as follows:

Diagonal: Line segment drawn from one corner of a geometric figure to the other corner.

Height: Line segment drawn to the top point of geometric shapes

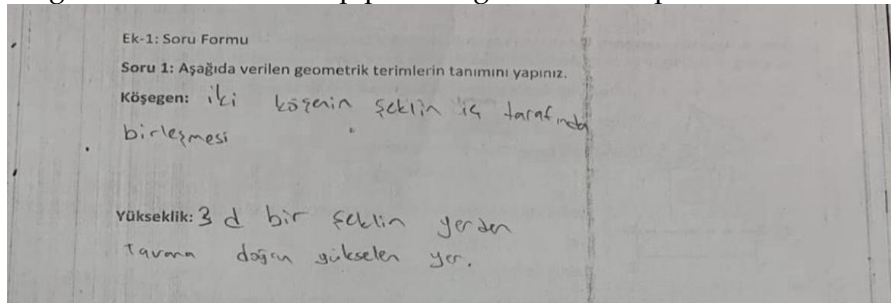


Figure 3. Student K16's answer to the first question

The response of the student coded K16 is as follows:

Diagonal: The union of two vertices on the inside of a figure.

Height: The place where a 3D shape rises from floor to ceiling

In the second question, students were asked to define height. Height is the farthest point of an object perpendicular to the base of the object from the base taken as reference. Taking this definition into account, the students' answers were coded. When the data in Table 3 are analyzed, it can be seen that while there were no students who could correctly define the definition of height in the second question, there were 11 students who could partially define it correctly. While 5 students defined it incorrectly, 2 students did not define

it at all. It was observed that the students who could define it partially correctly generally defined it as the length drawn from the corner to the base, from the base to the corner of a given shape, and as the perpendicular length. The students who answered incorrectly generally made definitions that were not related to height. Students did not specify polygons in their answers and used the expression "a shape". The definitions given by some students for this question are given below with direct quotations.

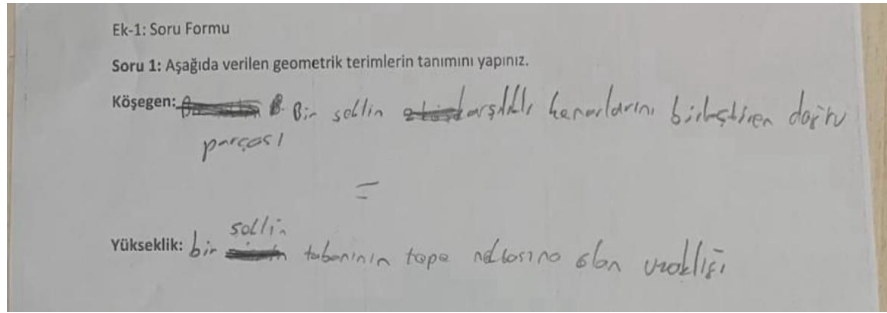


Figure 4. Student K5's answer to the second question

The response of the student coded K5 is as follows:

Diagonal: Line segment joining opposite sides of a shape

Height: The distance from the base of a shape to the vertex

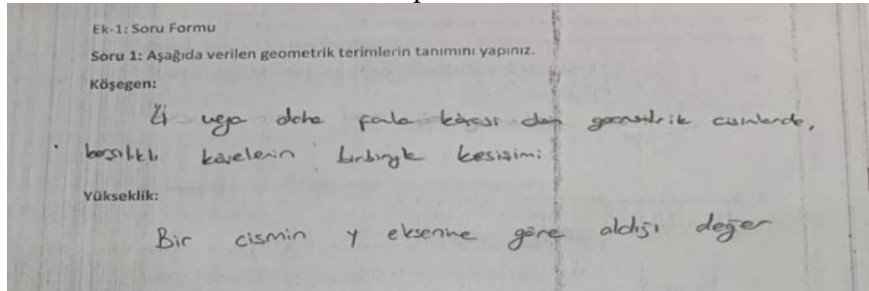


Figure 5. Student K9's answer to the second question

The response of the student coded K9 is as follows:

Diagonal: The intersection of opposite corners in geometric objects with four or more corners.

Height: The value of an object relative to the y-axis

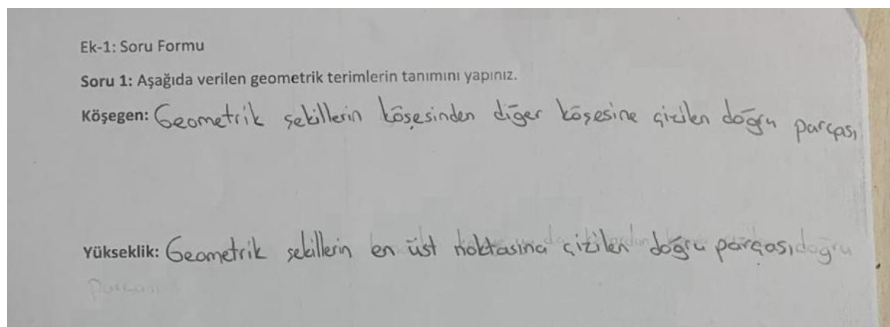


Figure 6. Student K13's answer to the second question

The response of the student coded K13 is as follows:

Diagonal: Line segment drawn from one corner of a geometric figure to the other corner.

Height: Line segment drawn to the top point of geometric shapes

Question 2. Draw the diagonals of the geometric shapes given below.

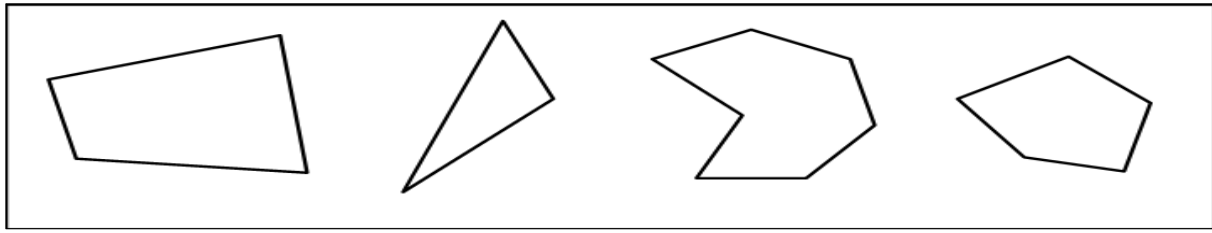


Table 4. Responses to question 2

Codes	Pre-Service Teachers	F	%
True	K ₇ , K ₉ , K ₁₂ , K ₁₄	4	%22
Partially Correct	K ₃ , K ₅ , K ₆ , K ₈ , K ₁₀ , K ₁₁ , K ₁₅ , K ₁₆ , K ₁₇ , K ₁₈	10	%55
Partially False	K ₁ , K ₂ , K ₄	3	%17
False	K ₁₃	1	%6
No Answer		0	

When the data in Table 4 are analyzed, the students who drew all of the diagonals of the geometric figures given in the second question correctly were coded as correct. Students who drew 1 of them incorrectly and the diagonals of other geometric figures correctly were coded as partially correct. Students who drew 2 diagonals incorrectly were coded as partially incorrect, while students who drew only 1 diagonal correctly were coded as incorrect. When the table is analyzed, 4 students drew the diagonals of all geometric figures correctly, while 10 students drew the diagonals of 3 of the geometric figures correctly. While 3 students drew 2 diagonals incorrectly; 1 student drew all diagonals incorrectly. Excerpts from some students are given below.

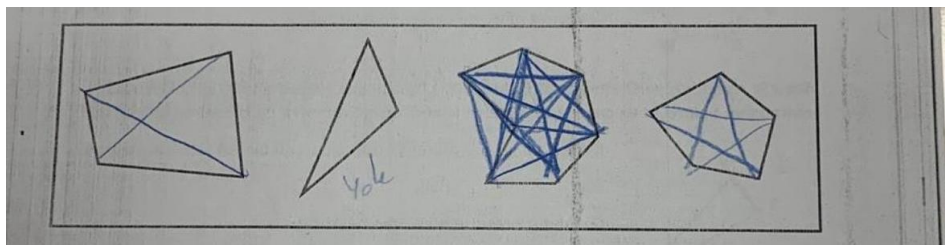


Figure 7. Student K₇'s response to the second question

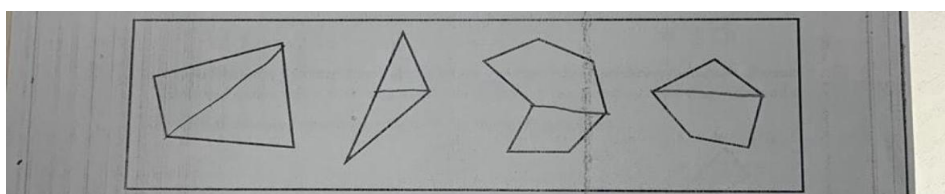


Figure 8. Student K₁₃'s response to the second question

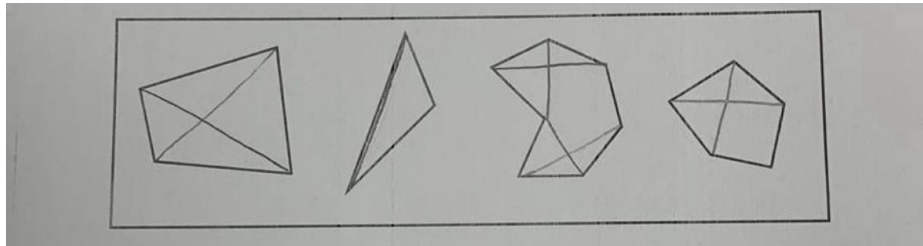


Figure 9. Student K4's response to the second question

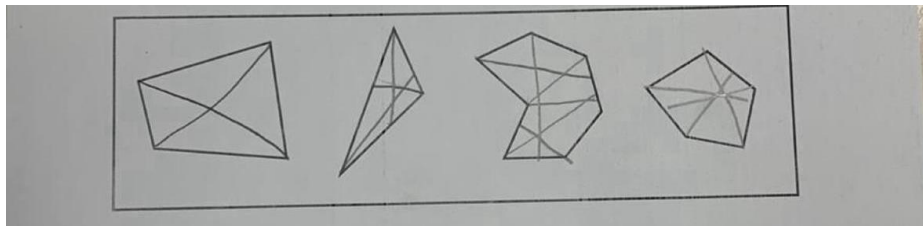


Figure 10. Student K15's response to the second question

Question 3. Find the heights of the triangles given below based on side A.

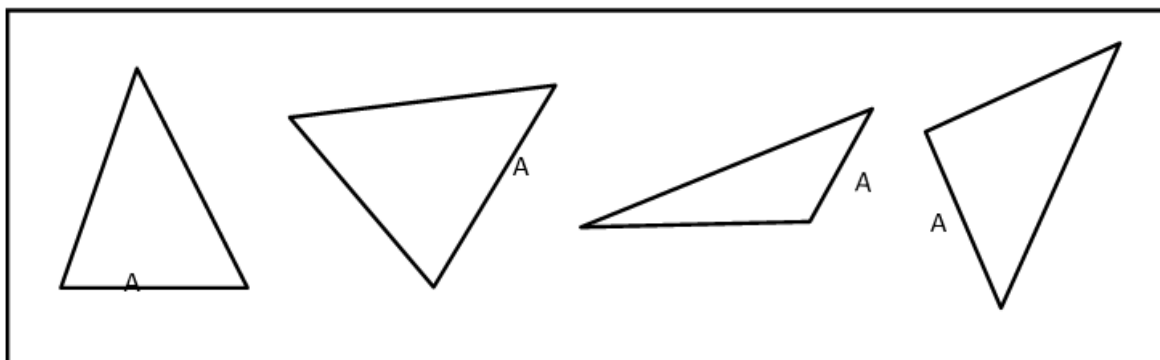


Table 5. Responses to question 3

Codes	Pre-Service Teachers	F	%
True	K ₉ , K ₁₃	2	%11
Partially Correct	K ₁ , K ₂ , K ₇ , K ₈ , K ₁₄ , K ₁₆ , K ₁₇ , K ₁₈	8	%44
Partially False	K ₃ , K ₄ , K ₅ , K ₆ , K ₁₀ , K ₁₂ , K ₁₅	7	%39
False	K ₁₁	1	%6
No Answer		0	

When the data in Table 5 are examined, the students who correctly drew all of the heights of the base area of side A in the triangles given in the third question were coded as correct. Students who drew 1 of them incorrectly and the other heights correctly were coded as partially correct. Students who drew 2 and 3 heights incorrectly were coded as partially incorrect, while students who could not draw the heights in the triangles correctly were

coded as incorrect. When the table is analyzed, 2 students drew all the heights of the given triangles correctly by taking side A as the base, while 8 students drew the heights of 3 of the given triangles correctly. While 7 students drew 2 or 3 heights incorrectly; 1 student drew all heights incorrectly. Excerpts from some students are given below.

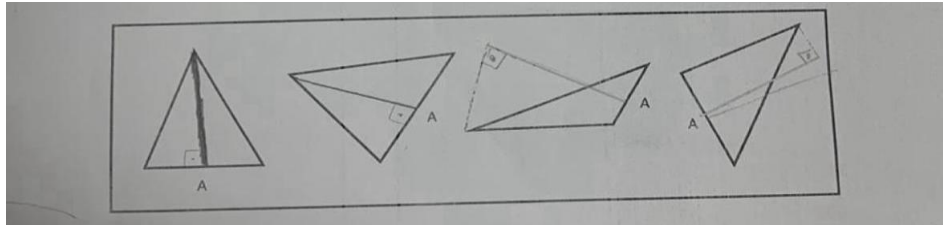


Figure 11. Student K₁₈'s response to the third question

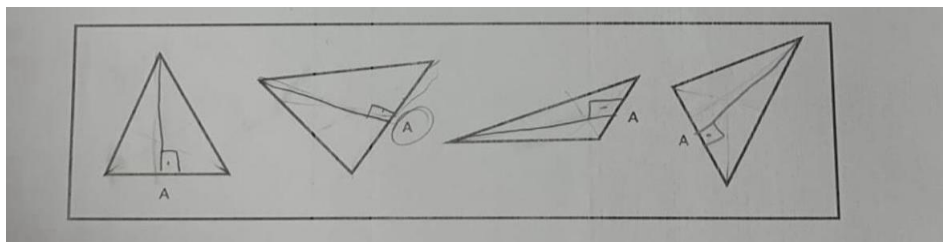


Figure 12. Student K₆'s response to the third question

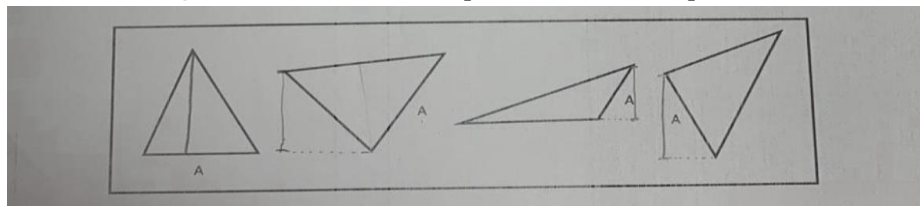


Figure 13. Student K₁₅'s response to the third question

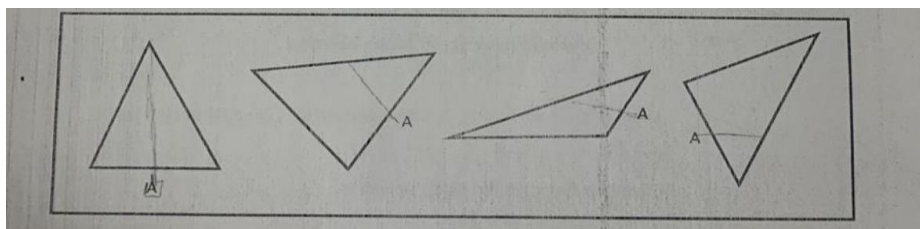
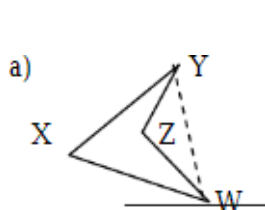


Figure 14. Student K₁₁'s response to the third question

Question 4. For each of the following figures, the dashed line segment has a diagonal.

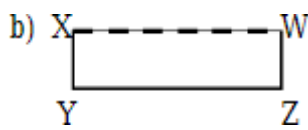
Determine that it is not, and circle your answer. If the answer is no, please give a reason.



Is the line segment YW denoted by the dashed line a diagonal?

Yes No

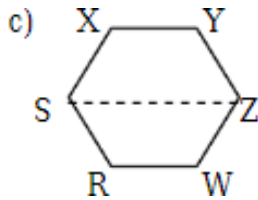
If the answer is no, please give a reason.



Is the line segment XW, denoted by the dashed line, a diagonal?

Yes No

If the answer is no, please give a reason.



Is the line segment SZ, denoted by a dashed line, a diagonal?

Yes No

If the answer is no, please give a reason.

Table 6. Answers related to question 4, option A

Codes	Pre-Service Teachers	F	%
True	K ₂ , K ₃ , K ₄ , K ₅ , K ₆ , K ₁₁ , K ₁₂ , K ₁₄	8	%44
Partially Correct		0	
Partially False	K ₁₅ , K ₁₇	2	%12
False	K ₁ , K ₇ , K ₈ , K ₉ , K ₁₀ , K ₁₃ , K ₁₆ , K ₁₈	8	%44
No Answer		0	

When Table 6 is examined, 8 of the students answered all of them correctly regarding whether the line segments with dashed lines in the figure given in the first option of the fourth question are diagonals. 2 students answered this question incorrectly. But they did not give any explanation. Therefore, they were coded as "Partially Incorrect". The remaining 8 students gave incorrect answers and gave incorrect explanations. Therefore, they were coded as incorrect. The students who gave wrong answers gave answers such as the diagonal should not be outside and it should be from corner to corner.

Table 7. Responses to Question 4, Option B

Codes	Pre-Service Teachers	F	%
True	K ₁ , K ₂ , K ₃ , K ₄ , K ₅ , K ₆ , K ₇ , K ₉ , K ₁₀ , K ₁₄ , K ₁₅ , K ₁₆ , K ₁₇ , K ₁₈	14	%78
Partially Correct	K ₈ , K ₁₂	2	%11
Partially False		0	
False	K ₁₁ , K ₁₃	2	%11
No Answer		0	

When Table 7 is examined, 16 of the students answered correctly regarding the reason why the line segment with dashed lines in the figure given in choice b of the fourth question is a diagonal. 2 students gave the wrong answer by answering "yes". No explanation was given for these students' answers. Two of the students who answered the question correctly gave correct answers but did not give any explanation. Therefore, they were coded as "Partially Correct". The explanations of those who gave correct answers were that the edge cannot be a diagonal and cannot be the union of two adjacent diagonals. The following are direct excerpts from some students' answers to the questions in the A and B options of Question 4.

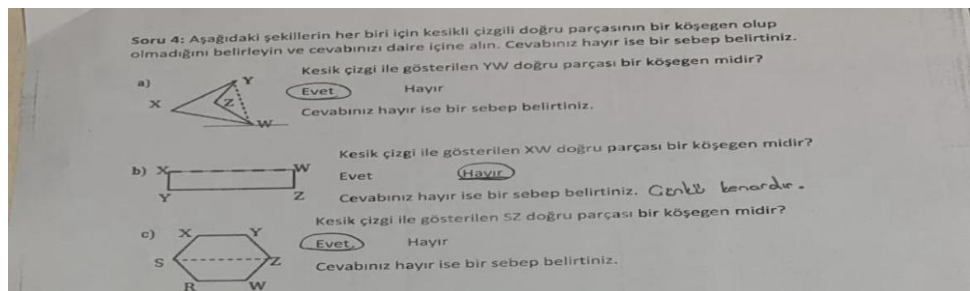


Figure15. Student K₂'s response to the fourth question

The response of the student coded K₂ is as follows:

b) because it is the edge

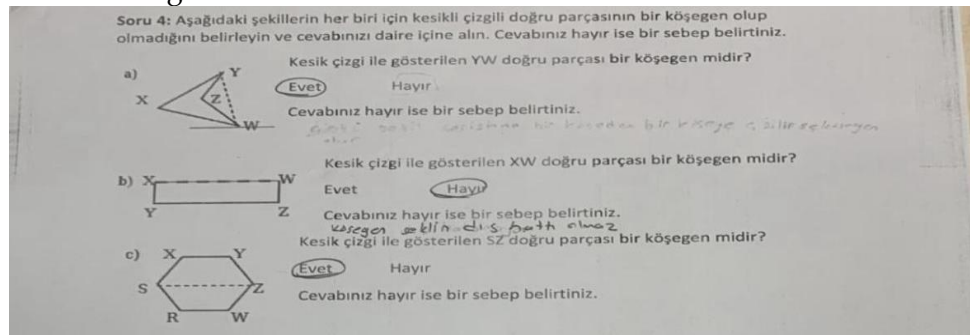


Figure16. Student K₁₃'s response to the fourth question

The response of the student coded K₁₃ is as follows:

b) cannot be out of diagonal shape

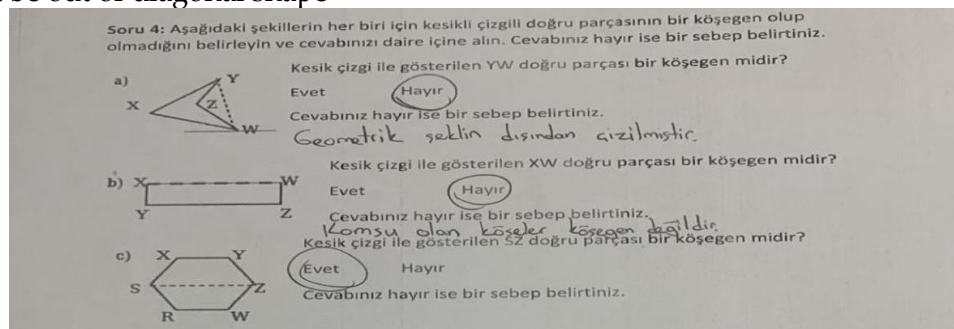


Figure17. Student K₁₇'s response to the fourth question

The response of the student coded K₁₇ is as follows:

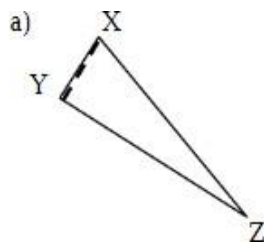
a) drawn from outside the geometric shape

b) Adjacent vertices are not diagonal

All students answered choice c of the fourth question correctly by answering "Yes". They did not give any explanation for saying yes. Therefore, no table was created and no quotation was made.

Question 5: Is there a height of the dashed line segment for each of the following figures

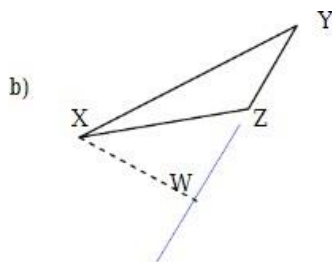
Determine that it is not, and circle your answer. If the answer is no, please give a reason.



Does the line segment XY line segment indicated by the dashed line indicate a height?

Yes No

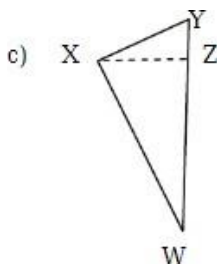
If the answer is no, please give a reason.



Does the line segment XW denoted by the dashed line indicate a height?

Yes No

If the answer is no, please give a reason.



Does the line segment XZ, denoted by the dashed line, indicate a height?

Yes No

If the answer is no, please give a reason.

Table 8. Answers to Question 5, Option A

Codes	Pre-Service Teachers	F	%
True	K ₃ , K ₁₄	2	%11
Partially Correct	K ₁₆ , K ₁₇	2	%11
Partially False	K ₅ , K ₆ , K ₇ , K ₁₀ , K ₁₁ , K ₁₈	6	%33
False	K ₁ , K ₂ , K ₄ , K ₈ , K ₉ , K ₁₂ , K ₁₃ , K ₁₅	8	%45
No Answer		0	

Table 8 shows that 2 of the students answered the question about whether the line segment with dashed lines in the figure given in the first option of the fifth question is a height correctly. These students explained that "if line segment XY is perpendicular to line segment YZ, then line segment XY is a height". 8 students gave partially incorrect answers to

this question. These students answered "No" to the question. Even though the answer was correct, their explanations were incorrect. Therefore, they were coded as "Partially Incorrect". Students generally stated that the edge cannot be a height. 2 students gave correct answers but did not give explanations. These were coded as "Partially Correct". The remaining 8 students answered incorrectly by saying "Yes". Therefore, they were coded as "Incorrect".

Table 9. Responses to Question 5, Option B

Codes	Pre-Service Teachers	F	%
True	K ₃ , K ₁₃	2	%11
Partially Correct	K ₁₅ , K ₁₇ ,	2	%11
Partially False	K ₁₈	1	%6
False	K ₁ , K ₂ , K ₄ K ₅ , K ₆ , K ₇ , K ₈ , K ₉ , K ₁₀ , K ₁₁ , K ₁₂ , K ₁₄ , K ₁₆ ,	13	%72
No Answer		0	

When Table 9 is analyzed, 2 of the students answered correctly whether the line segment with dashed lines in the figure given in choice B of the fifth question is a height. These students explained that "if line segment XW is perpendicular to line segment WY, then line segment XW is a height". 2 students answered "No" to this question and did not give any explanation. Therefore, it was coded as partially correct. 1 student answered "no" to this question but was coded as Partially Incorrect because he/she made the explanation incorrectly. This student stated that WZ would be a height. The remaining 13 students answered incorrectly by saying "Yes". Therefore, they were coded as "Incorrect".

Table 10. Responses to Question 5, Option C

Codes	Pre-Service Teachers	F	%
True	K ₃	1	%6
Partially Correct	K ₁₇	1	%6
Partially False		0	
False	K ₁ , K ₂ , K ₄ , K ₅ , K ₆ , K ₇ , K ₈ , K ₉ , K ₁₀ , K ₁₁ , K ₁₂ , K ₁₃ , K ₁₄ , K ₁₅ , K ₁₆ , K ₁₈	16	%88
No Answer		0	

Looking at Table 9, only 1 of the students answered correctly as to whether the line segment with dashed lines is a height as given in option C of the fifth question. This student explained that "if the line segment XZ is perpendicular to the line segment WY, then the line segment XZ is a height". 1 student answered "No" to this question and did not give any explanation. Therefore, it is partially encoded correctly. The other 16 students answered

incorrectly by saying "Yes". That's why they are coded as "False". Direct quotations for the fifth question are given below.

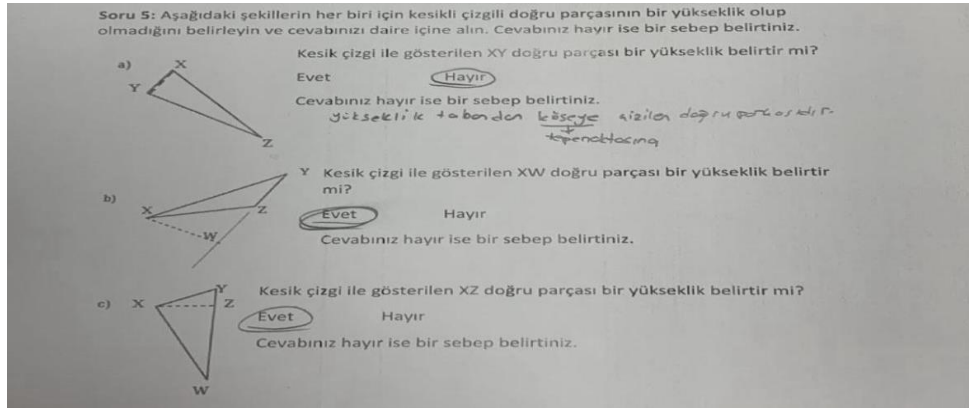


Figure 18. K₃'s answer to the fourth question

The response of the student coded K₃ is as follows:

- a) height is the segment drawn from the base to the corner

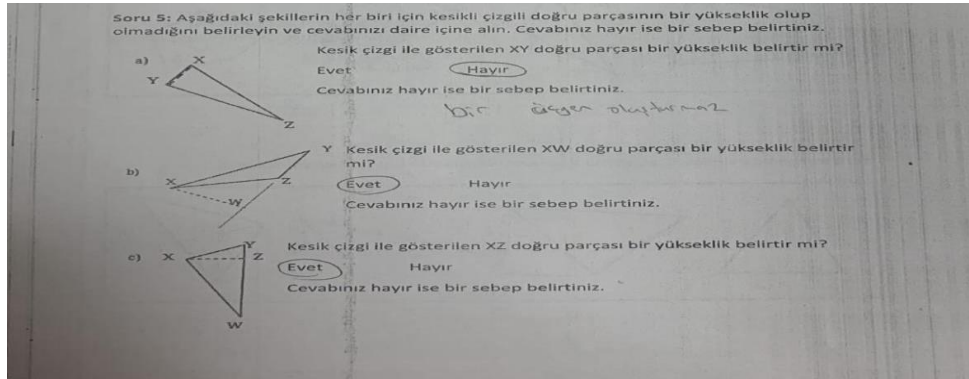


Figure 19. K₅'s answer to the fourth question

The response of the student coded K₅ is as follows:

- a) does not form a triangle

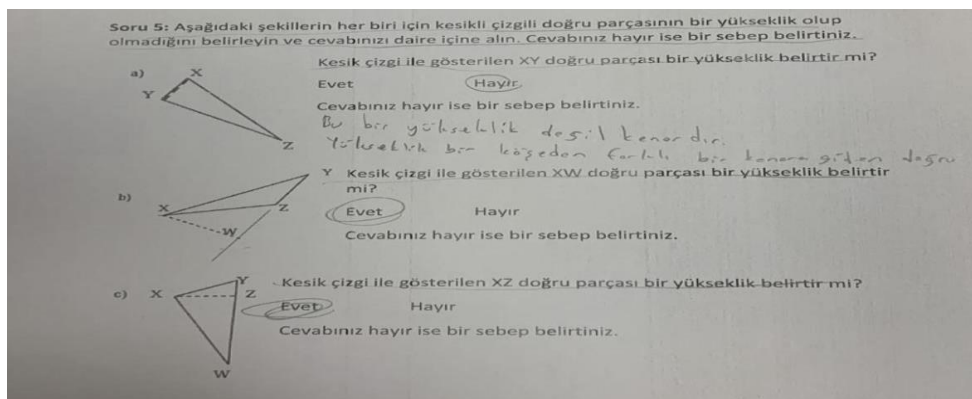


Figure 20. K₉'s answer to the fourth question

The response of the student coded K₉ is as follows:

- a) This is not a height but an edge. height is a line from a corner to a different edge

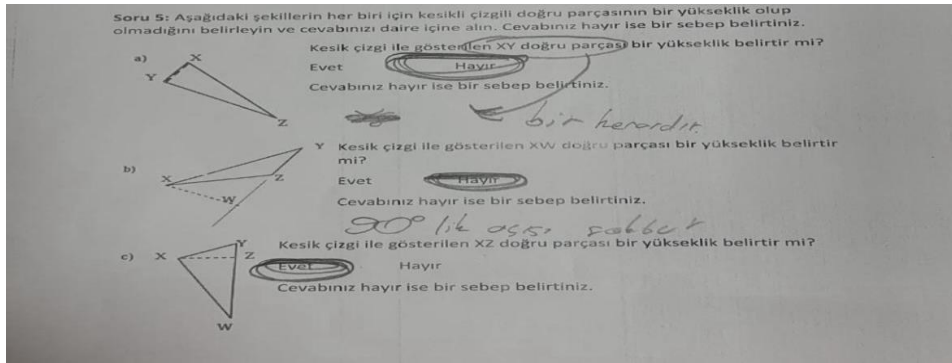


Figure 21. K₁₁'s answer to the fourth question

The response of the student coded K₁₁ is as follows:

- is an edge
- There is no 90 degree angle

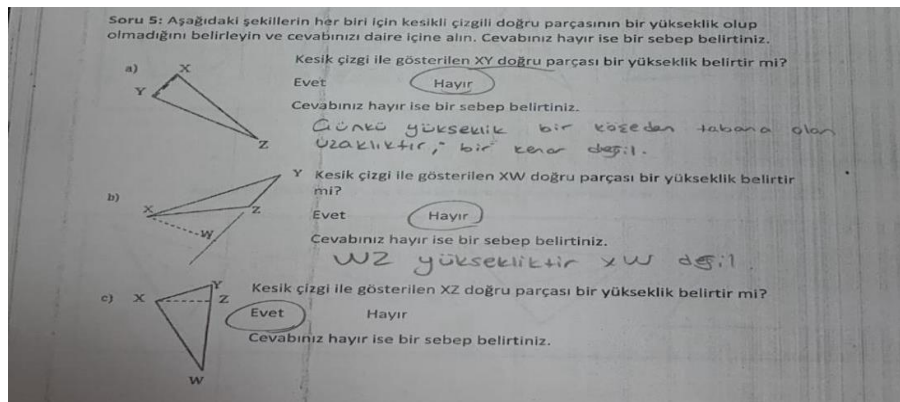


Figure 22. K₁₈'s answer to the fourth question

The response of the student coded K₁₈ is as follows:

- height is not an edge. Height is the distance from a corner to the base.
- WZ is the height. XW isn't the height.

Discussion and Conclusion

In this study, the errors found in the five-question knowledge test prepared for the height and diagonal subjects of the gifted students were examined. It was tried to determine whether there were errors in the solutions of the questions given in the knowledge test. The responses given to the knowledge test by gifted students were evaluated.

When gifted students were asked about the definition of the concept of height and diagonal, 2 of the students did not answer for the definition of the concept of diagonal, 3 of them were correct, 11 were partially correct and 2 were wrong; For the concept of height, 2 did not respond, 11 students gave partially correct and 5 incorrect answers. Until the 8th grade, the conceptual definition of height was not mentioned in the books, and this concept was shown to the students by drawing on the figure. In the 8th grade mathematics textbook (MONE, 2023), the concept of height is defined as "the line segment drawn perpendicular to the opposite side or extension of the triangle from one corner of the triangle is called the

height of that side" and "the distance between the bases" is defined for geometric objects. The concept of diagonal; It is defined as "a line segment connecting two non-adjacent vertices in a polygon" and "a line segment connecting two vertices that are not on the same face in a polyhedron" (Çoker & Karaçay, 1983). This concept was first included in the geometry learning area in the 5th grade elementary mathematics curriculum at the primary education level (MONE, 2023). Vinner (1991) stated that if students' thoughts about the concept are incorrect, the definitions may also be incorrect. Some of the students may be due to the fact that they do not have enough conceptual knowledge or their thoughts about the concept are wrong. Because the inability to learn geometric shapes conceptually can cause students to make incorrect definitions (Linchevsky et. al., 1992). Similarly, Şengün and Yılmaz (2021) stated that in their research, students confused the concept of height with different concepts and had difficulty in determining height. In addition, fifteen of the forty-seven pre-service teachers in the Aksu et al. (2013) research confused the concept of diagonal with the concepts of vertex and edge, and in the study conducted by Ayvaz et al. (2017), it was concluded that the pre-service teachers made the definition of the diagonal incorrectly or incompletely.

In the second question, gifted students were asked to draw diagonals for some geometric shapes. 4 of the students answered correctly, 10 partially correct, 3 partially incorrect, and 1 incorrect. This shows that the vast majority of students can draw diagonals for different geometric shapes and answer correctly. It can be said that this situation has emerged thanks to the constructivist education given within the scope of the special education that the students receive. It is seen that the students who make mistakes make mistakes, especially regarding the drawing of a diagonal in a triangle, and the students confuse the concept of diagonal with different concepts in the triangle. Owens (2005) also stated in his research that participants had difficulties in forming diagonals. When the literature review is done, there are studies that conclude that students believe in the existence of a diagonal in the triangle and look for a diagonal in the triangle in the questions asked (Pickreign, 2007). For gifted students, it is seen that the situation stated by İnan et al. (2015) is the opposite. It is extremely important to use GeoGebra, Cabri and other mathematics software and web 2 tools in classroom environments in geometry education (Şahin et al., 2023). Because GeoGebra and other mathematics software have the potential to be used in many subjects in our curriculum (Kaba et al., 2010). It is thought that mathematics

software and web 2 tools included in classroom environments in special education given for gifted individuals are effective in the emergence of this situation.

Gifted students were asked to draw heights for some geometric shapes in the third question. 2 of the students answered correctly, 8 partially correct and 8 incorrect answers. It is seen that the number of students who gave correct answers and those who gave wrong answers are close to each other. In the research conducted by Şahin et al. (2023) with secondary school students, it was determined that students similarly had problems in drawing heights. Moreover, in the study conducted with secondary school mathematics teachers, it was stated that the participants made a mistake while determining the center of perpendicularity of the wide-angle triangle, they could not draw the heights in the wide-angle triangle, and they could not show that the right sides in the right triangle are heights (Yurtyapan & Karataş, 2020). In line with these statements, it is thought that both students and teachers have problems in drawing heights. This situation coincides with the conclusion that knowing a subject is necessary but not sufficient for learning (Konyalıoğlu et al., 2012).

In the fourth question, gifted students were asked whether the line segment with a dashed line for some geometric shapes was a diagonal. Although the fourth question consists of three parts, 8 students answered the A option of the question correctly, 8 students answered incorrectly and 2 students partially answered incorrectly. In option A of the fourth question, the majority of gifted students made a mistake and it is seen that the students have deficiencies in drawing diagonals in concave polygons. Similarly, Cunningham and Roberts' (2010) pre-service teachers could not draw all the diagonals of concave polygons with the idea that the diagonals would pass through the polygon. For option B of the fourth question, 14 students, 2 students partially answered correctly and 2 students answered incorrectly, and it is seen that the majority of the students answered this question correctly. This shows that students do not confuse the concepts of edge and diagonal. Option C of the fourth question was answered correctly by all students. These results contradict the conclusion of the study by Duatepe et al. (2013) and Kuzniak and Rauscher (2007) that students in questions involving diagonals had low levels of reasoning. It can be thought that this situation is due to the fact that specially talented individuals have high-level reasoning skills. Saltık-Ayhanöz (2022) stated that gifted students can produce original and logical solutions to many mathematical problems that their peers cannot solve, and use mathematical formulas effectively. The ability of gifted students to solve problems in different ways with unusual

speed and accuracy, and their ability to relate mathematics to real life has also been mentioned (Fıçıcı & Siegle, 2008). It is thought that these characteristics of gifted students support their use of the mathematical reasoning approach.

In the fifth question, gifted students were asked whether the dashed line segment was a height for some geometric shapes. It is seen that the vast majority of students answer the questions incorrectly. İnan et al. (2015) stated that although students were visually aware of the concept of triangle and its types, they had difficulty and made mistakes while defining or drawing the concept of height. The result of the research coincides with the results of the research conducted by Yurtyapan and Karataş (2020).

As a result of the research, it was seen that there were some errors regarding the concept of diagonal and height in specially talented individuals. If the concepts in geometry education are not adequately understood, it will be difficult to achieve the expected goals in education (Dağlı, 2010). A correct understanding of the concept of height is very important, especially for geometry topics such as volume and area (Van De Walle, 2014). In this direction, it has been concluded that the concept of diagonal and height, which is the basis of many subjects in the geometry education of specially talented individuals, should be emphasized more.

Recommendations

In geometry education, teachers teach through presentation in order to train the subjects in the curriculum. This situation prevents the structuring of geometry concepts by students, so concept deficiencies may occur. A study by Oberdorf and Cox (1999) found that students have errors due to insufficient experience. He stated that students need concrete thinking in order to identify and understand their mistakes (Koester, 2003). In order to make the information concrete, students should be offered rich environments based on the problems and interaction in life in constructivist learning environments. For this reason, it is very important to create learning environments based on errors, where learning activities will be carried out in abundance in Mathematics and Geometry lessons, and learning by doing and experiencing can take place. It is thought that adopting an activity and application-oriented teaching based on errors instead of a content-intensive teaching in mathematics lesson will be more beneficial in learning the concepts correctly.

*Ethical Committee Permission Information**Name of the board that carries out ethical assessment: Niğde Ömer Halisdemir University**Social and Humanities Scientific Research and Publication Ethics Board**The date and number of the ethical assessment decision: 31.01.2024 and 2024/01-16**Author Contribution Statement*

Gülşah SALTİK AYHANÖZ: *Conceptualization, literature review, collection of data, review-writing and editing, editing the translation.*

Solmaz Damla GEDİK ALTUN: *Conceptualization, literature review, collection, processing, analysis of data, review-writing and editing, editing the translation.*

References

- Altıntaş, E. & İlgün Ş. (2017). Ortaokul matematik öğretmenlerinin geometride “yükseklik” ve “diklik merkezi” kavramına ilişkin kavram yanlışları [misconceptions of secondary school mathematics teachers regarding the concepts of "height" and "center of perpendicularity" in geometry]. *International Periodical for the Languages Literature and History of Turkish or Turkic*, 12(29), 73-86.
- Arabacı, D., & Kanbolat, O. (2023). Pre-service elementary mathematics teachers' evaluations of meetings with expert and peer participation based on Van Hiele geometric thinking levels. *International e-Journal of Educational Studies*, 7(15), 752-768. <https://doi.org/10.31458/iej.1345567>
- Ataman, A. (2003). Üstün zekâlı ve üstün yetenekli çocuklar (Ed: A. Ataman). *Özel gereksinimli çocuklar ve özel eğitime giriş* [gifted and gifted children (Ed: A. Ataman) *Children with special needs and introduction to special education*]. (s. 173-195). Gündüz Eğitim ve Yayıncılık.
- Ayvaz, Ü., Gündüz, N. & Bozkuş, F. (2017). Understanding of prospective mathematics teachers of the concept of diagonal. *Journal on Mathematics Education*, 8(2), 165-184.
- Bütüner, S. Ö. (2017). Matematik öğretmen adaylarının geometri alan bilgilerinin belirlenmesi: Açı, köşegen, yükseklik, dörtgen [Determination of mathematics teacher candidates' geometry field knowledge: Angle, diagonal, height, quadrilateral]. *Amasya Üniversitesi Eğitim Fakültesi Dergisi*, 6(2), 501-530.
- Cunningham, R. F., & Roberts, A. (2010). Reducing the mismatch of geometry concept definitions and concept images held by pre-service teachers. Erişim Tarihi: 7 Haziran 2023, www.k12prep.math.ttu.edu.tr
- Çoker, D. & Karaçay, T. (1983). *Matematik terimleri sözlüğü* [Dictionary of mathematical terms]. (1. Baskı). Türk Dil Kurumu Yayınları.
- Dağlı, H. (2010). İlköğretim beşinci sınıf öğrencilerinin çevre, alan ve hacim konularına ilişkin kavram yanlışları [Misconceptions of primary school fifth grade students regarding perimeter, area and volume]. Yüksek Lisans Tezi, Afyon Kocatepe Üniversitesi.
- Fazlı, E., & Avcı, Ö. (2022). Matematik eğitiminde motivasyon ve öz-düzenleme: Tek bir durum çalışması [otivation and self-regulation in mathematics education: A single case study]. *Harran Maarif Dergisi*, 7(1), 1-45.

- Fıçıcı A., & Siegle D. (2008). International teachers' judgment of gifted mathematics student characteristics. *Journal of Gifted Talented International*, 23(1), 22-37. <https://doi.org/10.1080/15332276.2008.11673510>
- Gutierrez, A. & Jaime, A. (1999). Pre-service primary teachers' understanding of the concept of attitude of a triangle. *Journal of Mathematics Teacher of Education*, 2(3), 253-275.
- Gül, Ş., & Sözbilir, M. (2015). Fen ve matematik eğitimi alanında gerçekleştirilen ölçek geliştirme araştırmalarına yönelik tematik içerik analizi [Thematic content analysis of scale development research in the field of science and mathematics education]. *Eğitim ve Bilim*, 40, 85-102.
- Gürefe, N. & Gültekin, S.H. (2016). Yükseklik kavramına dair öğrenci bilgilerinin incelenmesi [Examination of student knowledge about the concept of height]. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, 17(2), 429-450.
- Hızarcı, S., Ada, Ş. & Elmas, S. (2006). Geometride temel kavramların öğretilmesi ve öğrenilmesindeki hatalar [errors in teaching and learning basic concepts in geometry]. *Atatürk Üniversitesi Kazım Karabekir Eğitim Fakültesi Dergisi*, 13, 337-342.
- Jones, S., & Tanner, H. (2000). *Becoming a successful teacher of mathematics* (pp. 86-104). Routledge Falmer.
- Koester, B. A. (2003). Prisms and pyramids: Constructing three-dimensional models to build understanding, *Teaching Children Mathematics*, 9(8), 436- 442.
- Konyalıoğlu, A.C., Özkaya, M. & Gedik, S. D. (2012). Matematik öğretmen adaylarının konu alan bilgilerinin hataya yaklaşımları açısından incelenmesi [Examining the subject knowledge of mathematics teacher candidates in terms of their approach to errors]. *Iğdır University Journal of the Institute of Science and Technology*, 2(2SpA), 27-32.
- Linchevsky, L., Vinner, S., & Karsenty, R. (1992). To be or not to be minimal? Student teachers views about definitions in geometry. In W. Geeslin & K. Graham (Eds.), *Proceedings of the 16th international conference for the psychology of mathematics education* (pp. 48-55). Durham USA.
- Ministry of National Education [MONE], (2018). *Matematik dersi öğretim program [Mathematics course curriculum]*. MoNE Publications.
- Ministry of National Education [MONE], (2023). *Ortaokul 5. sınıf matematik ders kitabı [secondary school 5th grade mathematics textbook]*. MoNE Publications.
- Ministry of National Education [MONE], (2023). *Ortaokul 8. sınıf matematik ders kitabı [secondary school 8th grade mathematics textbook]*. MoNE Publications.
- Ministry of National Education [MONE], 1991. *Üstün yetenekli çocuklar ve eğitimleri raporu [gifted children and their education report]*. MoNE Publications.
- Miles, M. B., & Huberman A. M. (1994). *Qualitative data analysis: An expanded source book*. (2nd Edition). Sage Publications.
- Mullis, I.V.S., Martin, M. O., Foy, P., Kelly, D.L., & Fishbein B. (2019). *TIMSS 2019 International Results in Mathematics and Science*, Boston College, TIMSS & PIRLS International Study Center. Erişim Tarihi: 9 Haziran 2023
- NCTM. (2000). *Principles and standards for school mathematics*. NCTM.
- Owens, K. (2005). Substantive communication of space mathematics in upper primary school. *Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education*, 4, 33-40.
- Öçal, M.F. (2017). Geometri sorularındaki kavramsal hataları belirlemede geogebra'nın rolü [the role of geogebra in identifying conceptual errors in geometry questions]. *Erzincan Üniversitesi Eğitim Fakültesi Dergisi*, 19(3), 204-224.

- Paksu, A. D., İymen, E. & Pakmak, G. S. (2013). Sınıf öğretmeni adaylarının dörtgenlerin köşegenleri konusundaki kavram görüntüleri [Concept images of classroom teacher candidates on the subject of diagonals of quadrilaterals]. *Eğitim ve Bilim*, 38(167), 162-178.
- Saltık-Ayhanöz, G. (2022). The place of intelligence games in mathematics education for gifted students. In Zahal O. (Eds.), *Current research in edititon* (pp. 152-168), Gece Publishing.
- Sak, U. (2011). *Üstün zekâlılar: Özellikleri, tanulanmaları, eğitimleri* [Gifted people: Characteristics, diagnosis, education]. Maya Akademi.
- Siegle, D. (2001). Overcoming bias in gifted and talented referrals. *Gifted and Talented Communicator*, 32(3), 22-25.
- Şahin, M., Güven, M. B., & Cemalettin, I. (2023). Yükseklik kavramında ortaokul öğrencilerinin yaşadıkları zorluklar ve matematik öğretmenlerinin bu konudaki görüşleri [The difficulties experienced by secondary school students in the concept of height and the opinions of mathematics teachers on this subject]. *Neveşehir Hacı Bektaş Veli Üniversitesi SBE Dergisi*, 13(3), 1479-1502.
- Şengün, K. Ç., & Yılmaz, S. (2021). Ortaokul 8. sınıf öğrencilerinin üçgende açıortay ve kenarortay belirleme durumlarının incelenmesi [Examining the situations of 8th grade secondary school students in determining the angle bisector and median of a triangle]. *International Journal of Active Learning (IJAL)*, 6(1), 81-97.
- Taber, K. S. (2017). Neden üstün yetenekliler için fen eğitimi [why science education for the gifted]. Ed: *Gökdere, Üstün Yetenekliler İçin Fen Eğitimi*, 4-16.
- Türnüklü, E., Ergin, A.S., & Aydoğdu, M.Z. (2017). Examination of 8th grade students' problem posing studies on triangles. *Bayburt Eğitim Fakültesi Dergisi*, 12(24), 467-486.
- Van de Walle, J. A. (1998). *Elementary and middle school mathematics: Teaching developmentally*. Longman.
- Yanık, B. (2016). Kavramsal ve işlemsel anlama [conceptual and operational understanding]. E. Bingölbali, S. Arslan. & İ. Ö. Zembat (Ed.), *Matematik eğitiminde teoriler* [theories in mathematics education] (pp. 101-114). Ankara: Pegem Publishing.
- Yenilmez, K., & Yaşa, E. (2008). İlköğretim öğrencilerinin geometrideki kavram yanlışları [Primary school students' misconceptions in geometry]. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 21 (2), 461-483.
- Yıldırım, A. & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştırma yöntemleri* [Qualitative research methods in the social sciences (10th ed.)]. Seçkin Publishing.
- Yin, R. (1984). *Case study research: Design and methods* (3th ed.). Sage publications.
- Yurtyapan, M. İ., & Karataş, İ. (2020). Examination of secondary school mathematics teachers' pedagogical content knowledge on the subject of triangles and quadrilaterals]. *Turkish Journal of Computer and Mathematics Education*, 11(1), 53-90.
- Zembat, İ. Ö. (2015). Kavram yanlışısı nedir? [What is a misconception?] M. F. Özmantar, E. Bingölbali ve H. Akkoç (Ed.), *Matematiksel kavram yanlışları ve çözüm önerileri* (4. Baskı, s. 1-8). PegemA Yayıncılık.

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article

Teacher-Related Demotivating Factors Reducing Students' L2 Learning Motivation

Müjgan BEKDAŞ¹  Sami BASKIN^{2,*} 

¹ Malatya Turgut Özal University, Malatya, Turkey mujgan.bekdas@ozal.edu.tr

² Tokat Gaziosmanpaşa University, Tokat, Turkey sami.baskin@gop.edu.tr


* Corresponding Author: sami.baskin@gop.edu.tr

Article Info

Received: 10 May 2024

Accepted: 02 September 2024

Keywords: Demotivation, teacher-related factors, students' learning motivation, L2 learning

 10.18009/jcer.1482025

Publication Language: English

Abstract

This study aims to reveal the factors caused by the teacher that reduce the motivation of the student towards learning Turkish. The findings indicated that demotivating factors were teachers' instructional styles and teaching skills, teaching method, the teacher's personality, the teacher's attitude, the teacher's behaviors, the teacher's classroom management skills, the teacher's competence, the teacher's commitment to the job. This study theoretically extends previous demotivational measurements and the conceptual frameworks of L2 demotivational factors from English language learning to L2 Turkish learning. Also, It is important in terms of notable pedagogical implications are provided for L2 Turkish educators to reveal the demotivational constructions and to stimulate the motivation of L2 Turkish students. In addition, It is essential for taking some remedial measures and taking into account the needs and expectations of the students while determining the teaching methods.



To cite this article: Bekdaş, M. & Baskın, S. (2024). Teacher-related demotivating factors reducing students' l2 learning motivation. *Journal of Computer and Education Research*, 12 (24), 549-567. <https://doi.org/10.18009/jcer.1482025>

Introduction

In general terms, motivation means taking action to do something. L2 motivation can be described as a "combination of effort plus a desire to achieve the goal of learning the language plus favourable attitudes toward learning the language" (Gardner, 1985, p. 10). Moreover, student motivation naturally relates to the eagerness of learners to take part in the educational process. But it also has to do with the reasons or purposes underlying their participation or absence from academic activities (Bayraktar, 2015). While it is observed that some of the students in educational institutions are willing to produce solutions to the lesson, the subject or the problem encountered, it is observed that some other students are reluctant in the lessons and prefer to escape rather than struggle in producing solutions to the problems they encounter. At the beginning of the factors affecting the formation of this

difference between students is motivation. One of the most essential aspects influencing the efficacy of the learning-teaching process is motivation, as it is effective in energizing the individual and making him willing to behave (Akbaba, 2006). The impact of motivation on learning has been studied in many different languages. For example, L2 motivational situations were highly related with positive feelings but negatively correlated with negative counterparts among Italian secondary school learners (MacIntyre & Vincze, 2017). Accordingly, in the Saudi context, motivation totally influenced L2 learners' willingness to communicate and the perception of learning enjoyment for university English students (Alrabai, 2022). The finding of Kruk (2022) mirrored this pattern by stating that lower levels of anxiety and boredom were associated with higher levels of willingness to communicate and motivation in the Poland English learning context. And again, the findings of Lan, et al. (2023) indicated that L2 enjoyment mediated the association between L2 motivational intensity and L2 willingness to communicate. Additionally, both shyness and L2 boredom moderated the slope between L2 enjoyment and L2 willingness to communicate. However, this pattern has seldom been investigated in the L2 Turkish learning context, especially from the perspective of demotivational constructions. It is, therefore, intriguing and paramount to validate this pattern as the intricate relationship might vary across languages, participants, and contexts.

The effect of motivation on the language learning process has been proven and it has been determined that the key to proficiency and success in language learning is motivation (Spolsky, 1989). However, many negative effects on students' motivation occur during the target language learning process. Many academics emphasized motivation and explored strategies that might have a good impact on students (Dörnyei, 1994). There are, however, other elements that deter pupils from wanting to learn a foreign language and result in a lack of language proficiency. Demotivation, the opposite of motivation, has recently caught the attention of scholars and educators (Ghanizadeh & Jahedizadeh, 2015). Similar to motivators, demotivators lower students' desire to learn. These elements may contribute to pupils' lack of proficiency in learning foreign languages.

To bridge the aforementioned research gaps and improve the field forward, the current study serves as an initial attempt to research the demotivational factors in the L2 Turkish learning context. This study differentiates from previous research in considering the demotivational factors stemmed from the teacher by using interview for more detailed

information beyond quantitative data. Moreover, this study aims to enlarge the existing research scope to L2 Turkish language space from the point of demotivational factors caused by the teacher.

What is Demotivation?

Demotivation can be defined to be any power that lowers learners' motivation to learn or a lack of a desire to put forward an effort (Zhang, 2007). According to Küpers (2001), demotivation is not just a reversal of motivation. Demotivation contains more than inaction or unmotivated behavior. It can also indicate engaging in wrong or counterproductive directions. Aydın (2012) expresses demotivation as a lack of effort, need, and desire. These factors that negatively affect students can be caused by the student himself, the teacher, or many environmental reasons. Whatever the source of demotivation, it negatively affects the learning process (Lu, et al. 2023).

Literature Review

In his study, Dörnyei (2001) revealed the factors that reduce the motivation of students in countries where English is taught as a second language. These are factors originating from the teacher (teacher's personality, competencies, teaching methods, etc.), inadequate learning conditions (crowded classrooms, unsuitable class levels, or frequent changes of teachers), student's decreased self-confidence because of experiences of failure, negative manner towards the learned foreign language. (Lack of interest, obligatory foreign language learning, textbooks used in the course, and boring learning materials.

Inspired by Dörnyei's (2001) studies, many researchers have investigated the factors that decrease the motivation of foreign language learners (Arai, 2004; Falout & Maruyama, 2004; Hasegawa, 2004; Ikeno, 2002; İsaoglu & Emir, 2020; Kikuchi & Sakai, 2009; Quadir, 2021).

Ikeno (2002) investigated demotivation by interviewing 65 university students about their motivation and demotivation experiences. And he discovered some demotivating factors, such as sense of lack of control over what one is learning, doubts about teachers' abilities, doubts about teachers' character, a perception that courses are just focused on exams, self-doubt over one's English proficiency, and classmates' negative for learning the language. Hasegawa (2004) studied on both junior and senior high school students and asked them about their experiences of demotivation. He conducted a qualitative analysis of the data and discovered that teacher-related events were the most commonly reported as a

source of demotivation. According to the findings of the investigation, improper instructor behaviors may have a "significant influence" on student's lack of motivation. Falout and Maruyama (2004) looked into whether demotivating factors before starting college varied between beginner and advanced English students. They noticed that the demotivating factors for the beginner group were self-confidence, perceptions towards the second language itself, classes, teachers, and attitudes of members of the group (in decreasing order), while for the advanced group, self-confidence was the demotivating factor with the other factors being neutral. Arai (2004) questioned 33 university students if they experienced demotivating experiences in foreign language lectures, as well as to describe those events and their immediate reactions to them. The majority of the participants majored in English and were deemed fluent in the language. She gathered 105 comments and classified them into four categories: (a) instructors' attitude or personality, (b) dull or monotonous lessons, (c) classroom atmospheres, and (d) others. The leading group, instructors, accounted for 46.7% of the total, followed by dull lessons (36.2%), class atmospheres (13.3%), and others (3.8%). Kikuchi and Sakai (2007) recently investigated probable demotivating variables and extracted five components: (a) textbooks, (b) insufficient school resources, (c) exam results, (d) non-communicative techniques, and (e) teachers' competence and teaching styles. Kikuchi and Sakai (2007) determined that the factor Insufficient School Resources was less demotivating to their participants than the other four criteria, textbooks, exam results, non-communicative approaches, and teachers' competence and teaching styles.

Certain instructional elements, according to Quadir (2021), influence students' motivation. In addition, he investigated which instructional characteristics had a negative impact on students' enthusiasm to study English in Bangladesh. Teachers' instructional techniques and teaching methods, private lesson, teachers' character and behavior, teachers' competency and class management, and instructors' manner and devotion are listed as the five primary characteristics that negatively impact students' motivation in descending order.

It is well acknowledged that motivation is one of the most significant factors in learning a new language. But, in the literature review, it was observed that the factors that decrease the motivation of the students in teaching Turkish as a foreign language were not investigated much. When the Turkish literature was examined, it was determined that some studies were carried out on motivation (Abubakari, 2016; Barın, 2008; Biçer, 2016; İsaoglu & Emir, 2020; Mohamed, 2019; Yılmaz & Arslan, 2014). Abubakari (2016) evaluated the

motivation levels of students only in terms of high and low motivation and aimed to compare the motivation levels of Turkish students learning English and international students learning Turkish.

In his study, Barın (2008) offered suggestions to the instructors to increase motivation, such as arousing students' curiosity, making the student realize the importance of language learning and enjoying it, and planning the lesson in a way that the student would not get bored. Mohamed (2019) aimed to reveal the motivational status of graduate students learning Turkish as a foreign language in his study. And he concluded that the participants were motivated instrumentally and holistically. It was observed that students have more instrumental motivation. Yılmaz and Arslan (2014) aimed to determine students' motivation problems in their studies. They found out that the most important motivation problem of the students was caused by external reasons. İsaoglu and Emir (2020) studied demotivational factors in learning English and indicated that the main factors related to the class environment, course materials, experience of failure, and teacher-related factors are found as demotivators.

The Present Study

Despite the fact that some prior studies have documented the demotivational factors on L2 learning, few could shed light on the demotivational factors stemmed from the teacher in the L2 Turkish learning context with detailed information gathered from qualitative research.

This study theoretically extends previous demotivational measurements and the conceptual frameworks of L2 demotivational factors from English language learning to L2 Turkish learning with the following research question:

- What are the teacher-related factors that reduce the motivation of students learning Turkish as a foreign language?

Method

Research Design

In this study, a case study, one of the qualitative research designs, was used. The aim here was to make a detailed examination of a particular situation and to draw conclusions. The factors (environment, individuals, events, processes, etc.) related to the examined

situation were investigated with a holistic approach and focused on how they affect the relevant situation (Yıldırım & Şimşek, 2013, p. 83). Within the scope of the research, the holistic single-case model of the case study (Yin, 1984) was preferred. In holistic single case studies, the "unit of analysis" forms the basis of the case. This unit of analysis can sometimes be an individual, an event or an institution (Rowley, 2002). The unit of analysis in this study is "students learning Turkish as a foreign language". Another important concept is the "single situation to work in". The choice of the situation to be studied is determined according to the purpose, question and theoretical framework of the study (Rowley, 2002). In this context, the situation to be studied was determined as "teacher-related demotivating factors that reduce students' motivation".

Participants

A purposive sampling technique was preferred in this study since the subject was tried to be examined in depth and in detail (Yıldırım & Şimşek, 2013). The participants of the study consisted of 12 students in total using maximum diversity sampling. The students participating in the interview were selected from as many different nationalities as possible and the age ranges of these students are similar. 6 of the students are girls and 6 of them are boys. The students who participated in the interview were given code names in terms of the confidentiality of the interview data. Also, the voluntary nature of participation stressed, and each participant signed a voluntary consent form. In order to enable the students to express themselves comfortably, the researcher and the interviewees had no any communication before. The demographic data of the interviewed students are given in Table 1.

Table 1. Demographic data of the students who participated in the interview

Rank	Code Name	Gender	Nationality	Age	Number of language they know
1	S 1	Female	Iranian	21	1(Persian)
2	S 2	Male	Azerbaijan	19	1(Azerbaijani Turkish)
3	S 3	Female	Syrian	22	1(Arabic)
4	S 4	Male	Afghanistan	19	2(Persian, English)
5	S 5	Female	Syrian	20	1(Arabic)
6	S 6	Male	Syrian	20	1(Arabic)
7	S 7	Female	Kazakhstan	27	1(Kazakh Turkish)
8	S 8	Male	Syrian	23	1(Arabic)
9	S 9	Female	Syrian	21	1(Arabic)
10	S 10	Male	Iranian	21	1(Persian)
11	S 11	Female	Uyghur	20	2(Uyghur Turkish, English)
12	S 12	Male	Syrian	19	1(Arabic)

Data Collection Tools

Research data were collected by interview. Interviewing can be described as “a mutual and interactive communication process based on questioning and answering, conducted for a predetermined and serious purpose” (Stewart & Cash, 2011). Interviews were conducted using a semi-structured interview form with students studying at a Turkish teaching application and research center. The semi-structured interview was preferred because it provided the researcher with the opportunity to ask additional questions (Glesne, 2010). With this approach, all questions were asked in the same order to all participants in the same way. Thus, the subjective judgments of the researcher were minimized and the comparison and analysis of the data obtained were easier (Yıldırım & Şimşek, 2013). The interview form questions used in the research were created using the literature (Kim, 2009; Quadir, 2021). In the development of the interview forms, expert opinion was sought regarding the "content validity" of the interview forms. In line with the suggestions of the experts, the connection of the questions in the forms with the subject, their ordering within a certain logic, and language errors were examined and necessary changes were made. Miles and Huberman (1994) reliability formula ($\text{Reliability} = \text{Consensus} / (\text{Consensus} + \text{Disagreement})$) was used to measure the reliability of the current form created and the agreement rate among experts was determined as 90%. It is expected to be at least 80% (Miles & Huberman, 1994; Patton, 2002).

The interview form consisted of the questions teachers' instructional styles and teaching skills, the teachers' teaching method, teachers' personality, teachers' attitude, teachers' behavior, teachers' classroom management skills, teachers' competence, teachers' commitment to work.

At the end of each interview, the participant was asked to add situations that were not listed in the protocol but that reduced the student's own motivation.

Data Collection

The interviews were conducted in Turkish. The purpose of the first two questions was to break the ice. Everyone who took part in the interview was ready to share their experiences. The objective and topic of the interview were explained to the participants a day or two before the interview, and they were given time to reflect on their previous experiences and impressions of the issue. Moreover all participants were first informed that

their identifiable information would be hidden and the principles of science ethics would be adhered to, and they were reminded that the data to be collected would not be used for other than scientific purposes and that they could stop the interview at any stage of the research if desired.

The interview was held with 12 foreign students studying at a Turkish teaching application and research center. The interview was conducted in a quiet environment away from the factors that would negatively affect the participant. The interview took an average of 40 minutes for each participant. Interview questions were asked to each participant in the same way and in the same order. During the interview, the data were recorded with the consent of the student participant. The researcher recorded the information from the interview without making any changes, and a colleague verified the correctness.

Analysis of Data

The qualitative data analysis method developed by Miles and Huberman was used to analyse the gathered data (1994). Three processes of data analysis were proposed by Miles and Huberman: reduction, presentation, drawing conclusions, and verification. By developing matrices, variables, and codes based on the opinions of the students, the qualitative data acquired from the interviews was condensed and shown. First, the data obtained from the interviews were transcribed. Then the data were coded separately by both researchers and the coding was compared for verification. Finally, the coding was reorganized and tabulated in line with expert opinions.

Validity and Reliability

Internal validity: In order to increase the internal validity, the interviews were conducted in a quiet environment and were recorded with a voice recorder with the permission of the participant in this process. Afterwards, the interviews were transcribed and a copy was given to the participant within the scope of ethical rules and consent was obtained. In addition, the interview form was presented to the expert opinion and some corrections were made in line with the suggestions. In addition, the statements of the participants in the interview were given as direct quotations in the findings section to support the internal validity. In the findings section, the statements of the participants were supported by giving direct quotations.

External validity: External validity was tried to be provided by the demographic data of the study group, the methods and reasons used in the research, the participant statements provided that direct quotations are given without any changes and all sections are explained in detail.

Internal confidence: In the findings section, the data are given as direct quotations without comment, and the codes and factors that have been revealed were presented to the expert opinion and necessary corrections were made.

External confidence: In order to understand whether the results of the research and the findings are consistent, these two departments were presented to two academicians who are experts in their fields and the results obtained were confirmed.

Findings

Teacher-related factors that negatively affect the motivation of students to learn Turkish as a foreign language were examined under eight different categories. Based on the interviews, these factors were given in the table below, from the most stated to the least stated by the students.

Table 2. Teacher-related factors negatively affecting the motivation of students learning Turkish as a foreign language

Factors	Name of the participants mentioning the point	%
Factor 1 Teachers' instructional styles and teaching skills	All	100
Factor 2 The teachers' teaching method	All	100
Factor 3 Teachers' personality	S1, S2, S3, S4, S5, S6, S7, S9, S11, S12	83
Factor 4 Teachers' attitude	S1, S2, S3, S4, S5, S7, S10, S11, S12	75
Factor 5 Teachers' behavior	S1, S2, S3, S6, S7, S9, S10, S11, S12	75
Factor 6 Teachers' classroom management skills	S2, S4, S5, S7, S8, S9, S10, S11, S12	75
Factor 7 Teachers' competence	S1, S2, S5, S6, S8, S10, S11, S12	66
Factor 8 Teachers' commitment to work	S1, S2, S3, S4, S7, S8, S11, S12	66

As a result of the analysis, a separate table was created for each factor and the codes and participants for each factor were shown separately. The codes in each table were supported by giving direct quotations from the statements obtained from the interviews of the participants.

Factor 1: Teachers' instructional styles and teaching skills

According to the data obtained from the students' interviews, it was determined that the teacher's instructional styles and teaching skills emerged as the most significant factor (100%) that reduced the students' motivation to learn. The codes and participants for this factor were given in Table 3.

Table 3. Teachers' instructional styles and teaching skills

Codes	Participants
Does not encourage writing in own words	All
Not making creative writing practices but making memorized writings	All
Little or no group work	S1,4,5,6,10
Using only textbooks	S1,6,7,9
Encourage memorization of conversational dialogues only from books	S6
Not practicing interesting or effective grammar	S1,2,4,5,6
Not providing guidance to improve our Turkish language skills	S11, 5

When Table 3 is examined, 7 codes related to the teacher's teaching style and skill category were created. Accordingly, the students stated that the teachers neglected writing skills, only taught lessons based on the textbook, and did not use more entertaining methods such as group work. They emphasized that this situation caused them to have low motivation. Moreover, the data in Table 3 was tried to be supported by quoting directly from the answers given by the students to the question "How do you feel about the orientation skill and style your teacher uses in the classroom? Does it affect your motivation to learn?". For example, S4, one of the participants, explained the reason for his low motivation by saying "The teacher only makes activities from the textbook. It would be better if he uses other materials such as videos and daily life. Thus, my interest in the lesson will increase". S5, one of the participants, explained the situation that negatively affected her motivation with the following sentences: "Some grammar topics in Turkish are really difficult. I have difficulties sometimes. Maybe if the teacher explained these topics in more fun ways, it would be more memorable. And we can learn more easily."

Factor 2: The teachers' teaching method

According to the data obtained from the students' interviews, the teaching method used by the teacher was the factor that reduced student motivation. The codes and participants for this factor were given in Table 4.

Table 4. The teachers' teaching method

Codes	Participants
Teacher-centered boring lessons	All
Little/no classroom activities related to oral communication	S4,5,7,9
Too much emphasis on grammar	S1,4,6,10
Not using the demonstration method	S1,5
Not giving the student the opportunity to ask questions	S3,4,5

When Table 4 is examined, 5 codes related to the teacher's teaching method category were created. According to this, the students stated the fact that the teachers taught boring lessons that were mostly teacher-centered while focusing on grammar subjects, they were less active on speaking and did not give them the opportunity to ask questions. As a result of these, they stated that they had low motivation towards learning. In this section, the data in the table was tried to be supported by quoting directly from the answers given by the students to the question "What do you think about the teaching method your teacher uses in the classroom? Does it affect your motivation to learn?"

For example, S4, one of the participants, stated that his motivation towards the lesson sometimes decreased and explained this situation with the following sentence: "When I asked the same question several times because I did not understand a subject, the teacher's attitude changed and he did not want to answer it." S1, one of the participants, explained her low motivation by saying "I don't like boring lessons. I get bored when the teacher only talks about the subject and we listen passively. Maybe the teacher can do different things."

Factor 3: Teachers' personality

According to the data obtained from the students' interviews, the personality of the teacher has emerged as the factor that reduces student motivation. The codes and participants for this factor were given in Table 5.

Table 5. Teachers' personality

Codes	Participants
Passing through difficult issues quickly and being impatient with us	S1,4,5,11
To be angry	S1,2,3,4,5,6,7,9,12

When Table 5 is examined, 2 codes were created for the teacher's personality category. Accordingly, the students stated that the teachers were sometimes angry with themselves, were not more tolerant, and were impatient with the students by passing the difficult subjects quickly, irrespective of nationality and gender. In this section, the data in the table was tried to be supported by quoting directly from the answers given by the

students to the question "What do you think of your teacher's personality? Does it affect your motivation to learn?"

For example, S11, one of the participants, expressed her views as "The teacher is a little impatient and angry with me. Because I understand a little late and I have difficulties. She has to explain a little more, but she doesn't sometimes. It's like she gets angry."

Factor 4: Teachers' attitude

According to the data obtained from the students' interviews, the attitude of the teacher emerged as the factor that reduced student motivation. The codes and participants for this factor were given in Table 6.

Table 6. Teachers' attitude

Codes	Participants
Paying more attention to good students in the class	S1,2,3,4,5,7,10
Neglecting poor-performing students	S1,2,3,4,5,10,11,12
More caring to students of a certain gender	S4

When Table 6 is examined, 3 codes related to the teacher's attitude category were formed. Accordingly, students stated that teachers neglected students with poor performance and showed more interest in students with high performance. They said that this situation created an unwillingness to learn in them. Also, one male student said that some teachers discriminated against gender. He stated that this situation also upsets him. In this section, the data in the table was tried to be supported by quoting directly from the answers given by the students to the question "How do you feel about your teacher's attitude towards you in the classroom? Does it affect your motivation to learn?"

For example, S5, one of the participants, expressed her concern with the following sentence: "The teacher spends more time with successful and quick-to-understand students. She does not want to deal with me. Because I understand late. This makes me sad.". Another male participant S2 stated the negative effect of teacher attitude on student motivation with the words "My teacher sometimes treats girls much better. I feel sorry for this".

Factor 5: Teachers' behaviours

According to the data obtained from the students' interviews, the teacher's behaviors emerged as the factor that reduced student motivation. The codes and participants for this factor were given in Table 7.

Table 7. Teacher's behaviors

Codes	Participants
Critical behavior towards students' mistakes	S1,3,6,7,9
Does not encourage students to overcome their weak areas	S1,2,3,7,9,10,11,12

When Table 7 is examined, 2 codes related to the category of teacher behaviors were created. Accordingly, the students stated that the teachers sometimes acted critically against the mistakes made by the students and did not support the students in terms of improving their weaknesses. In such a situation, they stated that their motivation decreased and they emphasized that their participation in the lesson decreased because they were afraid of making mistakes. In this section, the data in the table was tried to be supported by quoting directly from the answers given by the students to the question "How do you feel about your teacher's behavior towards you in the classroom? Does it affect your motivation to learn?"

For example, S9 expressed her feelings with the following sentences: "Sometimes I don't fully understand Turkish and I make mistakes. Our teacher is actually very patient, but sometimes she can't be tolerant and reacts when I make too many mistakes. I wish it wasn't like that."

Factor 6: Teachers' classroom management skills

According to the data obtained from the students' interviews, the teacher's classroom management skills emerged as the factor that reduced student motivation. The codes and participants for this factor are given in Table 8.

Table 8. Teacher's classroom management skills

Codes	Participants
Not including all students in classroom activities	S2,4,5,9,11,
Failure of all students to focus on the lesson	S7,10
Inability to manage the noise in the lesson	S8,11,12
Not interacting with all low-performing students	S10,11

When Table 8 is examined, 4 codes were created for the teacher's classroom management skills category. Accordingly, the students stated that the teachers sometimes could not include all the students in the activities and could not focus the attention of the whole class on the lesson. In addition, they stated that sometimes the teacher could not manage the noise in the classroom and stated that these situations caused low motivation in them. In this section, the data in the table was tried to be supported by quoting directly from the answers given by the students to the question "How do you feel about your teacher's classroom management skills? Does it affect your motivation to learn?"

For example, S12, one of the participants, explained the situation that affects his motivation by saying "Sometimes there can be a lot of noise in the classroom. I can't concentrate. Our teacher is a very good person, but discipline is also important."

Factor 7: Teachers' competence

According to the data obtained from the interviews with the students, the competency of the teacher emerged as the factor that lowered the student's motivation. The codes and participants for this factor were given in Table 9.

Table 9. Teacher's competence

Codes	Participants
Giving unclear and unorganized instructions in the classroom	S2,6
Go through difficult topics quickly	S1,5,8,10,11,12

When Table 9 is examined, 2 codes related to the teacher's competence category were created. According to this, the students stated that the teachers sometimes passed the difficult topics quickly and the instructions were in a mess without being clear and understandable. They also stated that these situations cause low motivation in them. In this section, the data in the table was tried to be supported by quoting directly from the answers given by the students to the question "How do you feel about your teacher's competence? Does it affect your motivation to learn?".

For example, S2, one of the participants, explained the factor affecting his learning as follows: "The teacher sometimes has difficulty in explaining abstract concepts, and when we do not understand, she passes the subject quickly." Another participant S3 stated that sometimes in-class directions could not be made clearly, with the words "Sometimes I don't understand what the teacher is saying, I don't quite decide what to do about the activity. Because I don't think the teacher explains it fully".

Factor 8: Teachers' commitment to work

According to the data obtained from the students' interviews, the teacher's commitment to work emerged as the factor that lowered student motivation. The codes and participants for this factor are given in Table 10.

Table 10. Teacher's commitment to work

Codes	Participants
Usually finishes early	S1,2,3,4,7,8
Does not seriously motivate students to learn Turkish	S11,12

When Table 10 is examined, 2 codes were created for the category of teacher's commitment to his work. Accordingly, students stated that some teachers usually finish the course early and motivate them less towards learning Turkish. In this section, the data in the table was tried to be supported by quoting directly from the answers given by the students to the question "How do you feel about your teacher's commitment to his/her job? Does it affect your motivation to learn?"

Half of the participants stated that the teacher always finished the lesson early and explained that this situation created a reluctance towards the lesson in them. One of the participants, S11, supported this situation with the words "Our teacher usually leaves the class before the lesson ends".

Conclusion and Discussion

This study was carried out to reveal the teaching factors that negatively affect students' motivation in teaching Turkish to foreigners. In this context, a qualitative analysis of students' perceptions of teacher practices in Turkish teaching was made and the factors affecting the dynamic nature of student-teacher interactions were revealed.

Twelve L2 Turkish students were interviewed about the factors that reduce their motivation. In consequence of the interviews, it was determined that the factors that decrease the motivation of the students in the classroom are, in decreasing order, teachers' instructional styles and teaching skills, the teacher's teaching method, the teacher's personality, the teacher's attitude, the teacher's behaviors, the teacher's classroom management skills, the teacher's competence, the teacher's commitment to the job. Under these factors, sub-codes were created explaining the teacher-induced reasons underlying students' indifference towards the lesson.

The most noted codes by students are that teachers do not attach much importance to the development of writing skills, do not do different and fun activities, prefer to use textbooks all the time, focus too much on grammar teaching, and neglect communicative skills. When the demographic data of the participants who produced these codes are analysed, these codes do not vary according to the gender, nationality or the number of languages they know. Because these behaviours can affect the motivation of all students. In addition, it is among the codes stated by the students that the teachers prefer the teacher-centered lecture method that makes the student passive. It is also among the codes that the teacher gives more importance to the successful students but neglects the students with low

performance. Only one male student among the codes stated that the teacher was more compassionate and tolerant towards female students. There was no such code from the class in general. However, it can be thought that the distinction between male and female students in the classroom environment negatively affects student motivation. Many students also stated that the teacher, who cannot successfully manage the classroom, affects student motivation negatively. In addition, the codes of leaving the course early and not motivating students to learn in the real sense were also stated by the students a lot.

When the results of the studies done in other countries were compared with this study, they were parallel with the result of this study. In his research, Quadir (2021) discovered five unique elements that have a negative impact on student motivation. Teachers' instructional techniques and teaching methods, private tutoring, teachers' personality and behavior, teachers' competency and classroom management, and instructors' attitude and commitment were recognized in descending order.

According to Juybar and Rahimi (2021), the teacher had a crucial influence in learner motivation. Al-Khasawneh (2017) studied the demotivating factors of learning English among Saudi learners and discovered six factors that affect English learning among those students (classroom characteristics, teacher's behavior, curriculum content, and educational materials, impacts of poor test results, classroom atmosphere, and a lack of confidence and curiosity). These findings are similar to the results of our study.

According to Ghanizadeh and Jahedizadeh (2015), the teacher is the most influential external element in influencing students' failure. In other words, teachers' positive reinforcement and backing of students can decrease students' negative impressions of failing and push them to consider such experiences as a path to success rather than an impediment. As a consequence, this data strongly validates the findings of this study.

Dang et al., (2021) studied on factors influencing the motivation of students towards learning English and found parental, environmental, teacher's, and intrinsic (personal) factors. Chong et al., (2019) studied on demotivation in L2 classrooms and indicated that both teacher-related factors, such as inadequate teaching methods and attitudes, as well as learner-related factors, mostly resulting from internal problems like low self-esteem or low self-worth, had an impact on learner demotivation.

Effective and permanent teaching practices are a challenging and complex process and largely depend on the capacity of teachers (Fullan, 2007). This study is important in

terms of taking some remedial measures based on the results obtained and taking into account the needs and expectations of the students as a result of the research while determining the teaching methods of the teachers. Although this research was conducted with a limited study group, it ensures an chance to see class applications from the learners' point of view.

Limitations and Suggestions

Although the current study is the first attempt to offer evidence in terms of the demotivational factors stemmed from the teacher in L2 Turkish learning, we acknowledge some limitations and provide suggestions for future study. First of all, this study could not be supported by quantitative data, which would increase the objectivity of the research. Thus, a longitudinal research design or the mixed method is highly recommended to bridge the shortcoming of this study. Secondly, the present study's participants were from Turkey, L2 Turkish learners, and only 12 students, weakening the generalization of the findings. It is unknown whether the demotivational factors in this study could be supported by more participants of different languages and cultures as the results might vary across participants and contexts.

Ethical Committee Permission Information

Name of the board that carries out ethical assessment: Tokat Gaziosmanpaşa University Social and Humanities Scientific Research and Publication Ethics Board

The date and number of the ethical assessment decision: 07.05.2024 and 08/46

Author Contribution Statement

Müjgan BEKDAŞ: *Conceptualization, literature review, methodology, collection of data, data analysis, translation, and writing*

Sami BASKIN: *Conceptualization, literature review, methodology, data analysis, reviewing and editing.*

References

- Abubakarı, A. (2016). *Türkçe öğrenen yabancı öğrencilerle İngilizce öğrenen Türk öğrencilerin motivasyon durumlarının karşılaştırılması*, [Comparison of the motivation status of foreign students learning Turkish and Turkish students learning English]. Master Thesis, Ankara University, Educational Sciences Institute, Ankara. <https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp>
- Akbaba, S. (2006). Eğitimde motivasyon. [Motivation in education], *Kazım Karabekir Eğitim Fakültesi Dergisi*, 13, 343-361.

- Al-Khasawneh, F. M. (2017). Demotivating factors affecting EFL learning of Saudi undergraduate students. *International Journal of Language Education and Applied Linguistics (IJLEAL)*, 6, 25-34.
- Arabai, F. (2022). Modeling the relationship between classroom emotions, motivation, and learner willingness to communicate in EFL: Applying a holistic approach of positive psychology in SLA research. *Journal of Multilingual and Multicultural Development*, 1–19. <https://doi.org/10.1080/01434632.2022.2053138>
- Arai, K. (2004). What ‘demotivates’ language learners?: Qualitative study on demotivational factors and learners’ reactions. *Bulletin of Toyo Gakuen University*, 12(3), 39-47.
- Aydın, S. (2012). Factors causing demotivation in EFL teaching process: A case study. *The Qualitative Report*, 17(51), 1–13.
- Barın, E. (2008). The importance of motivation in teaching Turkish to foreigners. *Van Yüzüncü Yıl Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 7, 135-143.
- Bayraktar, H. (2015). Sınıf yönetiminde öğrenci motivasyonu ve motivasyonu etkileyen etmenler. [Student motivation and factors affecting motivation in classroom management], *Turkish Studies International Periodical for the Languages, Literature and History of Turkish or Turkic*, 10(3), 1079-1100.
- Biçer, N. (2016). Views of students about their motivation in teaching Turkish as a foreign language and classroom observations. *Ana Dili Eğitimi Dergisi*, 4(1), 84-99.
- Chong, M., Renandya, W. & Ng, Q. (2019). Demotivation in L2 classrooms: Teacher and learner factors. *Language Education and Acquisition Research Network Journal*, 12(2), 64-75.
- Dang, T., Lei, V. & Ha, T. (2021). Factors affecting motivation of English-majored students towards learning English at a university in the Mekong Delta, Vietnam. *European Journal of English Language Teaching*, 6(6), 95-115.
- Dörnyei, Z. (1994). Motivation and motivating in the foreign language classroom. *The Modern Language Journal*, 78(3), 273-284. <https://www.jstor.org/stable/330107>
- Dörnyei, Z. (2001). *Teaching and researching motivation*. Pearson Education Limited.
- Fullan, M. (2007). *The new meaning of educational change (4th ed.)*. Routledge.
- Gardner, R. C. (1985). *Social psychology and second language learning: The role of attitudes and motivation*. Edward Arnold.
- Ghanizadeh, A. & Jahedizadeh, S. (2015). Demotivators, burnout and language achievement in an Iranian EFL context. *The Journal of Teaching Language Skills (JTLS)*, 7(3), 61-85.
- Glesne, C. (2010). *Becoming qualitative researchers: An introduction* Pearson Publication.
- Hasegawa, A. (2004). Student demotivation in the foreign language classroom. *Takushoku Language Studies*, 107, 119-136.
- Ikeno, O. (2002). Motivating and demotivating factors in foreign language learning: A preliminary investigation. *Ehime University Journal of English Education Research*
- İsaoğlu, Y. & Emir, S. (2020). Demotivational factors towards learning English for the students of social sciences high school. *Kastamonu Education Journal*, 18(3), 1438-1447.
- Falout, J. & Maruyama, (2004). A comparative study of proficiency and learner demotivation *The Language Teacher*, 28(8) <https://jalt-publications.org/ilt/articles/447-comparative-study-proficiency-and-learner-demotivation>
- Juybar, M. & Rahimi, M. (2021). A qualitative study of demotivating factors among students who quit their English classroom. *Journal of Applied Linguistics and Language Research*, 8(2), 40-49. <http://www.jallr.com/index.php/JALLR/article/view/1178>

- Kikuchi, K., & Sakai, H. (2009). Japanese learners' demotivation to study English: A survey study. *JALT Journal*, 31(2), 183-204.
- Kim, K. (2009). A comparative analysis of demotivation in secondary English classes. *English Language & Literature Teaching*, 15(4), 75-94.
- Kruk, M. (2022). Dynamicity of perceived willingness to communicate, motivation, boredom and anxiety in second life: The case of two advanced learners of English. *Computer Assisted Language Learning*, 35, 190-216.
- Küpers, W. (2001). *A Phenomenology of embodied passion and the demotivational realities of organisations*. Citation source: <https://docplayer.net/90909399-A-phenomenology-of-embodied-passion-and-the-demotivational-realities-of-organisations.html> Date of access: 18.12.2022.
- Lan, G., Zhao, X. & Gong, M. (2023). Motivational intensity and willingness to communicate in L2 learning: A moderated mediation model of enjoyment, boredom, and shyness. *System* 117, 1-13. <https://doi.org/10.1016/j.system.2023.103116>
- Lu, G., Xie, K. & Liu, Q. (2023). An experience-sampling study of between- and within-individual predictors of emotional engagement in blended learning. *Learning and Individual Differences*, 107, 1-12. <https://doi.org/10.1016/j.lindif.2023.102348>
- MacIntyre, P. D., & Vincze, L. (2017). Positive and negative emotions underlie motivation for L2 learning. *Studies in Second Language Learning and Teaching*, 7(1), 61-88.
- Mohammed, A. (2019). *Post graduate foreign students' motivation towards learning Turkish as a foreign language*. Master Thesis. Marmara University, İstanbul.
- Quadir, M. (2021). Teaching factors that affect students' learning motivation: Bangladeshi EFL students' perceptions. *TEFLIN Journal*, 32(2), 295-315.
- Rowley, J. (2002). Using case studies in research. *Management Research News*, 25(1), 16-27.
- Spolsky, B. (1989). *Conditions for second language learning*. Oxford University Press.
- Stewart, C. J., & Cash, W. B. (2011). *Interviewing: principles and practices*. McGraw-Hill.
- Yıldırım, A. & Şimşek, H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri*. [Qualitative research methods in social sciences]. Seçkin Yayınevi.
- Yılmaz, F. & Arslan, S. B. (2014). Turkish learners' motivation resources and problems of foreign students at COMU TOMER. *Electronic Turkish Studies*, 9(6), 1181-1196.
- Yin, R. (1984). *Case study research: design and methods*. (3. Basım). Sage Publications
- Zhang, Q. (2007). Teacher misbehaviors as learning de-motivators in college classrooms: A cross-cultural investigation in China, Germany, Japan, and the United States. *Education*, 56, 209-227. <https://eric.ed.gov/?id=EJ763998>

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article

Investigation of Candidate Teachers' Early Teacher Identity with Public Personnel Selection Examination Anxiety Levels

Selim ASAN^{1,*}  Edanur YAĞAN² 

¹ Erzurum Technical University, Faculty of Sport Sciences, Erzurum, Turkey selim.asan@erzurum.edu.tr

² Erzurum Technical University, Faculty of Sport Sciences, Erzurum, Turkey edayagan050@gmail.com


* Corresponding Author: selim.asan@erzurum.edu.tr

Article Info

Received: 20 May 2024

Accepted: 19 August 2024

Keywords: Physical education, PPSE anxiety, sports sciences, teacher candidates, teacher identity

 10.18009/jcer.1486352

Publication Language: English

Abstract

In this research aims to examine the candidate teacher's identity with Public Personnel Selection Examination (PPSE) anxiety levels. The research included 302 candidate physical education teachers (140 female and 162 male) aged between 21 and 28 (23.95±1.54). "Personal Information Form," "Early Teacher Identity Scale (ETIS)," and "Public Personnel Selection Examination Anxiety Level Scale (PPSEALS)" were used as data collection tools in the research. According to the data obtained from the research, there was no significant correlation between the candidate teachers' PPSEALS scores and the ETIS scores. A significant difference existed between candidate teachers' grade levels with PPSEALS scores and ETIS scores. Compared to 3rd-grade and graduate students, 4th-grade students scored higher on the PPSEALS and ETIS. Although there was a significant difference between PPSEALS scores according to gender, there was no significant difference in terms of ETIS scores. According to this, women have higher PPSEALS scores compared to men. According to academic achievement status, no significant difference was found between the scores of PPSEALS and ETIS. The results obtained from the research revealed that candidate teachers have PPSE anxiety at a medium level and teacher Identity perception at a high level. As a result, it can be said that 4th-grade students' high perception of teacher identity leads to higher levels of test anxiety.



CrossMark



To cite this article: Asan, S. & Yağın, E. (2024). Investigation of candidate teachers' early teacher identity with public personnel selection examination anxiety levels. *Journal of Computer and Education Research*, 12 (24), 568-581. <https://doi.org/10.18009/jcer.1486352>

Introduction

The teaching profession is considered one of the professions that determine the fate of society. Therefore, everyone should not be expected to self-actualise in this profession (Şimşek, 2003). Teachers need to be able to define their professional identities and their education, knowledge, and competencies (Reio, 2005). Teacher identity is defined as how an individual perceives themselves in the teaching profession and what kind of teacher he/she wants to be (Beijaard et al., 2004). The elements that define the identity of an effective teacher

include subject knowledge, teaching methods, classroom management, and effective relationships with administrators and parents (Reio, 2005). Additionally, various factors influence teacher identity, including grade level, gender, language, age, and career stage. Each combination of these factors results in a different interpretation and perspective on a teacher's professional development. Therefore, it is not possible to have a single teacher identity (Samuel, 2008).

Candidate teachers are expected to develop a professional teacher identity while working and studying as teachers in today's challenging environment. However, teacher identity can change throughout a teacher's career due to interactions in school and society (Beauchamp & Thomas, 2009). A teacher's professional identity begins to form prior to entering teacher education and continues to develop throughout their career. Today, teachers are expected to be adaptable to change, have responsibility and initiative, plan and manage the learning process, monitor progress, use technology, collaborate, and be entrepreneurial (Tutkun & Aksoyalp, 2010). In the 21st century, the importance of the teacher education process in gaining the qualifications teachers should have emerges. Teacher candidates can gain teacher qualifications at the end of this process (Çengelci, 2021).

The term "anxiety" originates from the Greek language and is associated with notions of worry, curiosity, and fear as commonly understood. Anxiety is also interpreted as a reaction to internal stimuli from the environment and the individual. An anxious person experiences fear and worry about the future (Kaya & Varol, 2004). Although the cause and timing of anxiety remain a mystery, its effects can be observed, and it is obvious that this situation is not normal. It has been detected that anxiety exists throughout life and sometimes has a motivational role, such as the failures it causes. However, anxiety has become an emotion that often causes discomfort and affects social life in terms of development and transformation (Öner, 1997). A high level of anxiety leads to not being able to make decisions for the future and not knowing how to behave. While anxiety brings success when it is used positively, it can have negative results when it is not controlled (Ahmad & Aziz, 2019; Şimşek, 2023). One of the most critical stages students must overcome in their educational life is exams. It is common for a person to experience anxiety if he/she does not feel sufficiently prepared and adequate for the exams. It is known that candidate teachers study for the Public Personnel Selection Examination (PPSE), which is very important for themselves and their families, especially in their last year (Tümkeya &

Çavuşoğlu, 2010). In Turkey, teacher candidates take the Public Personnel Selection Examination (PPSE) to be employed in the public sector. Therefore, PPSE is one of the most challenging stages to be employed in the public sector. Therefore, PPSE creates intense pressure on candidate teachers. As a result of this intense pressure, exam anxiety emerges, which has a direct effect on success (Çapulcuoğlu & Gündüz, 2013).

In the literature review, we discovered research analyzing the PPSE burnout and anxiety levels of pre-service biology teachers (Köse et al., 2017) and pre-service science teachers (Yavuz & Akdeniz, 2019) according to various variables. Therefore, research on test anxiety and burnout levels is available but not sufficient. Additionally, what we know about teacher identity is generally obtained from research on teachers (Özdemir, 2010). According to this information, it is essential to determine how candidate teachers construct their teacher identities and which factors contribute to their identity development (Lerseth, 2013). Moreover, it is known that anxiety and hopelessness levels increase in graduated candidate teachers (Tümekaya & Çavuşoğlu, 2010). In this context, this research aimed to investigate candidate teachers' early teacher identity with PPSE anxiety levels. For this aim, answers to the following questions were searched during the research.

1. What is the level of early teacher identity perceptions of candidate physical education teachers?
2. What is the level of candidates' physical education teachers' anxiety towards PPSE?
3. Is there a significant relationship between early teacher identity perceptions of candidate physical education teachers and their PPSE anxiety levels?
4. Do physical education teacher candidates' early teacher identity perceptions and PPSE anxiety levels differ according to class, academic achievement, and gender?

Method

Research Model

The survey model, one of the quantitative research methods, was used. In this context, the participants' opinions on the subject were obtained using a scale (Karasar, 2015). At the same time, the relational research method was used to determine the relationship between variables. The relational research method is a method that determines the relationship between variables by analyzing the relationship between two or more variables (Büyüköztürk et al., 2009).

Research Group

The research population consisted of a total of 302 volunteer candidate physical education teachers, 140 females, and 162 males, aged between 21 and 28 years (23.95 ± 1.54), with an academic grade points average between 2.00-3.90 ($3.08 \pm .384$), who had graduated from physical education teaching or were continuing their education, completed or were continuing their pedagogical formation. Exclusion criteria were determined: a) Not signing the informed consent form, b) Deliberate manipulation of research data, c) Creating conflict in the work environment, and d) Having problems with other participants or the research team. G*Power analysis was conducted to calculate the sample size of the participants to be included in the research. The analysis showed that at least 115 samples were needed to obtain an effect size of 0.3 at a 90 percent difficulty level and 95 percent confidence interval. The scales were applied to 302 students to increase the validity of the research and in case the participants quit or the scales contained errors.

Data Collection Tools

"Personal Information Form," "Early Teacher Identity Scale," and "PPSE Anxiety Level Scale" were used as data collection tools in the research.

Personal Information Form

It includes complimentary questions such as age, gender, grade level, and grade point average (GPA) of the participants.

Early Teacher Identity Scale (ETIS)

The scale was developed by Friesen and Besli (2013) and adapted into Turkish by Arpacı and Bardakçı (2015). The scale consists of three sub-dimensions and seventeen five-point Likert-type questions. The scale questions have factor loadings ranging from .34 to .81. Cronbach's alpha coefficient for the internal consistency of the scale is .87. The reliability analysis conducted by Arpacı and Bardakçı (2015) showed that the Cronbach alpha value for the internal consistency of the scale was .93. In this research, Cronbach's alpha coefficient for internal consistency was found to be .75.

Public Personnel Selection Exam Anxiety Level Scale (PPSEALS)

The scale was developed by Karaçanta (2009). The scale consists of four sub-dimensions: "general anxiety," "concern about how you perceive yourself and how others perceive you," "future anxiety," and "exam preparation."

This scale comprises nineteen items presented in a 5-point Likert format, consisting of eight negative and eleven positive items. Cronbach's alpha internal consistency coefficient

calculated for the whole scale is .95. In this research, Cronbach's alpha internal consistency coefficient was determined as .83.

Statistical Analysis of Data

After the data obtained at the end of the research were checked, they were tested for normality using SPSS software. Skewness and kurtosis values were analyzed to decide the appropriate analysis methods. Values between $-2+2$ are accepted as normal distributions (Kim, 2013). In the research, the skewness values ranged from $-.885$ to 1.225 , and kurtosis values ranged from $-.112$ to 0.470 , indicating that the data were normally distributed. Therefore, parametric tests were used in the research. The Pearson correlation test was used to examine the relationship between the variables. An independent sample T-Test and a One-Way ANOVA Test were also used to compare the groups. The significance level was set as .05 in all analyses.

Findings

Table 1. Findings related to the relationship between the PPSE anxiety scale and early teacher identity scale

Variable	n	M	SD	1	2
1. PPSEALS	302	2.80	.645	—	
2. ETIS	302	3.55	.469	-.039	—

PPSEALS: Public Personnel Selection Exam Anxiety Level Scale, **ETIS:** Early Teacher Identity Scale, **n:** Number of persons, **M:** Mean, **SD:** Standard deviation

When Table 1 was analyzed, no significant relationship was found between the participants' PPSEALS scores and ETIS scores ($r=.039$, $p>.05$). At the same time; it was determined that PPSEALS scores of pre-service teachers were at the medium level ($M=2.80$) and ETIS scores were at a high level ($M=3.55$).

Table 2. Findings related to the comparison of the PPSE anxiety scale and early teacher identity scale scores of the participants according to gender variable

Gender	Female (n=140)		Male (n=162)		t (300)	p	Cohen's d
	M	SD	M	SD			
PPSEALS	2.89	.616	2.72	.659	2.33	.020*	.639
ETIS	3.57	.455	3.54	.482	.524	.600	.470

* $p<.05$

When Table 2 is analyzed, no significant differences were found between the ETIS scores of the participants according to their gender ($p=.600$, $p>.05$). On the other hand, it was found that there were significant differences between the PPSEALS scores of the participants according to their gender ($p=.020$, $p<.05$). Accordingly, it was determined that Females ($M=2.89\pm.616$) had higher PPSE anxiety levels than Males ($M=2.72\pm.659$).

Table 3. Findings related to the comparison of the PPSE anxiety scale and early teacher identity scale scores according to participants' grade point averages

GPA	2.00-3.00 (n=121)		3.01-4.00 (n=181)		t (300)	p	Cohen's d
	M	SD	M	SD			
PPSEALS	2.80	.631	2.80	.655	0.48	.962	.645
ETIS	3.57	.455	3.54	.479	.633	.527	.470

* $p<.05$

When Table 3 is analyzed, no significant differences were found between PPSEALS ($p=.962$, $p>.05$) and ETIS scores according to the grade point averages of the participants ($p=.527$, $p>.05$).

Table 4. Findings related to the comparison of the PPSE anxiety scale and early teacher identity scale scores according to participants' grade levels

Grade Level	Grade 3 (n=113)		Grade 4 (n=135)		Graduate (n=54)		F	p	η^2	
	M	SD	M	SD	M	SD				
PPSEALS	2.71	.672	2.91	.638	2.73	.566	3.46	.033*	.023	4>3
ETIS	3.46	.513	3.60	.462	3.62	.352	3.69	.026*	.024	4>3

* $p<.05$

According to Table 4, It was determined that there were significant differences between the PPSEALS scores of the participants according to their grade levels ($p=.033$, $p<.05$). Accordingly, it was determined that 4th-grade students had a higher average ($M=2.91\pm.638$) than 3rd grade and graduate students. According to another finding of the table, It was determined that there were significant differences between the ETIS scores of the participants according to their grade levels ($p=.026$, $p>.05$). According to this finding, it was determined that 4th-grade students had a higher average ($M=3.60\pm.638$) than 3rd-grade students. Although the mean ETIS scores of graduate students were higher than those of 3rd and 4th-grade students, no significant difference was found ($p>.05$).

Discussion and Conclusion

Teachers' professional identity is at the center of the teaching profession. Professional identity is how teachers form ideas about how they should behave and understand (Sachs, 2005). Prospective teachers are required to take the PPSE in order to commence teaching. This exam, which is a step for prospective teachers, is associated with anxiety. Therefore, candidate teachers' early teacher identity with PPSE anxiety levels were examined in this research.

According to the results of the research, it was determined that the anxiety levels of candidate teachers related to PPSE were at a moderate level. The literature review showed that PPSE-related anxiety was at a moderate level in studies conducted with students from different disciplines (Yavuz & Akdeniz, 2019). These findings support the results of the study. Another result of the research showed that the average scores of candidate teachers from the early teaching identity scale were high. It is seen that the results of the studies in the literature are similar to the results of the research (Çelik & Kalkan, 2019; Eğmir & Çelik, 2019). When the theoretical studies in the literature are evaluated, it has been shown that teacher identity perceptions increase with the time spent in faculty (Chong et al., 2011) and increase as they teach (Samuel, 2008). At the same time, it has been reported that teacher education programs will increase teacher awareness and facilitate future professional challenges (Beauchamp & Thomas, 2009). According to this information, it can be said that the level of identity perception of candidate teachers is high, and their professional identities develop before they become teachers.

In the research, no significant relationship was found between candidate teachers' perceptions of early teacher identity and PPSE anxiety levels. Since no research in the literature directly investigates the relationship between candidate teachers' perceptions of early teacher identity and PPSE anxiety levels, the research results were compared with studies examining different variables. In a study investigating the relationship between attitude toward the teaching profession and anxiety level, a weak, significant negative relationship was found between attitude and anxiety (Doğan & Çoban, 2009). In another study, no significant difference was found between pre-service teachers' attitudes toward the teaching profession and the sense of pressure they felt to prepare for the PPSE (Hüdavendigâr, 2018). The research findings show that having a high teacher identity may

increase the desire to start teaching as early as possible. We can say that this situation also increases the level of PPSE anxiety.

The research found no significant difference between early identity perceptions of candidate teachers according to gender. In the literature, there are studies in which there is no significant difference between the total scores of pre-service teachers' professional identity scale according to gender (Kan & Yel, 2020). In contrast to this study, Cattley's (2007) study on candidate teachers showed that professional identity varies according to gender. In the literature, there are studies in which early identity perception is higher in favor of female candidate teachers (Alptekin-Yolcu, 2018; Çelik & Kalkan, 2019; Eğmir & Çelik, 2019). Saylam et al. (2017), in their research on sports sciences students, found that female students had a higher perception of teacher identity than male students, and Cinpolat et al. (2016) found that female sports sciences students had higher perceptions of the teaching profession. Özdemir (2008) asserts that the teaching profession is more suitable for females in terms of social gender roles, and some affective qualities required for the teaching profession are more common in females. The idea that teaching is more suitable for females is widely accepted in society (Sayılan, 2012). Female teacher candidates are more willing to become teachers (Kingir et al., 2020). However, the fact that the study's findings did not differ according to gender contradicted these ideas that are thought to be generally accepted in society.

The results of the research on the differences between PPSE anxiety and gender show that female candidate teachers have a higher level of PPSE anxiety than male candidate teachers. When the literature was examined, significant differences were found between PPSE anxiety and gender (Özay et al., 2017). Many studies have indicated that PPSE anxiety is higher in females than males (Özsarı, 2008). When the studies related to the anxiety dimension are investigated, the results of some research shows that, depending on the gender, female candidate teachers' anxiety levels about PPSE are higher than male candidate teachers' anxiety levels (Çimen, 2007). In contrast to these researches, there are many studies in the literature showing that there is no significant difference between the level of anxiety about PPSE and the gender variable (Coşkun et al., 2021; Tümkiye & Çavuşoğlu, 2010; Yavuz & Akdeniz, 2019). In line with the available information, the literature has no unity. This is thought to be because the sample groups included in the studies have different characteristics (such as program, age, and grade level).

In the research, no significant differences were found between early identity perceptions of candidate teachers according to their academic achievement. In contrast to the study, several studies in the literature report that candidate teachers with high preprofessional identity perceptions also have high academic grade point averages (Alptekin & Kingır, 2021). Alptekin Yolcu (2018) concluded in his research with candidate classroom teachers that students with high general identity perceptions also had high academic grade point averages. Hanna et al. (2020) noted that professional identity affects teachers' attitudes, ideas, and feelings. The findings of the research do not coincide with the literature. This may be because the samples were formed from different branches.

The research found no significant difference between the KPSS anxiety scores of candidate teachers according to their academic achievement. Özyay et al. (2017) reported that there was no significant relationship between KPSS anxiety and academic achievement and that test anxiety levels were not reflected in academic performance. However, several research studies show that anxiety decreases as academic performance increases (Akgün et al., 2007). A different research found that candidate teachers' KPSS anxiety levels varied according to their academic performance (Coşkun et al., 2021). When the literature is investigated, it is concluded that academic performance affects the anxiety level of candidate teachers in many studies (Jacobs & Dodd, 2003).

The research determined differences in early teacher identity according to the grade variable of candidate teachers and that 4th-grade students had higher early teacher identity scores than 3rd-grade students. There are studies in the literature where similar results are obtained with the research. Ulubey et al. (2018) examined the identity perceptions of candidate teachers at the beginning and end of teacher education. They found that the identity perceptions of candidate teachers were higher at the beginning of teacher education than those measured at the end of teacher education. In another research, the preprofessional identities of teachers differed significantly according to the grade level. 4th grade students were found to have a significantly higher level of qualification than students in other grades (Eğmir & Erdem, 2021). Çelik and Kalkan (2019) found that 4th-grade students had a higher level of early identity. Eğmir and Çelik (2019) found that 4th-grade candidate teachers' professional identity perceptions were higher than candidate teachers at other grade levels. However, these results differ from some studies in the literature. Several studies show no significant difference between candidate teachers' perceptions of professional identity

according to grade level (Alptekin-Yolcu, 2018). The research conducted by Erdem (2020) supported this result and reported that the difference between the professional identity perceptions of candidate teachers in the 1st and 4th grades was not significant. Although there is no unity in the literature based on the research findings, upper-class students' high perception of teacher identity can be attributed to the fact that visiting schools and doing internships affect the perception of teacher identity (Eğmir & Çelik, 2019).

In the research, significant differences were found between the PPSE anxiety levels of the prospective teachers according to their grade level. When the literature is reviewed, In the research conducted by Tümkaya and Çavuşoğlu (2010), it was reported that the anxiety and hopelessness scores of graduates were higher than those of non-graduates. A different research found that as the students' grade levels increased, their exam anxiety also increased (Ekiz, 2023). According to the findings of the study conducted by Yavuz and Akdeniz (2019), it was found that 1st and 2nd-grade students at the beginning of their education had more negative thoughts, while 3rd and 4th-grade students approaching the end of their education had more positive thoughts. Çakmak and Hevedanlı (2005) found that 1st-grade students experienced more anxiety than 2nd-grade students. These results coincide with the results of this research. In addition, in a few studies in the literature, no significant difference was found between education level and anxiety level (Ahmad & Aziz, 2019).

As a result, no significant relationship was found between PPSEALS scores and ETIS scores of candidate teachers. At the same time, it was determined that the PPSEALS scores of candidate teachers were at a medium level, and ETIS scores were at a high level. There was a significant difference between the grade level with PPSEALS and ETIS scores. Accordingly, fourth-grade students' anxiety levels and teacher identity perceptions were higher than other grades. There were significant differences between the PPSEALS scores of candidate teachers according to their gender, and it was determined that females had higher PPSE anxiety levels than males. The research investigating candidate teachers' identity perception and PPSE anxiety levels together is limited in the literature, which can be considered as the strength of the research. On the other hand, the limitation of the research is that it covers a limited number of teacher candidates who have studied and graduated from the physical education and sports department.

Suggestions

Future research involving many candidate teachers in different university departments in different regions may provide more reliable and comprehensive results. In order to reduce PPSE anxiety, counseling services can be provided to candidate teachers to raise awareness about the importance of the field and pedagogical formation courses from their first year. In addition, giving candidate teachers enough time and opportunity to make decisions and learn through research may contribute to developing a positive teacher identity.

Acknowledgement

This research was supported by TUBITAK Scientific and Technological Research Council of Turkey (BİDEB) within the scope of "University Students Research Projects Support Programme 2209-A" with the application number 1919B012306955.

Ethical Committee Permission Information

Name of the board that carries out ethical assessment: Erzurum Technical University Research and Publication Ethics Committee

The date and number of the ethical assessment decision: 19.10.2023 and 11-8

Author Contribution Statement

Selim ASAN: *Conceptualization, literature review, data analysis, data collection, translation, and writing.*

Edanur YAĞIN: *Conceptualization, literature review, data collection and writing.*

References

- Ahmad, M. & Aziz, F. (2019). Relationship between emotional intelligence and exam anxiety of higher secondary students. *International e-Journal of Educational Studies (IEJES)*, 3 (6), 97-108. <https://doi.org/10.31458/iejes.543549>
- Akgün, A., Gönen, S. & Aydın, M. (2007). İlköğretim fen ve matematik öğretmenliği öğrencilerinin kaygı düzeylerinin bazı değişkenlere göre incelenmesi [The investigation of anxiety levels of primary school science and mathematics teacher students' according to some variables], *Elektronik Sosyal Bilimler Dergisi*, 6(20), 283-299.
- Alptekin, M., & Kingır, S. (2021). Sınıf öğretmeni adaylarının mesleki kimlik algılarının incelenmesi [Investigation of professional identity perceptions of preservice elementary teachers], *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 34(2), 778-812.
- Alptekin-Yolcu, M. (2018). *Sınıf öğretmeni adaylarının meslek öncesi öğretmen kimlik algılarının incelenmesi [Investigation of preservice primary school teachers' early teacher identity perceptions]*, Master's Thesis. Hacettepe University. Ankara.

- Arpacı, D. & Bardakçı, M. (2015). An investigation on the relationship between prospective teachers early teacher identity and their need for cognition. *Journal of Education and Training Studies*, 4(3), 9-19.
- Beauchamp, C. & Thomas, L. (2009). Understanding teacher identity: an overview of issues in the literature and implications for teacher education. *Cambridge Journal of Education*, 39(2), 175–189.
- Beijaard, D., Meijer P. C. & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education*, 20(2004), 107–128.
- Büyüköztürk, Ş., Çakmak, E.K., Akgün, Ö. E., Karadeniz, Ş. & Demirel, F. (2009). *Scientific research methods [Bilimsel araştırma yöntemleri]*, Pegem Akadem.
- Cattley, G. (2007). Emergence of professional identity for the candidate. *Teacher International Education Journal*, 8(2), 337–347.
- Chong, S., Low, E., & Goh, K. (2011). Emerging professional teacher identity of candidate teachers. *Australian Journal of Teacher Education*, 36(8), 50–64.
- Cinpolat, T., Alıncak, F. & Abakay, U. (2016). Beden eğitimi ve spor yüksekokulu öğrencilerinin öğretmenlik mesleğine yönelik tutumlarının incelenmesi [Physical education and sports school students' attitudes towards teaching profession investigation of attitudes towards], *Gaziantep Üniversitesi Spor Bilimleri Dergisi*, 1(1), 38-47.
- Coşkun, M. K., Zengin, E. & Arslan, A. (2021). Sosyal bilgiler öğretmen adaylarının kamu personel seçme sınavı (KPSS) kaygı ve tükenmişlik düzeylerinin çeşitli değişkenler açısından incelenmesi [Investigation of social studies teacher candidates' public personnel selection examination (PPSE) anxiety and burnout levels in terms of various variables], *International Journal of New Approaches in Social Studies*, 5(2), 354-365. <https://doi.org/110.38015/sbyy.943617> .
- Çakmak, Ö. & Hevedanlı M. (2005) Eğitim ve Fen-edebiyat fakülteleri biyoloji bölümü öğrencilerinin kaygı düzeylerinin çeşitli değişkenler açısından incelenmesi [The examination of concern levels of biology student's class by various variables], *Elektronik Sosyal Bilimler Dergisi*, 14 (4), 115-127.
- Çapulcuoğlu, U. & Gündüz, B. (2013). Lise öğrencilerinde tükenmişliğin gender, sınıf düzeyi, okul türü ve algılanan akademik başarı değişkenlerine göre incelenmesi [Investigation of burnout of high school students according to gender, grade level, school type and perceived academic achievement level], *Trakya Üniversitesi Eğitim Fakültesi Dergisi*, 3(1), 12-24.
- Çelik, H. R. & Kalkan, Ö. K. (2019). Öğretmen adaylarının meslek öncesi öğretmen kimliği algıları: Pamukkale üniversitesi örneği [Perception of the pre-service teachers on the early teacher identity: Pamukkale university case], *Ege Eğitim Dergisi*, 20(2), 351-365.
- Çengelci, S. (2021). Öğretmen adaylarının 21. yüzyıl öğrenen becerileri ile üstbilişsel farkındalık düzeylerinin meslek öncesi öğretmen kimliği üzerindeki etkisi (Afyonkarahisar örnekleme), [21st century learning skills and metacognitive awareness levels to determine the impact on pre-vocational teacher identity], Master's Thesis. Afyonkarahisar University. Afyon
- Çimen, S. (2007). İlköğretim öğretmenlerinde tükenmişlik ve yeterlik algıları [Primary school teachers' burnout levels and perceived self-efficacy beliefs], Master's Thesis. Kocaeli University, Kocaeli.
- Doğan, T., & Çoban, A. E. (2009). Eğitim fakültesi öğrencilerinin öğretmenlik mesleğine yönelik tutumları ile kaygı düzeyleri arasındaki ilişkinin incelenmesi [The

- investigation of the relations between students' attitude toward teaching profession and anxiety level in faculty of education], *Eğitim ve Bilim*, 34(153).
- Eğmir, E. & Çelik, S. (2019). The educational beliefs of candidate teachers as An important predictor of teacher identity. *International Journal of Contemporary Educational Research*, 6(2),438-451. <https://doi.org/10.33200/ijcer.621717>
- Eğmir, E., & Erdem, C. (2021). Öğretmen adaylarının meslek öncesi öğretmen kimliklerinin yordayıcısı olarak 21. yüzyıl öğrenen becerileri [Pre-service teachers' 21st century learner skills as a predictor of their early teacher identity], *Trakya Eğitim Dergisi*, 11(2), 953-968.
- Ekiz, M. A. (2023). The effect of rubric and portfolio evaluation on general self-efficacy perception, exam anxiety and mindfulness levels of physical education and sports school students. *Humanistic Perspective*, 5(3), 1166-1188.
- Erdem, C. (2020). Exploring the relationships between possible selves and early teacher identity of turkish candidate teachers. *FIRE: Forum for International Research in Education*, 6(3), 94–115. <https://doi.org/10.32865/fire2020632251> .
- Hanna, F., Oostdam, R., Severiens, S. E., & Zijlstra, B. J. H. (2020). Assessing the professional identity of primary student teachers: design and validation of the teacher identity measurement scale. *Studies in Educational Evaluation*, 64, 100822.
- Hüdavendigâr, M. N. (2018). *Sosyal bilgiler öğretmen adaylarının mesleğe atanmaya ilişkin tutum ve kaygılarının farklı değişkenler açısından incelenmesi* [Social studies examination of teacher candidates ' attitudes and concerns about appointment to the profession in terms of different variables], Master's Thesis, Aksaray University. Aksaray.
- Jacobs, S.R. & Dodd, D.K. (2003). Student burnout as a function of personality, social support, and workload. *Journal of College Student Development*, 44, 291–303.
- Kan, A.Ü. & Yel, E. (2020). Pedagojik formasyon öğrencilerinin meslek öncesi öğretmenlik kimlikleri ile öğretmenlik mesleğine yönelik tutumları arasındaki ilişkinin incelenmesi [The investigation of the relations between pedagogical formation students' pre-professional identification of teaching and attitude toward teaching profession], *Journal of History School*, 44,300-321.
- Karaçanta, H. (2009). Öğretmen adayları için kamu personeli seçme sınavı kaygı ölçeğinin geliştirilmesi (geçerlik ve güvenirlik çalışması) [Eacher candidates for public staff examination of concern scale development (validity and reliability study)], *Gazi Üniversitesi Endüstriyel Sanatlar Eğitim Fakültesi Dergisi*, 25: 50-57.
- Karasar, N. (2015). *Bilimsel araştırma yöntemleri* [Scientific research methods] Nobel Yayıncılık.
- Kaya, M. & Varol, K. (2004). The levels and reasons of state-trait anxiety of the students of the faculty of theology (the case of Samsun). *Ondokuz Mayıs Üniversitesi İlahiyat Fakültesi Dergisi*, 17 (17), 31-63.
- Kim, H. Y. (2013). Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. *Restorative Dentistry & Endodontics*, 38(1), 52–54.
- Kingir, S., Gok, B., & Bozkir, A. S. (2020). Exploring relations among candidate science teachers' motivational beliefs, learning strategies and constructivist learning environment perceptions through unsupervised data mining. *Journal of Baltic Science Education*, 19(5), 804-823. <https://doi.org/10.33225/jbse/20.19.804> .
- Köse, E., Diken, E. H., & Gül, Ş. (2017). Analysis of prospective biology teachers' burnout and ppse anxiety levels in terms of various variables. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 37(3), 991-1012.



- Öner, N. (1997). *Durumluluk-sürekli kaygı envanterinin Türk toplumunda geçerliği [Validity of state-trait anxiety inventory in Turkish society]*, Associate Professorship Thesis, Hacettepe University. Ankara.
- Özay, E., Diken, E. H., & Gül, Ş., (2017). Analysis of prospective biology teachers' burnout and kpss anxiety levels in terms of various variables. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 37(3), 991-1012.
- Özdemir, B. (2010). *Öğretmen kimliği: sınıf öğretmenleri üzerine sosyolojik bir çalışma (Malatya örneği) [Teacher's identity: A sociological study on classroom teachers (Malatya case)]*, Master's Thesis, Fırat University. Elâzığ.
- Reio, T. G. (2005). Emotions as a lens to explore teacher identity and change: a commentary. *Teaching and Teacher Education*, 21(8), 985–993.
- Sachs, J. (2005). Teacher education and the development of professional identity: learning to be a teacher. In P. M. Denicolo, & M. Kompf (Eds.), *Connecting policy and practice: Challenges for teaching and learning in schools and universities*. Taylor and Francis Group
- Samuel, M. (2008). Accountability to whom? For what? Teacher identity and the force field model of teacher development. *Perspectives in Education*, 26(2), 3–16.
- Sarason, I. G. (1975). Test anxiety and the self-disclosing coping model. *Journal of Consulting and Clinical Psychology*, 43(2), 148.
- Sayılan, F. (2012). *Toplumsal gender ve eğitim [Social gender and education.]*, Dipnot Yayınları.
- Saylam, D. K., Soytürk, M., Asma, M., Çamlıyer, H. & Kalkan, N. (2017). *Spor bilimleri fakültesinde öğrenim gören öğrencilerin meslek öncesi öğretmen kimliklerinin incelenmesi [Reasons for selecting the teaching profession with teacher identity of physical education teacher candidate]*, Dünya Spor Bilimleri Araştırmaları Kongresi, Manisa.
- Şimşek, H. (2003). Attitudes towards teaching profession of students attending secondary education field teaching master's programme without thesis. *Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Dergisi*, 2 (1).
- Şimşek, T., (2023). Examination of foreign students' anxiety in learning Turkish in terms of various variables services. *International e-Journal of Educational Studies*, 7 (15), 484-501. <https://doi.org/10.31458/iej.1291763>
- Tutkun, Ö. F. & Aksoyalp, Y. (2010). 21. yüzyılda eğitimde program geliştirmede yönelim, kavram ve anlayışlar [Curriculum development in 21st century: New tendencies, concepts and understanding], *Sakarya Üniversitesi Eğitim Fakültesi Dergisi*, 19, 156-169.
- Tümkaya, S. & Çavuşoğlu, İ. (2010). An analysis of the burnout level of primary school teaching department student teachers. *Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 19(2), 468–481.
- Ulubey, Ö., Yıldırım, K., & Alpaslan, M. M. (2018). Investigation of effects of the pedagogical formation education certificate program on pre-service teachers' teacher identity. *Muğla Sıtkı Koçman Üniversitesi Eğitim Fakültesi Dergisi*, 5(1), 48-5.
- Yavuz, S., & Akdeniz, A. (2019). The investigation of burnout and kpss anxiety levels from various variables among science teacher candidates, *Karadere Eğitim Bilimleri Dergisi*, 7(2), 212-227.

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article

CodelessML: A Beginner's Web Application for Getting Started with Machine Learning

Hanif Noer ROFIQ^{1,*}  Galuh Mafela Mutiara SUJAK² 

¹ Ministry of Finance of Republic Indonesia, Indonesia hanif.noer94@gmail.com

² Ministry of Finance of Republic Indonesia, Indonesia galuhmafela@gmail.com


* Corresponding Author: hanif.noer94@gmail.com

Article Info

Received: 28 June 2024

Accepted: 06 September 2024

Keywords: Machine learning, learning, barrier, software

 [10.18009/jcer.1506864](https://doi.org/10.18009/jcer.1506864)

Publication Language: English

Abstract

Building machine learning models requires intensive coding and installation of certain software. This is frequently a barrier for beginners learning about machine learning. To overcome this situation, we present CodelessML, a reproducible web-based application designed for Machine Learning beginners due to its coding-free and installation-free design, published under Code Ocean capsule. It provides a common workflow that eases the process of building Machine Learning models and using the model for predictions. Using the Agile method, CodelessML was successfully built using Python, Anaconda, and Streamlit It. By using CodelessML, users can get a walkthrough and interactive experience of building machine learning through a simplified machine learning process: exploratory data analytics (EDA), modelling, and prediction. The impact of the software was evaluated based on feedback from 79 respondents, which showed that based on a 5-scale Likert, CodelessML received average ratings of 4.4 in accessibility, 4.3 in content, and 4.4 in functionality. CodelessML serves as an accessible entry point for learning machine learning, offering online, free, and reproducible features.



To cite this article: Rofiq, H.N. & Sujak, G.M.M. (2024). CodelessML: A beginner's web application for getting started with machine learning. *Journal of Computer and Education Research*, 12 (24), 582-599. <https://doi.org/10.18009/jcer.1506864>

Introduction

Data analysis has a long history (Tukey, 1962) and has often been used to help carry out tasks and achieve goals (Register & Ko, 2020). In this era, it has evolved into more complex applications, driven by the rising popularity of machine learning, which builds on traditional data analytics by enabling predictive models and automating decision-making processes. The origin history of machine learning in its modern sense is typically associated with Frank Rosenblatt, who created a group that built a machine for recognising the letter of the alphabet Rosenblatt in 1957 (Fradkov, 2020). The machine learning era continued until its turning point at the beginning of the first XXI decade. At that time, the rapidness of machine learning was enabled due to the Big Data trend, reduced cost of parallel computing and

memory, and the new development of deep machine learning algorithms (Fradkov, 2020). With the exponential growth in data volume, machine learning has evolved into a widely utilised tool for data analysis across various fields (Kononenko, 2001; Tetzlaff & Szepannek, 2022). Consequently, Machine Learning has gained significant enthusiasm from professionals and the general public (Fradkov, 2020).

Machine learning is closely related to artificial intelligence (AI). Some countries have begun to chase the opportunity from early education, for example, Hong Kong, America, and Iraq, which are trying to incorporate artificial intelligence-related subjects into their K-12 grade schools (Sallow et al., 2024; Wang & Cheng, 2021; Woodruff et al., 2023). In Indonesia, machine learning is also growing in popularity among vast audiences, including the Ministry of Finance of the Republic of Indonesia. In line with its commitment to becoming a data-driven organisation, the Ministry of Finance has provided its employees with diverse artificial intelligence-related training, including the data analytics subset of training.

Despite its popularity, there is a learning gap for beginners due to machine learning models' rapid development and complexity (Tetzlaff & Szepannek, 2022). As Woodruff et al. (2023) implied, there are learning barriers to learning artificial intelligence, including technical challenges and resource constraints. Wang and Cheng (2021) identified several similar issues for artificial intelligence learning, including the uncertainty of hardware and learning kits and the technical complexity of which can be intimidating for those who are not tech-savvy. Implementing it also requires substantial resources, including financial investment, infrastructure, and training.

Furthermore, people who want to learn about machine learning need to have sufficient knowledge of coding, as the machine learning's algorithms are written in code and implemented through programming. Machine learning itself is an evolving branch of computational algorithms that originated from computer sciences and statistics (Naqa & Murphy, 2015). One of the renowned methodologies, CRISP-DM (Cross Industry Standard Process for Data Mining), which was introduced by Chapman et al. (2000), also showed that most of the cycle in data analytics involves coding and programming stages. Even though the CRISP-DM was proposed as a data mining methodology at the end of the 20th century, it remains widely recognised as the standard framework for organising and managing data mining and machine learning projects (Martinez-Plumed et al., 2019). CRISP-DM depicts the process in reiterative phases: business understanding, data understanding, data preparation,

modelling, evaluation, and deployment. From the stages outlined above, it is discernible that machine learning heavily relies on programming languages, which are essential for data preparation, modelling, evaluation, and deployment phases. However, many algorithms are time-consuming and costly to code one by one (Burscher et al., 2014), making it difficult for beginners to build their models.

Additionally, other requirements must be met to perform machine learning analysis, such as installing and learning the software that will be used. The installation process for these applications can pose challenges for beginners learning machine learning, as it often involves a substantial number of programs and libraries. The foundational languages of machine learning range from programming environments such as Python, C++, R, and Julia (Sarkar et al., 2017). Although there are numerous options available, Python is widely regarded as the most suitable language for teaching introductory statistics in a data-rich environment for machine learning education (Ozgun et al., 2021; Sarkar et al., 2017) and has extensive libraries available for machine learning, such as NumPy, SciPy, TensorFlow, and scikit-learn (Liu, 2020). To further utilise Python in ML learning, we need to install other tools, such as Anaconda and Jupyter Notebook. Minimum computer requirements must also be met to ensure the software operates effectively, which adds additional consideration for beginners learning about machine learning.

Those barriers highlight the challenges that must be addressed to create a more conducive environment for educating someone about machine learning, particularly for adult learners. Many argue that educational machine learning should focus on a broader context than technical issues like coding and programming (Wang & Cheng, 2021). As for novices, especially working employees, the key idea of learning about machine learning is to introduce machine learning to them. Acquiring fundamental coding skills is quite challenging as it requires additional effort and time, which can be particularly demanding for working professionals with no data science and programming background. Therefore, it is essential to introduce user-friendly tools that enable non-technical employees to build their models (Dyck, 2018; Ferguson, 2017; Z.-H. Zhou, 2017).

To fill the capacity and requirement gap to learn the basics of machine learning, we built a website-based application that can be used to learn machine learning without the need for any installation or coding. This application is called CodelessML, which has features that can assist users in doing Exploratory Data Analytics (EDA) and creating

machine learning models (regression and classification). Users can also download predictive models that have been built to be used with new data sets. This application gives a handy workflow that eases the process of learning Machine Learning for beginners. It has been tested in workshops, discussions, and closed training where the participants are all beginners starting to learn machine learning. For further action, it can be widely used to reach wider audiences.

Method

The software was built using the Agile Method. It is a structured approach dividing the project into several continuous phases. We followed the five-step agile method: Plan, Design and Develop, Test, Deploy, and Review, as shown in Figure 1 below. This approach was chosen to facilitate continuous improvement and responsiveness to user needs. For instance, a data splitting option was added based on user feedback, allowing users to adjust the training and testing split ratio. Initially fixed at 70:30, this ratio was made flexible in response to iterative feedback, giving users greater control over the model-building process. The Agile process employed in CodelessML focuses on iterative improvements and adapting to user feedback, ensuring the tool evolves in alignment with user needs and expectations.

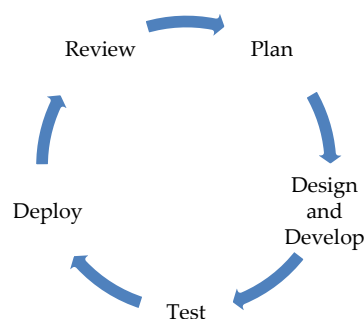


Figure 1. Agile method used in research

Planning CodelessML began when the problem occurred. To construct CodelessML, we used a set of tools: Python, Anaconda Navigator, and Streamlit. The software is licensed under the Apache License 2.0, and we use Git for code versioning. The required environment for compiling and running CodelessML is Python 3.9.16.

The CodelessML's user interface is built with Streamlit, and it uses several libraries for processing and modelling, including Pandas (McKinney, 2010), scikit-learn (Fabian, 2011), XGBoost (Ke et al., 2017), and LightGBM (Chen & Guestrin, 2016). CodelessML has three main menus: EDA, Modeling, and Prediction. The user interface is designed to follow

the general workflow, making it easier for users to learn machine learning. The procedures and the software workflow are illustrated in Figure 2.

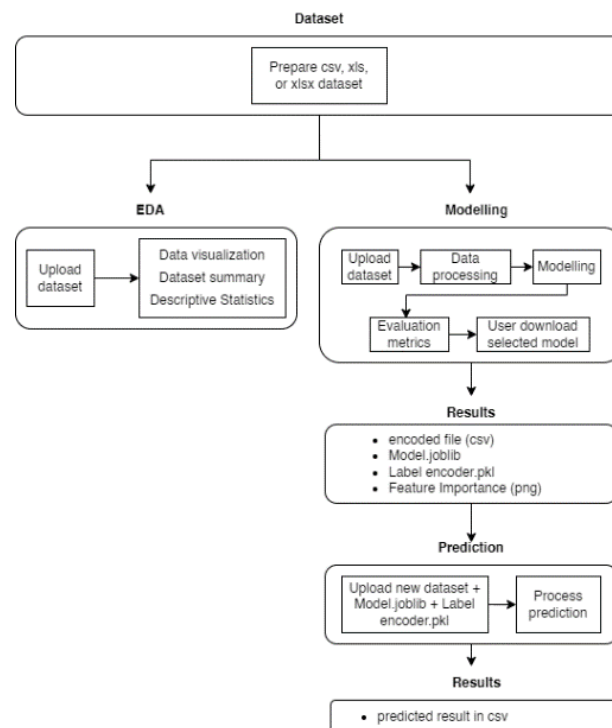


Figure 2. Software workflow

CodelessML was tested on two datasets, the Wine dataset (Aeberhard & Forina, 1991) for classification and the Automobile dataset (Schlimmer, 1987) for regression. The Wine dataset consists of chemical properties and quality ratings of wines from the same region in Italy. It has 13 features and 178 instances, and it is commonly used for classification tasks, particularly in predicting wine quality based on its attributes. The Wine dataset was selected for its simplicity and frequent use in educational contexts to demonstrate classification algorithms. The Automobile dataset contains information about various car models, including attributes such as engine size, horsepower, body style, and fuel system, making it ideal for regression tasks where continuous variables like price prediction are involved. It includes 25 features with 205 instances, making it suitable for testing various machine learning algorithms on a moderately sized dataset. The automobile dataset was chosen for its practical use in predicting car prices, a common application of machine learning in the automotive industry. While CodelessML uses these datasets as examples, users can also upload and work with their own data. These examples were chosen to cover both regression

and classification tasks, allowing users to experiment with real-world data and gain practical, hands-on experience with different machine learning applications.

CodelessML is also equipped with several evaluation metrics to measure its Classification and Regression Model. Machine learning models are generated from iterated and complex model-building processes. Therefore, no single measure can evaluate classifier performance (Mohamed, 2017), so different evaluation metrics are used for different methods of observing the model's performance (Novakovic et al., 2017). Classification is used to classify the object types (Novakovic et al., 2017), and its performance is commonly measured using evaluation metrics such as accuracy, precision, recall, and F1 score (Opitz, 2024). In contrast, regression is used to predict numeric outcomes (Grandini et al., 2020) with performance metrics comparing the predicted values to the actual results (Botchkarev, 2018) such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), Mean Squared Error (MSE), Mean Absolute Percentage Error (MAPE), and R^2 (Botchkarev, 2018; Botchkarev, 2019). CodelessML provides these commonly used evaluation metrics for classification and regression to assess model performance.

To evaluate the usability of CodelessML for beginners without prior knowledge of programming or machine learning, a survey was conducted by the lead author, who occasionally teaches data analytics classes for the Ministry of Finance. CodelessML was made open-source and accessible online, and it was introduced to participants during various events in 2023, including lectures, workshops, and discussions. 87 participants were introduced to CodelessML, and 79 completed the questionnaire, resulting in a response rate of 90.80%. The survey, distributed through Google Forms, provided valuable insights into the effectiveness of CodelessML in assisting beginners with their learning journey. The sample size was limited to employees within the Ministry of Finance of the Republic of Indonesia, with most respondents coming from the Directorate General of State Asset Management (DGSAM), where the authors are employed. Most employees in this organisation are beginners in machine learning due to their primary education and job responsibilities not being related to this field, making it challenging to learn machine learning concepts. Given their heavy workloads, acquiring new skills can be difficult, underscoring the need for innovative tools to facilitate learning. Although CodelessML was primarily introduced internally within the Ministry of Finance, its source code is openly

accessible on platforms such as GitHub and Code Ocean, with the hope that it can also assist other educators facing similar challenges.

The questionnaire was constructed into 8 Likert-scale questions, divided into three 3 sections to understand the Accessibility, Content, and Functionality of CodelessML from the learner's perspectives as shown in Table 1.

Table 1. Questionnaire used in research.

Item Number	Question	Aspects Observed
1.	I don't feel any difficulties when accessing CodelessML	Accessibility
2.	CodelessML is easy to use and has clear navigation	Content
3.	The instructions in CodelessML helped me in operating the Application	Content
4.	CodelessML was useful for me in understanding the basics of Machine Learning	Functionality
5.	I did not experience any difficulties when using the EDA menu	Functionality
6.	I did not experience any difficulties in using the Modeling menu	Functionality
7.	I did not experience any difficulties in using the Prediction menu	Functionality
8.	I would recommend CodelessML to others who want to start learning Machine Learning	Functionality

The survey is tested using Pearson Correlation to prove its validity and Cronbach Alpha to measure its reliability. The validity test is carried out by using Pearson Correlation test to assess whether or not data is correlated with another. The validity test result using Pearson Correlation is shown in Table 2. r_{table} is given for 5% significance. The results showed that $r_{xy} > r_{table}$ indicates that all items in the questionnaire are valid.

Table 2. Validity test result

Item Number	r_{xy}	r_{table}	Result (valid if $r_{xy} > r_{table}$)
1	0,812	0.1841	Valid
2	0.667	0.1841	Valid
3	0.678	0.1841	Valid
4	0.705	0.1841	Valid
5	0.828	0.1841	Valid
6	0.737	0.1841	Valid
7	0.693	0.1841	Valid
8	0.757	0.1841	Valid

Meanwhile, the Cronbach Alpha score for the survey is 0.892. Cronbach Alpha is a measurement to determine reliability and consistency inside the survey items. The closer the

Cronbach Alpha value to 1 means it has greater internal consistency and reliability. The value is usually acceptable between 0.70 and 0.90 or higher depending on the research type (Adeniran, 2019). From the analysis, the given Cronbach Alpha score is greater than the lowest acceptable reliability limit of 0.6 or 0.7 (Hair et al., 2019), so the survey is considered reliable.

Result

CodelessML was successfully built using Python and deployed using Streamlit. It is a reproducible open-access software published under Code Ocean capsule (<https://codeocean.com/capsule/5407148/tree/v1>). The final deployment of the software is shown in Figure 3. CodelessML features five main menus: "About," "EDA," "Modelling - Classification," "Modelling - Regression," and "Prediction." The "About" menu provides an application overview and includes user instructions. The "EDA" (Exploratory Data Analysis) menu offers descriptive statistics, dataset summaries, and various visualizations of uploaded datasets to give users a comprehensive overview of their data. The "Modelling - Classification" and "Modelling - Regression" menus are used to build machine learning models, while the "Prediction" menu allows users to make predictions based on the trained models.

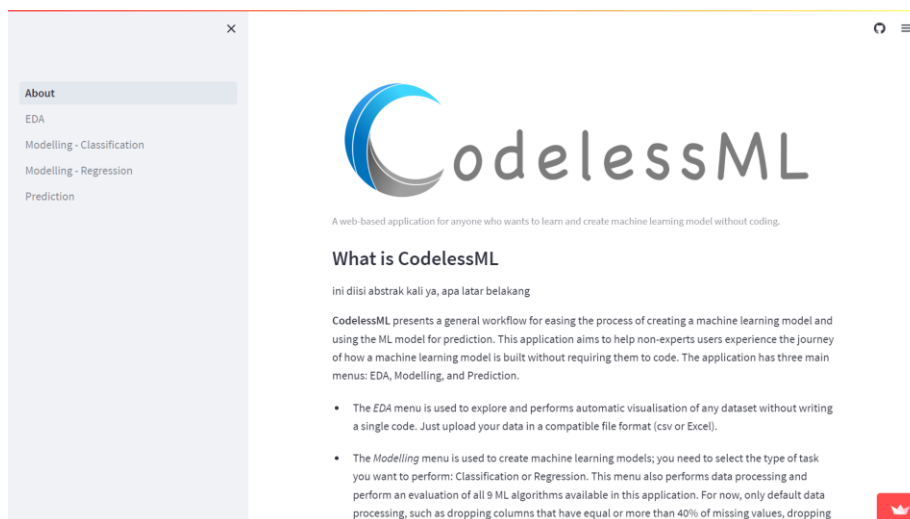


Figure 3. CodelessML main menu

The EDA (Exploratory Data Analysis) menu is designed to help users explore and analyse datasets to gain insights into data distribution and relationships between variables, identify patterns, detect anomalies, test hypotheses, and verify assumptions. Users can upload a CSV, XLSX, or XLS file by dragging it into the interface or using the "browse file" button. Once uploaded, the menu displays a sample of the dataset, a summary, descriptive

statistics, visualizations for numerical and categorical data distributions, a correlation matrix, and options for custom plots like boxplots or scatterplots. This step can be skipped if users have already processed the data in another software or are familiar with the dataset.

The modelling menu consists of Modelling-classification for the classification task and Modelling-regression for the regression task. To use this menu, users must upload a CSV, XLSX, or XLS file by dragging it into the interface or clicking the "browse file" button. If users have already utilized the EDA menu, they can skip the upload step and directly select the target column, set the data splitting ratio, and click "Submit" to automatically train the data using nine different machine learning algorithms. During this process, CodelessML applies default data processing, such as dropping columns with 40% or more missing values, removing columns that are 100% unique, and imputing missing values with the mean for numerical data or mode for categorical data. The modeling menu also divides the dataset into training and test data with a default size of 70% for training data and 30% for test data. The amount of distribution in this dataset can be changed based on the user's preferences. Once training is complete, the evaluation metrics for each model are displayed, allowing users to choose and download their preferred model.

The output from the modelling menu on CodelessML is a compressed zipped folder that contains coded input data, the results of a classification or regression model (model.joblib), the save of the encoder label, which functions to convert non-numeric data into a numeric format that matches the training data (label encoder.pkl), and Feature Importance of selected model in png format. The Feature Importance contains each feature's contribution to the outcome (Nohara et al., 2022) and is only available in Regression Models other than Support Vector Regression and K-Nearest Neighbors. The input file that has been processed using the encoder label is returned to the user so that the user can understand what kind of file is ready for modelling.

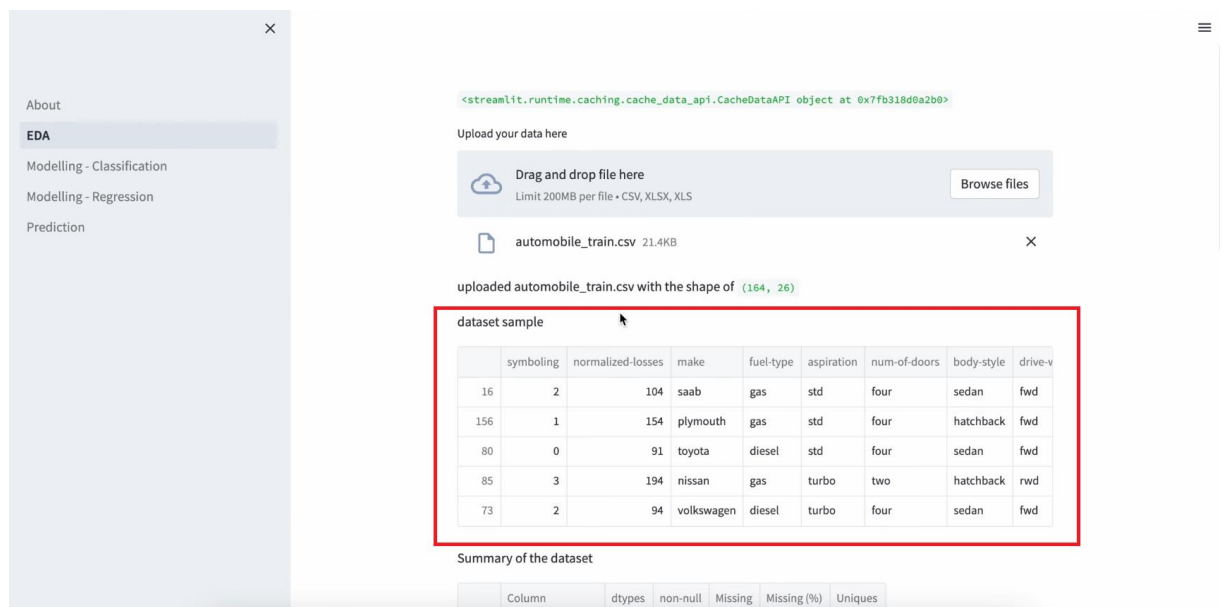
The Prediction menu is linked to the Modelling menu, as it relies on the output generated from the previous Modelling menu. In the Prediction menu, users must upload two output files from the Modeling menu: the encoder (.pkl) and the model (.joblib), along with the new, unseen data to be predicted. The encoder (.pkl) file is necessary to convert non-numeric data into a numeric format that matches the training data. The model (.joblib) file is the machine learning model created in the Modelling menu, which will be used for prediction. Once all required files are uploaded, the option to select columns to ignore will

show up, and there is a preview of the unseen data that will be predicted to make sure that every column name matches the data used in the Modelling. After confirming the column match, the tool will display a sample output, and the user can download the full prediction results in a CSV file named prediction.csv.

CodelessML Illustrative Example

We demonstrate the capabilities of CodelessML using two datasets: the Wine dataset (Aeberhard & Forina, 1991) for classification and the Automobile dataset (Schlimmer, 1987) for regression. In this example, we focus on the regression analysis using the Automobile dataset.

The process begins with the Exploratory Data Analysis (EDA) menu, where the user uploads the Automobile training dataset. Upon upload, CodelessML automatically provides a sample of the dataset (Figure 4), allowing users to understand the dataset column and properties.



The screenshot shows the CodelessML application interface. On the left, there is a navigation menu with the following items: About, EDA (highlighted), Modelling - Classification, Modelling - Regression, and Prediction. The main area displays the EDA workflow. At the top, there is a green text indicating a cache object: `<streamlit.runtime.caching.cache_data_api.CacheDataAPI object at 0x7fb318d0a2b0>`. Below this, there is a section titled "Upload your data here" with a "Drag and drop file here" area and a "Browse files" button. A file named "automobile_train.csv" (21.4KB) is shown as uploaded. Below the upload area, there is a text indicating the shape of the dataset: "uploaded automobile_train.csv with the shape of (164, 26)". A table titled "dataset sample" is displayed, showing a preview of the data. The table has 9 columns: symboling, normalized-losses, make, fuel-type, aspiration, num-of-doors, body-style, and drive-v. Below the table, there is a "Summary of the dataset" section with a table showing column statistics: Column, dtypes, non-null, Missing, Missing (%), and Uniques.

	symboling	normalized-losses	make	fuel-type	aspiration	num-of-doors	body-style	drive-v
16	2	104	saab	gas	std	four	sedan	fwd
156	1	154	plymouth	gas	std	four	hatchback	fwd
80	0	91	toyota	diesel	std	four	sedan	fwd
85	3	194	nissan	gas	turbo	two	hatchback	rwd
73	2	94	volkswagen	diesel	turbo	four	sedan	fwd

Figure 4. Sample of automobile dataset in CodelessML application

Below the dataset sample table, summary statistics (Figure 5) and descriptive analytics (Figure 6) are displayed.

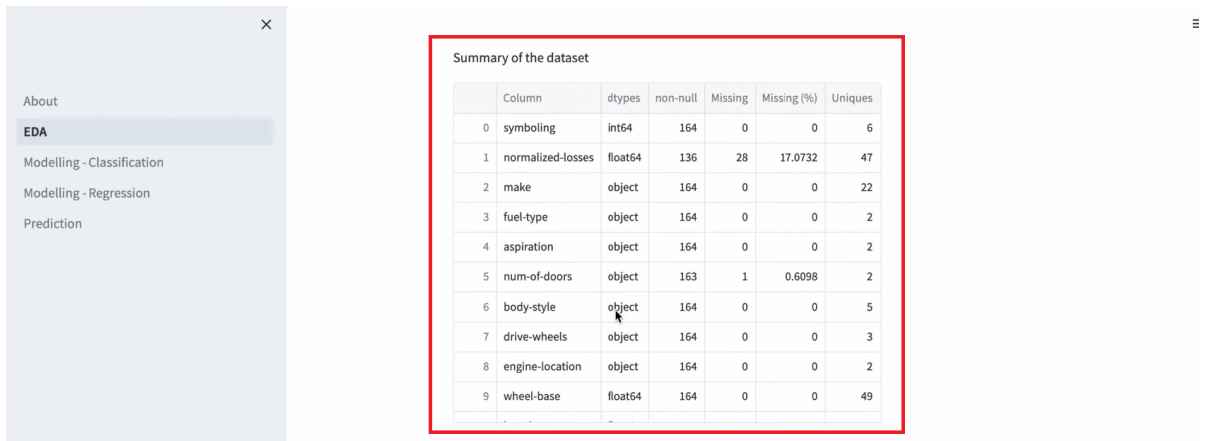


Figure 5. Summary of the automobile dataset in CodelessML

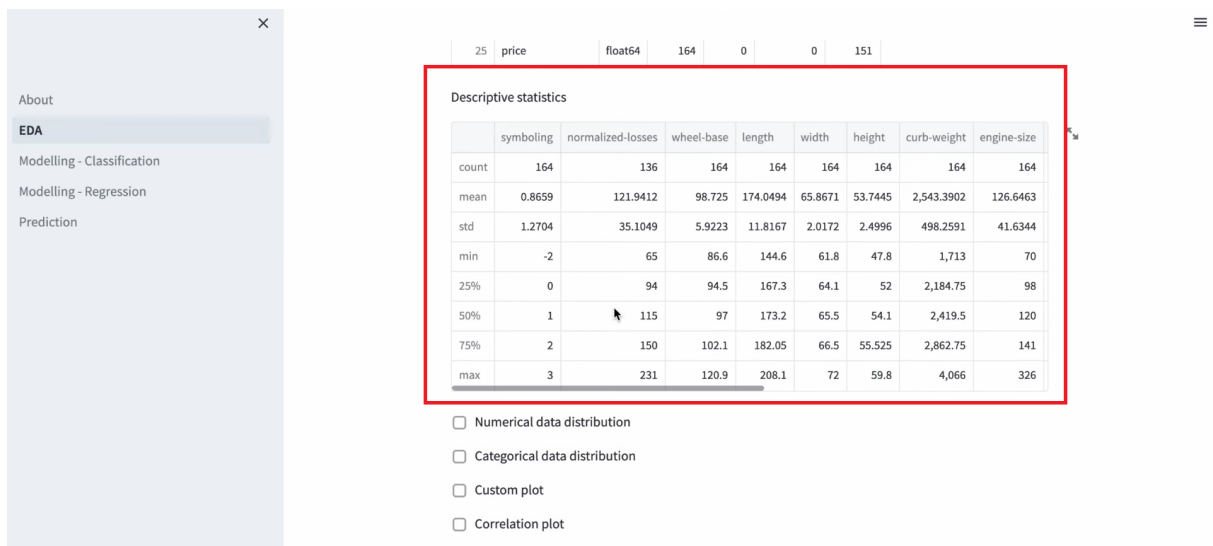


Figure 6. Descriptive analytics of automobile dataset in CodelessML application

Users can select options to visualise numerical data distributions, categorical data distributions, custom plots, and correlation plots. Here are some graph examples: Figure 7 below depicts the numerical data distribution from the dataset; Figure 8 shows the scatterplot; Figure 9 shows the categorical data distribution; and Figure 10 shows the correlation plot.

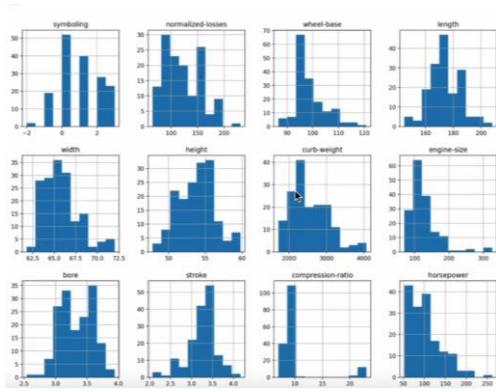


Figure 7. Numerical data distribution graph in CodelessML

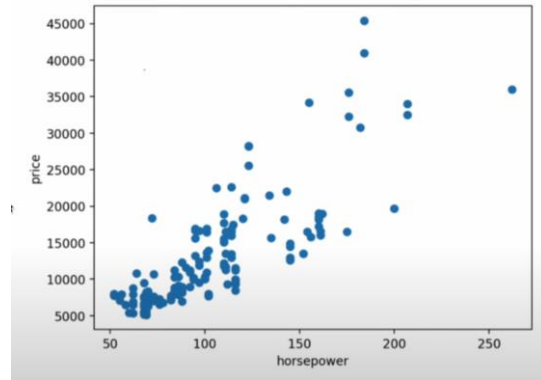


Figure 8. Scatterplot in CodelessML

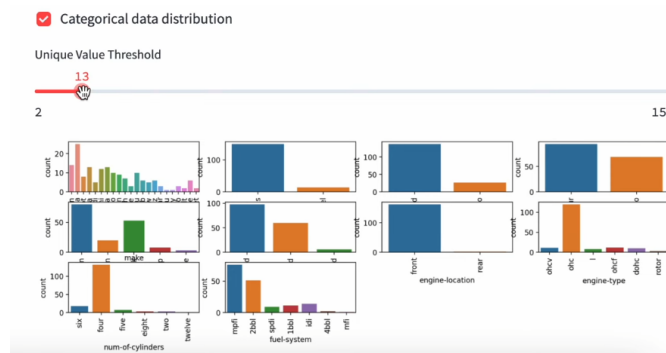


Figure 9. Categorical data distribution in the CodelessML

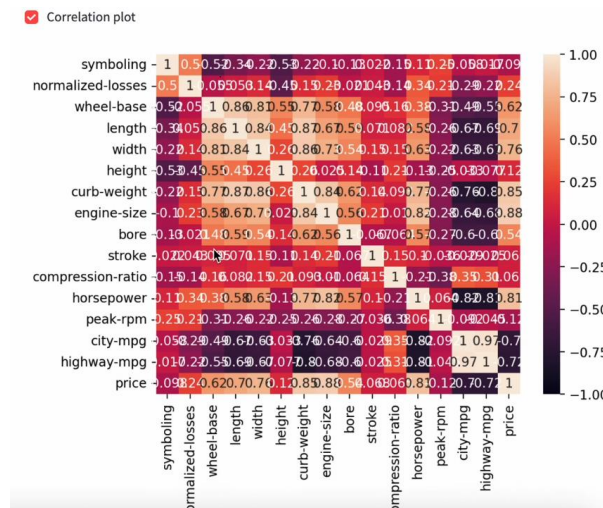


Figure 10. Correlation plot in CodelessML application

In the Modelling - Regression menu, we set "price" as the targeted column, aiming to predict automobile prices. The data was split into training and testing sets using an 80:20 ratio. After processing, CodelessML generated models using nine different algorithms, with each performance metric as shown in Figure 11. Users can sort and select the best model

based on their preferred metrics. In this case, the Random Forest algorithm was chosen with an R^2 score of 0.928767, MSE of 2,538,853.761265, RMSE of 1,593.378098, MAE of 1,167.756414, and MAPE of 0.095964. The Random Forest model was subsequently downloaded, consisting of encoded data, a .joblib model file, and a .pkl encoder file, as shown in Figure 12.

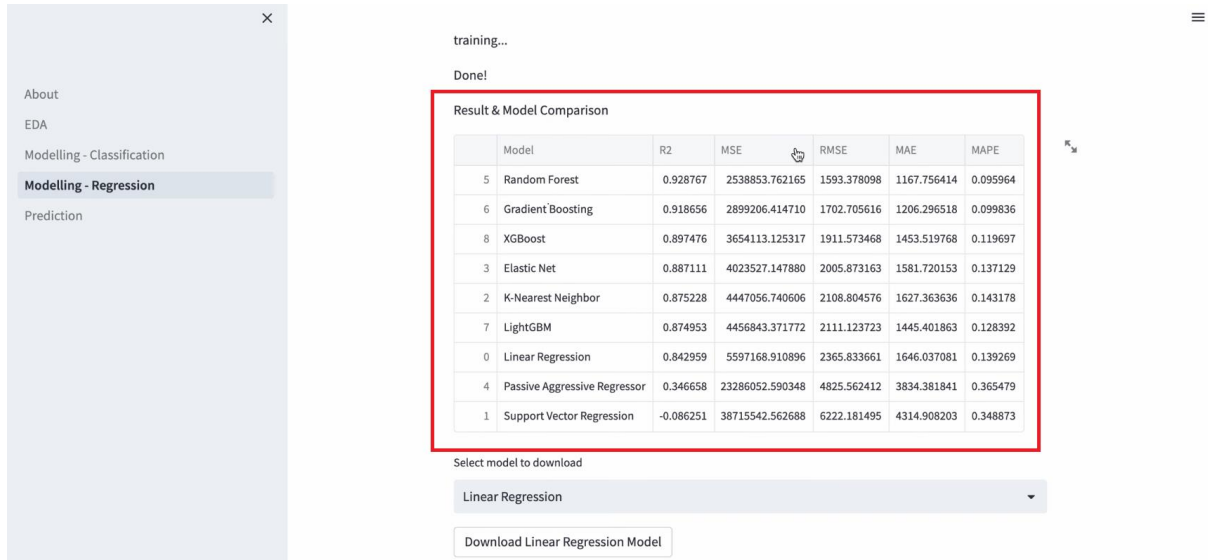


Figure 11. Regression result and model comparison



Figure 12. Regression result and model comparison

Finally, in the Prediction menu, the user uploads the test dataset, along with the .pkl encoder file and the .joblib model file. CodelessML then provided a table containing the predicted and actual automobile prices, as shown in Figure 13.

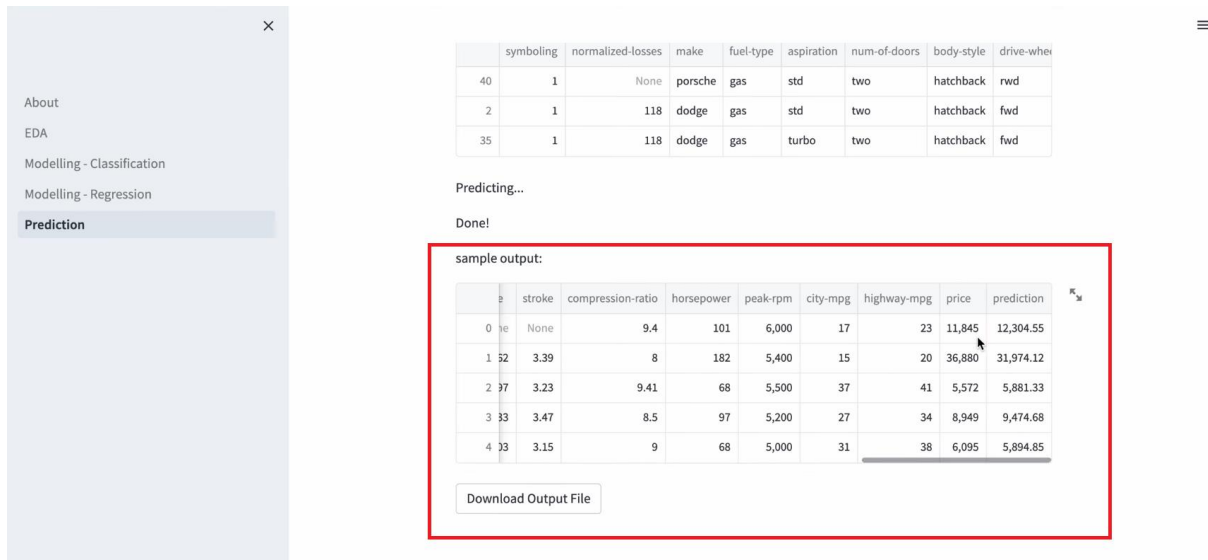


Figure 13. Regression result and model comparison

CodelessML Impact

The impact of CodelessML was measured through a survey that was conducted on 79 respondents. The questionnaires are given to determine three quality factors of visitor perspective: accessibility, content, and usability (Nabil et al., 2011). Calculated from the Likert scale average, the results are shown in Table 3 below:

Table 3. Likert average score based on each aspect

Number	Aspect	Likert Average Score
1.	Accessibility	4.4
2.	Content	4.3
3.	Functionality	4.4

In addition to the questionnaire, the respondents were also presented with a tick box and open-ended questions, asking their opinion about the CodelessML. The complete questionnaire is attached in the supplementary materials. From the calculated average scale and the questions' answers, it can be concluded that the respondents Agree (point 4 in the Likert Scale) that CodelessML is accessible and easy to use, has clear navigation and documentation, and has an impact on helping to understand machine learning. Respondents also would recommend CodelessML for other people starting to learn Machine Learning.

Conclusion

In this work, we introduce CodelessML, a tool designed for anyone interested in learning about and creating machine learning models without needing programming skills or specific software installations.

The software possesses three functionalities: EDA, Modeling, and Prediction:

- *EDA*: CodelessML provides data exploration tools, allowing users to summarize and visualize the uploaded dataset and provide the dataset's descriptive statistics.
- *Modelling*: CodelessML comes with preconfigured models for classification and regression. Users can freely configure the models they want and download the selected model to be used in the Prediction Menu.
- *Prediction*: Users can upload the selected downloaded model from the Modelling Menu along with a new dataset to yield new prediction results.

A survey of 79 beginners with no prior experience in machine learning concluded that respondents rated CodelessML as accessible and easy to use, with clear navigation and documentation. Each of the following criteria scored 4.4, 4.3, 4.4 (5-scale likert) for accessibility, content, and functionality. Additionally, the majority indicated that CodelessML significantly aids in understanding machine learning concepts and expressed willingness to recommend it to others starting in the field. The results demonstrate that CodelessML effectively facilitates learning machine learning without the need for coding skills or additional software installation. From the survey, CodelessML has proven to help the respondents learn machine learning easily without coding skills and installing certain software. Users can also compare three Machine Learning models at once without coding each individually. Finally, CodelessML can help users gain an initial understanding of Machine Learning before mastering it further.

Study Limitation and Future Development

CodelessML offers limited customization in data processing, with fixed options for handling missing values, dropping columns, and imputing using mean or mode. While this simplicity benefits non-expert users, advanced users may find it restrictive, especially when dealing with complex datasets that require specific imputation techniques or transformations. The CodelessML supports only 9 machine learning algorithms, allowing beginners to easily explore models without coding one by one. However, advanced users

may feel constrained by the lack of hyperparameter tuning, which can limit model optimization. Additionally, CodelessML's performance with large datasets depends on server capacity in the hosted version or the user's hardware when installed locally. Handling large datasets demands significant computational resources, which CodelessML cannot influence. As a result, users with large datasets may experience slow performance or memory issues, particularly on less powerful machines. However, small to medium datasets typically perform well without significant performance issues.

CodelessML's future development will be driven by user feedback and specific requirements, primarily focusing on helping inexperienced users understand machine learning and data science workflows. Planned feature updates may enhance the EDA feature and add additional machine learning models while maintaining simplicity and accessibility. As CodelessML is designed solely for educational purposes, its development will remain targeted toward non-expert users without integrating external platforms to ensure a focused and streamlined experience.

Acknowledgement

Due to the scope and method of the study, ethics committee permission was not required.

Author Contribution Statement

Hanif Noer ROFIQ : *Conceptualization, coding, survey question design, data collection, data analysis, implementation, writing, and translation.*

Galuh Mafela Mutiara SUJAK: *Conceptualization, literature review, survey question design, data collection, implementation, and writing.*

References

- Adeniran, A. O. (2019). Application of Likert scale's type and Cronbach's alpha analysis in an airport perception study. *Scholar Journal of Applied Sciences and Research*, 2(4), 1-5.
- Aeberhard, S., & Forina, M. (1991). Wine [Data set]. UCI Machine Learning Repository, 10, C5PC7J.
- Botchkarev, A. (2018). Performance metrics (Error Measures) in machine learning regression, forecasting and prognostics: Properties and typology. *ArXiv*.
- Botchkarev, A. (2019). A new typology design of performance metrics to measure errors in machine learning regression algorithms. *Interdisciplinary Journal of Information Knowledge and Management*, 14, 045–076. <https://doi.org/10.28945/4184> .

- Burscher, B., Odijk, D., Vliegthart, R., De Rijke, M., & De Vreese, C. H. (2014). Teaching the computer to code frames in news: comparing two supervised machine learning approaches to frame analysis. *Communication Methods and Measures*, 8(3), 190–206.
- Chapman, P., Clinton, J., Kerber, R., Khabaza, T., Reinartz, T., Shearer, C. & Wirth, R. (2000). CRISP-DM 1.0 - Step-by-step data mining guide. *CRISP-DM Consortium*.
- Chen, T., & Guestrin, C. (2016, August). Xgboost: A scalable tree boosting system. In *Proceedings of the 22nd acm sigkdd international conference on knowledge discovery and data mining*, 785-794. <https://doi.org/10.1145/2939672.2939785>.
- Dyck, J. (2018). *Machine learning for engineering*. In: Proceedings of the 23rd Asia and South Pacific Design Automation Conference. IEEE Press, pp. 422–427.
- Fabian, P. (2011). Scikit-learn: Machine learning in Python. *Journal of machine learning research* 12, 2825-2830, <https://doi.org/10.1145/3369834>.
- Ferguson, A. L. (2017). Machine learning and data science in soft materials engineering. *Journal of Physics: Condensed Matter* 30(4).
- Fradkov, A. L. (2020). Early history of machine learning. *IFAC-PapersOnLine*, 53(2), 1385–1390. <https://doi.org/10.1016/j.ifacol.2020.12.1888>.
- Grandini, M., Bagli, E., & Visani, G. (2020). Metrics for multi-class classification: An overview. *arXiv (Cornell University)*. <https://doi.org/10.48550/arxiv.2008.05756>.
- Hair, J. F. J., Black, W. C., Babin, B. J., Anderson, R. E., Black, W. C., & Anderson, R. E. (2019). *Multivariate data analysis. Cengage Learning*.
- Ke, G., Meng, Q., Finley, T., Wang, T., Chen, W., Ma, W., Ye, Q., & Liu, T.-Y. (2017). LightGBM: A Highly Efficient Gradient Boosting Decision Tree. In I. Guyon, U. V. Luxburg, S. Bengio, H. Wallach, R. Fergus, S. Vishwanathan, & R. Garnett (Eds.), *Advances in Neural Information Processing Systems*, 30.
- Kononenko, I. (2001). Machine learning for medical diagnosis: History, state of the art and perspective. *Artificial Intelligence in Medicine*, 23(1), 89-109.
- Liu, Y. (2020). *Python machine learning by example - Third Edition*.
- Martinez-Plumed, F., Contreras-Ochando, L., Ferri, C., Hernandez-Orallo, J., Kull, M., Lachiche, N., Ramirez-Quintana, M. J., & Flach, P. (2021). CRISP-DM Twenty years later: From data mining processes to data science trajectories. *IEEE Transactions on Knowledge and Data Engineering*, 33(8), 3048–3061.
- McKinney, W. (2010, June). Data structures for statistical computing in python. *Proceedings of the 9th Python in Science Conference*, 445(1), 51-56.
- Mohamed, A. E. (2017). Comparative study of four supervised machine learning techniques for classification. *International Journal of Applied*, 7(2), 1-15.
- Nabil, D., Mosad, A., & Hefny, H. A. (2011). Web-Based applications quality factors: A survey and a proposed conceptual model. *Egyptian Informatics Journal*, 12(3), 211-217. <https://doi.org/10.1016/j.eij.2011.09.003>.
- Naqa, I. E., & Murphy, M. J. (2015). What is machine learning? In *Springer eBooks* (pp. 3–11). https://doi.org/10.1007/978-3-319-18305-3_1

- Nohara, Y., Matsumoto, K., Soejima, H., & Nakashima, N. (2022). Explanation of machine learning models using shapley additive explanation and application for real data in hospital. *Computer Methods and Programs in Biomedicine*, 214, 106584.
- Novakovic, J. Dj., Veljovic, A., S. Ilic, S., Papic, Z., & Tomovic, M. (2017). Evaluation of classification models in machine learning. *Theory and Applications of Mathematics & Computer Science*, 7(1), 39–46.
- Opitz, J. (2024). A closer look at classification evaluation metrics and a critical reflection of common evaluation practice. *arXiv (Cornell University)*.
- Ozgur, C., Colliau, T., Rogers, G., & Hughes, Z. (2021). MatLab vs. Python vs. R. *Journal of Data Science*, 15(3), 355–372. [https://doi.org/10.6339/jds.201707_15\(3\).0001](https://doi.org/10.6339/jds.201707_15(3).0001).
- Register, Y., & Ko, A. J. (2020, August). Learning machine learning with personal data helps stakeholders ground advocacy arguments in model mechanics. *Proceedings of the 2020 ACM Conference on International Computing Education Research*, 67-78,
- Sallow, A. B., Asaad, R. R., Ahmad, H. B., Abdulrahman, S. M., Hani, A. A., & Zeebaree, S. R. (2024). Machine learning skills to K–12. *Journal of Soft Computing and Data Mining*, 5(1), 132-141.
- Sarkar, D., Bali, R., & Sharma, T. (2017). The python machine learning ecosystem. In *Apress eBooks* (pp. 67–118). https://doi.org/10.1007/978-1-4842-3207-1_2.
- Schlimmer, J. (1987). Automobile [Data set]. UCI machine learning repository. DOI, 10, C5B01C. <https://doi.org/10.24432/C5B01C>.
- Tetzlaff, L. M., & Szepannek, G. (2022). mlr3shiny—State-of-the-art machine learning made easy. *SoftwareX*, 20, 101246. <https://doi.org/10.1016/j.softx.2022.101246>.
- Tukey, J. W. (1962). The future of data analysis. *The annals of mathematical statistics*, 33(1), 1-67.
- Wang, T., & Cheng, E. C. K. (2021). An investigation of barriers to Hong Kong K-12 schools incorporating Artificial Intelligence in education. *Computers and Education Artificial Intelligence*, 2, 100031. <https://doi.org/10.1016/j.caeai.2021.100031>.
- Woodruff, K., Hutson, J., & Arnone, K. (2023). Perceptions and barriers to adopting artificial intelligence in k-12 education: A survey of educators in fifty states. In *IntechOpen eBooks*. <https://doi.org/10.5772/intechopen.1002741>.
- Zhou, Z.-H. (2017). “Machine learning challenges and impact: an interview with Thomas Dietterich.” *National Science Review* 5(1), 54–58.

Review Article

Artificial Intelligence in the Education of Teachers: A Qualitative Synthesis of the Cutting-Edge Research Literature

Rusen MEYLANI^{1,*} 

¹ Dicle University Faculty of Education, Diyarbakır, Turkey rusen.meylani@dicle.edu.tr


* Corresponding Author: rusen.meylani@dicle.edu.tr

Article Info

Received: 03 May 2024

Accepted: 23 September 2024

Keywords: Artificial intelligence, teacher education, professional development, pedagogy, intelligent tutoring systems, AI-driven analytics, digital literacy

 [10.18009/jcer.1477709](https://doi.org/10.18009/jcer.1477709)

Publication Language: English

Abstract

The integration of Artificial Intelligence (AI) into teacher education has been transformative, offering personalized learning experiences, enhanced professional development, and improved teaching methodologies. AI technologies such as Intelligent Tutoring Systems (ITS), AI-driven analytics, and automated assessment tools have become central to modern educational practices, significantly improving engagement, adaptability, and effectiveness. This study employs a qualitative thematic analysis of current literature on AI in teacher education, examining peer-reviewed articles and reports using thematic coding to identify key patterns, opportunities, and challenges. The findings reveal that AI enhances teacher education by providing personalized learning pathways, fostering critical thinking, and supporting ongoing professional growth. Technologies like ITS, Virtual Reality (VR), and AI-driven analytics have proven effective in promoting motivation and engagement among teachers. However, ethical challenges such as biases in AI systems and concerns regarding data privacy require continuous attention. Furthermore, a gap in teacher preparedness, particularly in developing AI literacy and integrating AI tools into classroom practices, is evident. Despite these challenges, AI offers substantial benefits, transforming teaching practices and enabling personalized, adaptive instruction that supports both teachers and students. The study emphasizes the need for comprehensive teacher training programs focusing on digital literacy and ethical AI use, ensuring educators can navigate an AI-enhanced educational environment effectively. This research contributes to the ongoing discourse by highlighting the need for ethical guidelines and robust teacher training programs, offering actionable insights for educators, policymakers, and institutions aiming to integrate AI into teacher education..



CrossMark



To cite this article: Meylani, R. (2024). Artificial intelligence in the education of teachers: a qualitative synthesis of the cutting-edge research literature. *Journal of Computer and Education Research*, 12 (24), 600-637. <https://doi.org/10.18009/jcer.1477709>

Introduction

Overview of AI in Education

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, particularly computer systems, which encompass learning, reasoning, and self-correction. These processes allow machines to acquire information, apply rules to reach conclusions, and improve performance through feedback and correction (Russell & Norvig, 2021). In the context of education, AI technologies such as Intelligent Tutoring Systems (ITS),

AI-driven analytics, and automated assessment tools significantly contribute to creating personalized and dynamic learning experiences. ITS, for example, can adapt instruction based on student needs, providing individualized support and feedback (VanLehn, 2011). AI-driven analytics further enhance learning by offering educators detailed insights into student performance, enabling tailored interventions (Popenici & Kerr, 2017). Automated assessment tools streamline evaluation, ensuring timely and accurate feedback, which fosters continuous improvement in the learning process (Chen et al., 2020).

AI in education marks a significant shift in teaching and learning approaches. Initially recognized for delivering personalized learning experiences and automating assessments, AI has enabled tailored educational paths for individual students (Fahimirad & Kotamjani, 2018). ITS and AI-driven analytics have enhanced student engagement and performance, demonstrating AI's profound impact on educational outcomes (Sudjitjoo et al., 2022).

AI's utility extends beyond student learning, including teacher education and professional development. It provides educators with personalized learning pathways, collaborative spaces, and gamified experiences that enrich teaching methods (Dergunova et al., 2022). Additionally, AI aids teachers in developing critical thinking and problem-solving skills through simulations and instant feedback, proving its efficacy in professional training (Tubino & Adachi, 2022).

The adoption of AI in education presents several challenges, particularly related to ethical considerations. Issues such as bias in AI systems, data privacy, and the responsible use of AI-driven technologies are significant concerns. Addressing these challenges is essential to ensure the fair and equitable implementation of AI in educational settings (Fahimirad & Kotamjani, 2018). Teachers must also develop their digital and AI skills to effectively integrate these technologies into their teaching practices and navigate their complexities responsibly (Akram et al., 2022).

The potential impact of AI has been explored extensively in higher education. It is poised to redefine the nature of universities as AI becomes integral to the educational fabric (Popenici & Kerr, 2017). The application of AI in web-based education highlights its versatility across different educational settings (Chen et al., 2020). AI's role in augmenting human intelligence and supporting educational decision-making processes stresses its potential to enhance rather than replace human involvement (Cukurova et al., 2019).

In STEM education, systematic reviews have focused on integrating diverse AI techniques to address complex educational needs, underscoring the challenge of effectively employing AI technologies (Xu & Ouyang, 2022). The critical evaluation of AI and emerging technologies in intelligent classrooms reveals the need to consider their educational implications seriously (Dimitriadou & Lanitis, 2023). Additionally, the potential use of generative AI in medical education suggests opportunities for optimizing its integration to improve various aspects of education (Boscardin et al., 2024).

K-12 education has seen significant AI integration efforts, from AI education initiatives in China to implementing AI education in South Korea's middle school technology curricula, showcasing global efforts to make AI knowledge accessible and relevant to young learners (Park & Kwon, 2023). The development of web-based platforms for AI education and the role of AI during the COVID-19 pandemic highlights AI's contributions to addressing educational challenges and disparities (Wu et al., 2021).

AI's integration into education spans various levels and subjects, presenting opportunities and challenges. It has the potential to revolutionize educational experiences, enhance teaching efficacy, and support human intelligence augmentation, all while requiring careful consideration of its ethical implications and the professional development of educators.

The Significance of AI in Teacher Education

Integrating AI into teacher education transforms teaching practices, enhances professional development, and prepares educators for an AI-driven educational environment. AI provides personalized learning paths and fosters collaborative learning environments, which improve teachers' critical thinking and problem-solving abilities. Moreover, AI offers real-time feedback and simulations that are crucial for teachers' professional development and the enhancement of teaching skills (Fryberg & Markus, 2007).

AI's role extends beyond professional development to include increasing digital literacy and AI skills among teachers. Based on self-determination theory, curriculum planning for AI education aims to empower teachers to design AI-based curricula that align with their goals and meet their students' needs. This approach involves teachers in curriculum planning and gives them control and a sense of ownership over their professional growth, leading to more dedicated and motivated teaching staff (Chiu & Chai, 2020).

Ethical considerations are paramount when implementing AI in education. Teachers must understand the effects of using AI tools in the classroom and develop strategies for their responsible use. Addressing biases, promoting inclusion, and maintaining trust in AI technologies are crucial to ensure they are used fairly and responsibly. This awareness and strategy development help ensure that AI tools contribute positively to educational fairness and inclusivity (Chiu et al., 2022).

The significance of AI in teacher education is underscored by its potential to enhance conceptual understanding, personalize instruction, and improve engagement and motivation. However, the sustainable development of AI in education faces challenges, including the need for comprehensive public policy, ensuring inclusion and equity, and preparing teachers for AI-powered education (Nguyen et al., 2022). Strengthening teachers' AI digital competency is essential for effectively using AI in teaching, learning, and assessment (Ng et al., 2023).

Teachers' role as key actors in bringing innovation to the classroom and developing innovative educational paths is crucial. Addressing the ethics of AI in teacher preparation programs and engaging in-service teachers in ethical discussions are vital for considering the ethical applications of AI in classrooms (Polak et al., 2022). Raising awareness of AI's positive effects and training teachers in AI usage is recommended (AlKanaan, 2022).

Recent studies have continued to explore AI's potential in education. Tubino and Adachi (2022) emphasized the importance of developing AI literacy in teacher education, while Boscardin et al. (2024) explored the role of AI in personalized medical education, highlighting its broader applications across disciplines. These studies underline the importance of equipping educators with the skills necessary to harness AI tools effectively.

Objectives of the Study and Research Questions

The study's primary objective is to explore the transformative impact of AI on teacher education, specifically focusing on the intersection of technology, pedagogy, and professional development. The research delves into how AI technologies, such as ITS, AI-driven analytics, and automated assessment tools, significantly enhance teaching and learning by providing personalized, dynamic, and interactive learning experiences. These technologies augment students' educational outcomes and facilitate ongoing professional development for teachers, promoting a profound understanding and sophisticated use of AI tools within education.

The study raises several critical research questions to guide the exploration of AI in teacher education: 1) How should AI technologies be integrated within teacher education programs to improve pedagogical outcomes? 2) How do AI-driven tools impact teacher professional growth and student learning outcomes? 3) What ethical considerations emerge from using AI in education, and how are they addressed to ensure fair and equitable learning environments? 4) How do AI technologies alter traditional teaching and teacher preparation paradigms?

These questions are intended to probe AI's capabilities and limitations in educational contexts, assess the readiness of teacher education programs to adopt such technologies, and explore the broader implications of AI integration in terms of ethics, pedagogy, and professional practice. By answering these questions, the study aims to provide actionable insights and recommendations for effectively incorporating AI into teacher education and enhancing teaching practices and learning experiences.

Method

Research Design

This study employs a qualitative thematic document analysis to explore how AI technologies are integrated into teacher education. The research design follows an inductive approach, which allows the generation of themes directly from the data. The analysis focuses on identifying patterns within peer-reviewed literature that examine the use of AI in various educational contexts. MAXQDA software was used to manage the large volume of documents and streamline the coding process, ensuring the accuracy and reliability of the analysis. The iterative process involved coding the data in phases, including open, axial, and selective coding to identify the most relevant themes.

This methodology is appropriate for systematically reviewing diverse studies and extracting significant insights into AI's role in teacher education. By relying on existing literature, this qualitative synthesis highlights both the opportunities and challenges of AI implementation, while also addressing gaps in educators' readiness and the ethical considerations of using AI in the classroom.

Target Audience and Relevance of the Studies

The primary target audience of this research is teachers and teacher candidates, focusing on how they engage with AI technologies in their professional development and

teaching practices. The literature reviewed specifically highlights studies centered on these groups, ensuring the findings are directly applicable to educators in training and in-service teachers.

Data Collection

The data for this thematic analysis was collected through a comprehensive literature review, focusing on peer-reviewed articles, conference papers, and authoritative reports from the last two decades. The databases searched included PubMed, JSTOR, IEEE Xplore, Google Scholar, Scopus, and Web of Science, utilizing a combination of keywords such as "Artificial Intelligence," "Teacher Education," "AI in Education," and "Pedagogical AI Applications." The search was refined by including only those documents published in English from 2000 onwards to focus on the most recent and relevant findings.

Rationale for Keyword Selection

The choice of search keywords was guided by the need to capture a comprehensive range of studies relevant to the integration of Artificial Intelligence (AI) in teacher education. Keywords such as "Artificial Intelligence," "Teacher Education," "AI in Education," and "Pedagogical AI Applications" were chosen to ensure the inclusion of studies focusing on the application of AI technologies in educational settings, particularly those that address teacher training and development. These keywords reflect the core objectives of the research, which aims to explore how AI enhances pedagogical practices, supports teacher professional development, and addresses educational challenges through AI-driven tools.

Additionally, the keywords were selected to cover a broad spectrum of AI technologies such as Intelligent Tutoring Systems (ITS), AI-driven analytics, and automated assessment tools, which are commonly discussed in the literature regarding AI's impact on teaching and learning. By using these specific search terms, the study aimed to include a diverse range of studies that highlight both the benefits and challenges of AI in education, ensuring a comprehensive understanding of its integration into teacher education programs.

This approach was designed to align with the study's objectives and capture relevant literature across various educational levels and contexts, while focusing on the pedagogical and professional implications of AI for teachers and teacher candidates.

Data Analysis

MAXQDA software was utilized to organize, code, and perform thematic analysis on collected documents, which facilitated the efficient management of large volumes of text and

enabled complex coding mechanisms to unearth underlying themes and patterns. The process began with the preparation and importation of data, where all collected articles were converted to compatible formats such as .txt or .rtf and imported into MAXQDA. Preliminary readings of the content were conducted to begin the initial coding process.

In the initial coding phase, codes were generated inductively from the data rather than using predefined categories. This process involved thoroughly reading the collected literature, identifying significant text segments, and tagging them with short, descriptive labels. After this, focused coding was conducted to synthesize and group similar codes into broader categories. These categories were then refined and reduced to a manageable number, forming the basis for the final themes. To ensure reliability and eliminate bias, the themes were validated through peer debriefings and multiple coding cycles.

Subsequently, theme development was undertaken, where codes and categories were refined, combined, and organized into potential themes. These themes were thoroughly reviewed about the coded extracts and the entire data set to ensure they represented a coherent pattern. The refining themes phase involved ongoing analysis to detail each theme and the overall narrative, checking themes against each other and referring to the original data set to confirm their distinctiveness and consistency.

The final analysis and interpretation phase involved interpreting the themes within the context of existing literature on AI in teacher education, exploring connections between themes, and drawing conclusions about their implications. To ensure reliability and validity, the study included multiple review cycles, peer debriefings to challenge the emerging themes, and independent coding by two researchers to avoid bias. MAXQDA's tools allowed for meticulous tracking and re-evaluation of themes and codes, ensuring the development of robust thematic constructs well-grounded in the collected data (Figure 1).

Findings

This qualitative thematic analysis provided comprehensive insights into the diverse dimensions of AI applications in teacher education. By rigorously analyzing the literature through a structured methodology, this study offers a nuanced understanding of how AI enhances, transforms, and occasionally challenges pedagogical paradigms in teacher education (Figure 1 and Table 1).

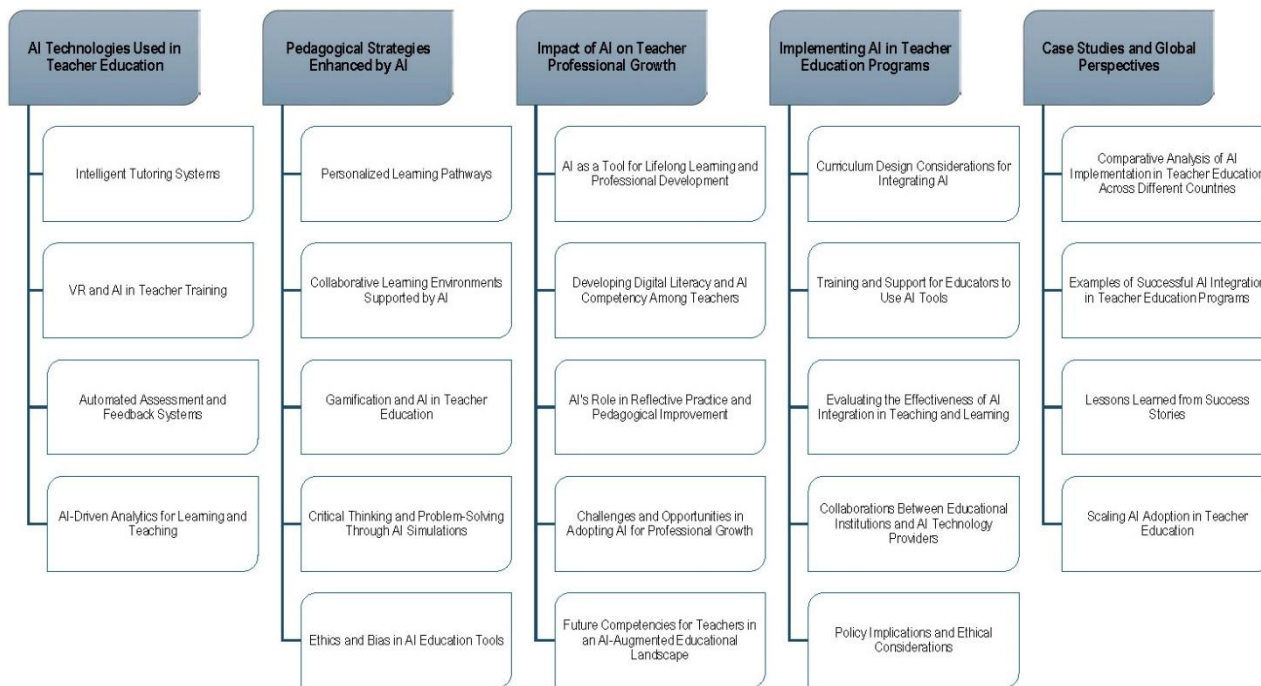


Figure 1. Themes and sub-themes that emerged from the qualitative analysis.

Table 1. Results of the qualitative analysis are summarized in this table with main themes, sub-themes, codes, the number of resources consulted, the actual resources consulted, and critical research findings.

Main Themes	Sub-Themes	Codes	Number of Resources	Actual Resources	Key Research Findings
AI Technologies Used in Teacher Education	Intelligent Tutoring Systems (ITS)	Applications; Professional Development	3	Nwana, 1990; Shih et al., 2021; Lee & Perret, 2022	ITS leverages AI to provide dynamic and individualized educational experiences that support students and teachers. These systems are instrumental in enhancing learning outcomes through personalized instruction and feedback.
	Virtual Reality (VR) and Augmented Reality (AR) in Teacher Training	Enhanced Training Techniques; Application in Simulations; Learning Management Enhancements	3	Yan & Song, 2015; Faria et al., 2009; Ghanim & Kovács, 2021	VR/AR technologies enhance teacher training programs by providing immersive and interactive simulations to improve educators' pedagogical skills.
	Automated Assessment and Feedback Systems	Feedback Mechanisms; Enhancing Learner-Instructor Interaction; Use of NLP in Education	3	Fidan & Genel, 2022; Seo et al., 2021; Shaik et al., 2022	Automated assessment and feedback systems are pivotal in optimizing educational practices through AI by enhancing the accuracy and timeliness of student feedback.
	AI-Driven Analytics for Learning and Teaching	Integration with Learning Analytics; Support for Personalized Education; Enhancement of Teaching Methods	9	Ng et al., 2023; Ouyang et al., 2023; Sedrakyan et al. 2020; Seo et al., 2021; Pelaez et al., 2022; Nazaretsky et al., 2022a, 2022b; Hamal et al., 2022; Bulathwela et al., 2021; Wang, 2023	AI-driven analytics significantly contribute to learning and teaching by providing actionable insights that enhance student and teacher performance.
Pedagogical Strategies Enhanced by AI	Personalized Learning Pathways	Development and Impact; Broader Applications and Studies; AI Tools in Education	4	Chen et al., 2020; Popenici & Kerr, 2017; Tapalova & Zhiyenbayeva, 2022; Su & Yang, 2023	Personalized learning pathways facilitated by AI cater to individual learning styles and needs and enhance the educational process by providing focused and efficient learning solutions.
	Collaborative Learning Environments Supported by AI	Studies and Developments; Effectiveness of AI in Collaboration	3	Portugal et al., 2000; Joiner, 2004; Lee et al., 2021	AI-supported collaborative learning environments enhance the effectiveness of group interactions and enrich students' learning experiences by making them more engaging and tailored to develop specific collaborative skills.
	Gamification and AI in Teacher Education	Research Insights: AI's Role in Gamification	3	Mårell-Olsson, 2022; Sajinžić et al., 2022; Babu, 2023	Integrating AI with gamification strategies in education enhances learner engagement and motivation and facilitates the adoption of innovative instructional techniques that make learning more effective and enjoyable.
	Critical Thinking and Problem-Solving Through AI Simulations	Study Findings; Related Research	2	Amanda et al., 2022; Memduhoğlu & Keleş, 2016	AI-driven simulations enhance critical thinking and problem-solving skills by providing dynamic, realistic, and complex scenarios that encourage deep learning and practical application of knowledge.
Ethics and Bias in AI Education Tools	Ethical Guidelines and Bias Mitigation; Integrating Ethics in AI Education	Ethical Guidelines and Bias Mitigation; Integrating Ethics in AI Education	3	Jobin and Jenca, 2019; Zhang and Zhang, 2023; Zhang et al., 2022	Addressing ethics and bias in AI education tools is critical to maintaining fairness, transparency, and accountability, ensuring that AI technologies benefit all users equitably and justly.
	AI as a Tool for Lifelong Learning and Professional Development	Enhancing Lifelong Learning; Supporting Teacher Development; Motivation and Competence	3	Narang et al., 2018; Şen & Yıldız Durak, 2022; Ekşi et al., 2020	AI, as a tool for lifelong learning and professional development, not only supports continuous educational endeavors but also enhances the professional competencies of individuals, preparing them for sustained success in their respective fields.
	Developing Digital Literacy and AI Competency Among Teachers	Building AI Competencies; Role of Motivation	2	Şen & Yıldız Durak, 2022; Ekşi et al., 2020	Developing digital literacy and AI competencies in teachers is fundamental to adapting educational practices to the digital age, enhancing teacher effectiveness, and preparing educators to meet future challenges.
	AI's Role in Reflective Practice and Pedagogical Improvement	Supporting Reflective Practice; Personalized Learning Support; Improving Teaching Practices	3	Forayska-Pomsta, 2016; Santos, 2016; Cadiz, 2022	AI's role in reflective practice and pedagogical improvement is instrumental in enhancing the quality of teaching and learning. It gives educators the tools to assess and refine their pedagogical approaches effectively.
Challenges and Opportunities in Adopting AI for Professional Growth	Strategic Implications and Challenges; Technostress and Ethical Concerns; Enhancing Job Roles and Competitiveness	Strategic Implications and Challenges; Technostress and Ethical Concerns; Enhancing Job Roles and Competitiveness	3	Dwivedi et al., 2021; Lebovitz et al., 2022; Sharma et al., 2024	Adopting AI for professional growth offers numerous opportunities to enhance job roles and decision-making processes, although it also presents challenges that must be addressed to leverage AI's capabilities fully.
	Future Competencies for Teachers in an AI-Augmented Educational Landscape	Future-Oriented Skills; Ethical and Technical Training; Curriculum and Professional Development	5	Kreinsen & Schulz, 2023; Ng et al., 2023; Zhao et al., 2022; Chiu & Chai, 2020; Heng & Tabunshchik, 2021	Preparing teachers for an AI-augmented educational environment involves a multifaceted approach that includes enhancing AI literacy, ethical training, and innovative curriculum development. This ensures that educators are well-prepared to utilize AI effectively.
	Integrating AI into Educational Curricula	Ethical and Knowledgeable Implementation; Integrated Curriculum Framework; Problem-Based Learning (PBL) Approach; Sustainable Curriculum Planning	4	Kim, 2023; Vergel et al., 2017; Bridges et al., 2016; Chiu and Chai, 2020	Integrating AI into educational curricula requires careful consideration of ethical practices, innovative curriculum frameworks, and sustainable planning to enhance teaching and learning experiences effectively.
	Training and Support for Educators to Use AI Tools	Developing Competencies; Ethical Training and AI Literacy; Curriculum and Professional Development	6	Kreinsen & Schulz, 2023; Ng et al., 2023; Touretzky et al., 2019; Zhao et al., 2022; Chiu & Chai, 2020; Heng & Tabunshchik, 2021	Equipping educators with AI competencies through targeted training programs and comprehensive professional development plans is crucial for effective AI integration in teaching practices.
Evaluating the Effectiveness of AI Integration in Teaching and Learning	Impact on Teaching Methods; Personalized Learning Environments; AI in Medical Education; Challenges and Opportunities	Impact on Teaching Methods; Personalized Learning Environments; AI in Medical Education; Challenges and Opportunities	5	Wang, 2023; Lin, 2022; Chassignol et al.; Burney and Ahmad, 2022; Alasadi and Baiz, 2023; Alenezi, 2023	The effective integration of AI in education requires comprehensive evaluation to optimize teaching methods, personalize learning, and overcome inherent challenges.
	Collaborations Between Educational Institutions and AI Technology Providers	Enhancing Educational Practices; Role of Teachers and Systematic Reviews; Pedagogical and Technological Enhancements	6	Ghennat et al., 2022; Funes, 2024; Kim et al., 2022; Zawacki-Richter et al., 2019; Luckin & Cukurova, 2019; Kuleto et al., 2021	Fostering partnerships between educational institutions and AI technology providers is essential for developing innovative solutions that improve educational practices and outcomes.
	Policy Implications and Ethical Considerations	Ethical Guidelines and Transparency; Addressing Ethical Risks; Promoting Ethical AI Use	10	Jobin & Jenca, 2019; Köbis & Mehner, 2021; Mahligawati et al., 2023; Marino et al., 2023; Nazaretsky et al., 2022a, 2022b; Yu & Yu, 2023; Huriye, 2023; Boscardin et al., 2024; Holmes et al., 2021; Chaudhry et al., 2022	Careful consideration of policy implications and ethical standards is essential for successfully integrating AI into teacher education programs. Educators and policymakers must prioritize ethical practices, transparency, and accountability.
	Comparative Analysis of AI Implementation in Teacher Education Across Different Countries	Variability in AI Adoption; Challenges in K-12 Education; Global Adoption and Professional Development Issues; Importance of AI Literacy	7	Nguyen et al., 2022; Chounta et al., 2021; Pelaez et al., 2022; Chen et al., 2020; Lee & Perret, 2022; Yau et al., 2022; Zhao et al., 2022	The comparative analysis highlights the need to tackle professional development gaps, develop core AI competencies, and promote AI literacy to ensure effective AI integration in education systems worldwide.
Examples of Successful AI Integration in Teacher Education Programs	Integrative Educational Practices; Enhancing Teacher and Student Engagement; Developing Self-Efficacy and AI Literacy; Curricular and Pedagogical Improvements	Integrative Educational Practices; Enhancing Teacher and Student Engagement; Developing Self-Efficacy and AI Literacy; Curricular and Pedagogical Improvements	9	Park and Kwon, 2023; Lee and Perret, 2022; Salas-Pilco, 2020; Polak et al., 2022; Caner and Aydin, 2021; Nazaretsky et al., 2022a, 2022b; Amante et al., 2019; Monteiro et al., 2021; Otero et al., 2023	Successful AI integration requires comprehensive training, effective curricular design, and a focus on teacher and student needs to enhance pedagogical practices and learning outcomes.
	Lessons Learned from Success Stories	Professional Development Needs; Building Trust in AI Technology; Importance of Teacher Perspectives; Strategic Curriculum Integration	4	Lee & Perret, 2022; Nazaretsky et al., 2022a, 2022b; Yau et al., 2022; Chiu & Chai, 2020	Lessons learned from success stories emphasize the importance of targeted professional development, trust-building, teacher involvement, and strategic curriculum planning to facilitate successful AI integration in teacher education programs.
	Scaling AI Adoption in Teacher Education Strategies and Recommendations	Institutional and Recognition Barriers; Educational Level and AI Adoption; Preparation Strategies for Technology Use; Didactical Strategies and AI Use	8	Gupta & Bhaskar, 2020; Kuo et al., 2011; Tondeur et al., 2016; Shahzad et al., 2017; Prieto et al., 2019; Williamson & Eynon, 2020; Kang et al., 2021; Chen et al., 2020	Scaling AI adoption in teacher education requires addressing institutional barriers, enhancing educational strategies, and providing robust training and support frameworks to ensure teachers are well-prepared to integrate AI effectively.

Results

AI Technologies Used in Teacher Education

The utilization of AI technologies in teacher education encompasses various systems and tools designed to enhance educators' training, development, and performance through personalized and adaptive learning experiences. Four significant AI-driven technologies are deployed in teacher education, and these will be elaborated on here.

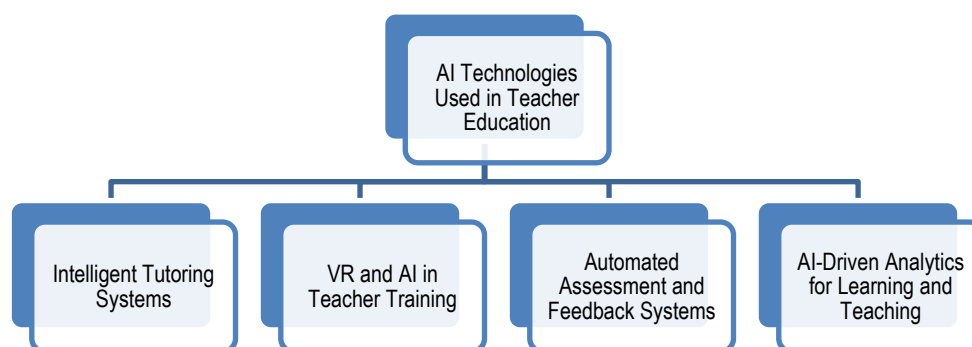


Figure 2. Thematic representation of AI technologies in teacher education.

Intelligent Tutoring Systems (ITS)

ITS, built on AI frameworks, have revolutionized educational paradigms. They achieve this by personalizing learning experiences and enhancing student outcomes. These systems are adaptable to the individual learner's needs, providing customized instruction and feedback. This adaptability is a crucial factor in effective learning processes.

- *Overview and Applications:* The research highlights the application of ITS in education, with systems designed to support personalized learning efficiently (Nwana, 1990). Such systems are particularly effective in domains requiring foundational solid knowledge, such as mathematics, where they offer tailored support on topics like equivalent fractions (Shih et al., 2021).
- *Professional Development:* ITS are also critical in teacher training to integrate AI in classrooms, particularly in STEM education. They help introduce essential AI skills for teachers and emphasize the ethical dimensions of AI usage in educational settings (Lee & Perret, 2022).

ITS leverages AI to provide dynamic and individualized educational experiences that support students and teachers. These systems enhance learning outcomes through personalized instruction and feedback.

VR and AR in Teacher Training

VR/AR technologies, empowered by AI, offer immersive and interactive environments that benefit teacher training. These technologies provide realistic simulations and scenarios that enhance the learning process, making it more engaging and effective.

- *Enhanced Training Techniques:* Using VR, ITS delivers personalized education and training to teachers, improving their instructional techniques and adapting to their learning styles (Yan & Song, 2015).
- *Application in Simulations:* In fields like power restoration and incident management, VR integrated with AI optimizes training outcomes through realistic, interactive simulations that enhance decision-making skills (Faria et al., 2009).
- *Learning Management Enhancements:* Developing ontology-based models in Learning Management Systems (LMS) using AI facilitates metacognitive awareness and adaptive learning, significantly improving engagement and retention (Ghanim & Kovács, 2021).

VR/AR technologies enhance teacher training programs by providing immersive and interactive simulations tailored to improve educators' pedagogical skills.

Automated Assessment and Feedback Systems

Automated assessment and feedback systems that utilize AI technologies are reshaping educational practices by providing timely, personalized feedback and improving student engagement and learning outcomes.

- *Feedback Mechanisms:* Studies indicate that AI-driven feedback mechanisms significantly enhance learning performance and motivation by providing instant, relevant feedback (Fidan & Gencel, 2022).
- *Enhancing Learner-Instructor Interaction:* AI systems improve the interaction between learners and instructors by facilitating effective communication and timely feedback, which is essential for personalized learning environments (Seo et al., 2021).
- *Use of NLP in Education:* Implementing Natural Language Processing (NLP) techniques to analyze educational feedback offers profound insights that help refine teaching strategies and student interactions (Shaik et al., 2022).

Automated assessment and feedback systems are pivotal in optimizing educational practices through AI by enhancing the accuracy and timeliness of student feedback.

AI-Driven Analytics for Learning and Teaching

AI-driven analytics play a crucial role in the modern educational landscape, offering insights that help personalize learning experiences, enhance student outcomes, and streamline teaching practices.

- *Integration with Learning Analytics:* Integrating AI with learning analytics tools provides educators with detailed dashboards highlighting learning patterns, facilitating informed decision-making (Sedrakyan et al., 2020).
- *Support for Personalized Education:* Studies emphasize the potential of AI to support personalized learning approaches, which are critical in addressing individual student needs and promoting effective learning strategies (Nazaretsky et al., 2022a, 2022b; Pelaez et al., 2022).
- *Enhancement of Teaching Methods:* AI tools are instrumental in advancing teaching methodologies through the analysis of networked learning environments and pedagogical data, which help educators refine their practices (Bulathwela et al., 2021; Hamal et al., 2022; Wang, 2023).

AI-driven analytics significantly contribute to learning and teaching by providing actionable insights that enhance student and teacher performance.

These AI technologies collectively enhance the educational ecosystem by improving educators' skills, personalizing students' learning, and refining assessment methodologies through advanced, data-driven insights. Through these innovations, teacher education is becoming more adaptive, effective, and aligned with the needs of both educators and learners in a rapidly evolving digital world.

Pedagogical Strategies Enhanced by AI

AI has profoundly impacted pedagogical strategies by introducing methods that personalize and enhance the learning experience through customized educational pathways, collaborative environments, gamification, critical thinking exercises, and ethical practices. This section delves into these strategies to understand their benefits, challenges, and the integral role of AI in modern educational settings.

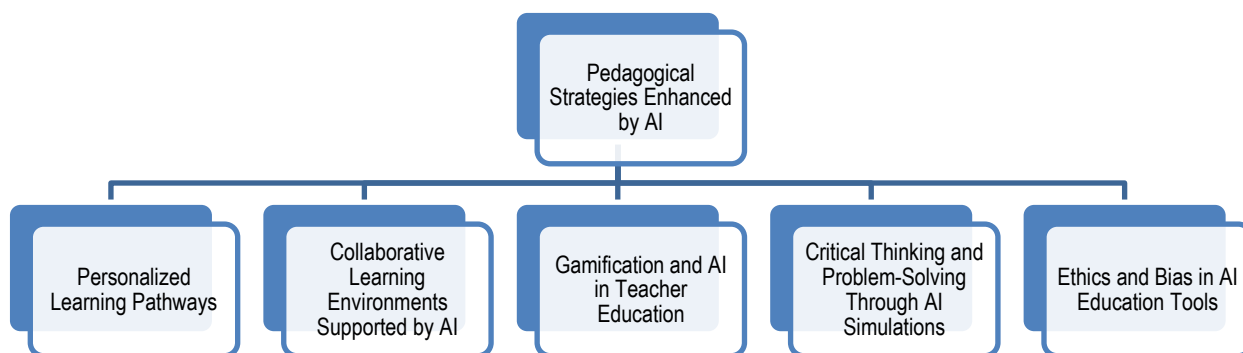


Figure 3. Thematic representation of pedagogical strategies enhanced by AI.

Personalized Learning Pathways

AI's integration into education has pioneered personalized learning. It provides tailored educational content and feedback mechanisms that adapt to individual learners' needs, optimizing their learning experiences.

- *Development and Impact:* Intelligent educational systems leverage AI to deliver immediate, personalized assistance, significantly benefiting learners by adapting to their unique educational needs (Chen et al., 2020).
- *Broader Applications and Studies:* The collaboration between Talkspace and IBM's Watson exemplifies AI's potential beyond traditional education settings, such as psychotherapy, to personalize learning and support (Popenici & Kerr, 2017). Moreover, research by Tapalova and Zhiyenbayeva (2022) utilizing text mining and social network analysis has been pivotal in creating personalized learning pathways and understanding AI's educational impact.
- *AI Tools in Education:* AI tools, including ChatGPT, have streamlined the educational process by personalizing learning and simplifying feedback, enhancing learner and teacher experiences (Su & Yang, 2023).

Personalized learning pathways facilitated by AI cater to individual learning styles and needs, enhancing the educational process by providing focused and efficient learning solutions.

Collaborative Learning Environments Supported by AI

AI enhances collaborative learning environments through tools that support student interaction and engagement, fostering skills essential for modern educational and professional settings.

- *Studies and Developments:* Portugal et al. (2000) demonstrated using virtual spaces like DeskTOP to enhance student collaboration, an early indication of how AI facilitates better interactive learning environments.
- *Effectiveness of AI in Collaboration:* Further research by Joiner (2004) and Lee et al. (2021) on virtual collaborative environments and game-based learning shows that AI significantly improves learners' communication, coordination, and collaborative skills.

AI-supported collaborative learning environments enhance the effectiveness of group interactions and enrich students' learning experiences by making them more engaging and tailored to develop specific collaborative skills.

Gamification and AI in Teacher Education

Gamification in education, enhanced by AI, incorporates game design elements in learning environments to boost engagement, motivation, and the educational value of content, making learning an enjoyable and impactful experience.

- *Research Insights:* Studies by Mårell-Olsson (2022) and Sajinčič et al. (2022) explore teachers' perceptions of gamification and highlight the positive reception and potential challenges of implementing gamified elements in education.
- *AI's Role in Gamification:* Babu (2023) discusses how AI personalizes gamification strategies to suit individual learner preferences, maximizing educational outcomes and student engagement.

Integrating AI with gamification strategies in education enhances learner engagement and motivation and facilitates the adoption of innovative instructional techniques that make learning more effective and enjoyable.

Critical Thinking and Problem-Solving Through AI Simulations

AI simulations play a crucial role in developing critical thinking and problem-solving skills. They provide realistic scenarios that challenge students to engage deeply with content and apply their knowledge practically.

- *Study Findings:* Amanda et al. (2022) emphasize enhancing critical thinking through problem-based learning models integrated with AI, which support complex learning and decision-making processes.

- *Related Research:* Memduhoğlu and Keleş (2016) highlight the development of critical thinking and its direct impact on effective problem-solving capabilities, further supported by AI tools.

AI-driven simulations enhance critical thinking and problem-solving skills by providing dynamic, realistic, and complex scenarios that encourage deep learning and practical application of knowledge.

Ethics and Bias in AI Education Tools

Implementing AI in education requires a rigorous examination of ethical standards and biases to prevent inequalities and ensure fair educational practices.

- *Ethical Guidelines and Bias Mitigation:* Research by Jobin and Ienca (2019) and Zhang and Zhang (2023) highlights the necessity of comprehensive ethical guidelines and governance models to mitigate bias in AI applications and ensure trustworthy AI deployments in education.
- *Integrating Ethics in AI Education:* Zhang et al. (2022) further investigate the integration of ethical considerations in AI learning tools, advocating for enhanced AI literacy that encompasses ethical standards to educate students about AI's societal impacts.

Addressing ethics and bias in AI education tools is critical to maintaining fairness, transparency, and accountability, ensuring that AI technologies benefit all users equitably and justly.

These pedagogical strategies, enhanced by AI, illustrate the transformative potential of technology in education. By personalizing learning, enhancing collaborative and gamified environments, improving critical thinking and problem-solving, and addressing ethical considerations, AI is setting a new standard for educational practices that are both effective and equitable.

Impact of AI on Teacher Professional Growth

AI is significantly transforming the landscape of teacher professional development by facilitating lifelong learning, enhancing digital literacy, promoting reflective practice, and addressing challenges associated with AI adoption. This section explores how AI contributes to these areas, underlining the profound effects on teacher professional growth.

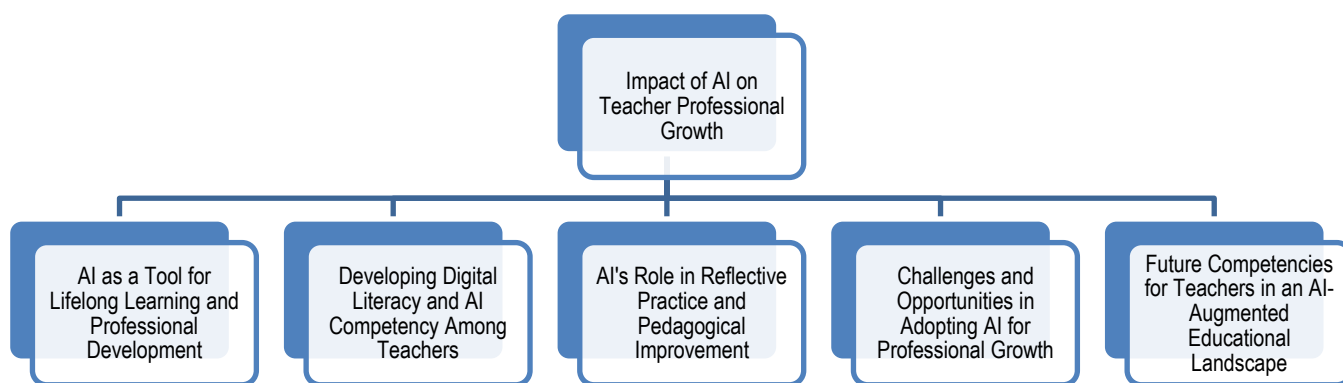


Figure 4. Thematic representation of the impact of AI on teacher professional growth.

AI as a Tool for Lifelong Learning and Professional Development

AI technologies play a crucial role in supporting lifelong learning and professional development. They offer innovative tools that enhance educational experiences and facilitate continuous professional growth.

- *Enhancing Lifelong Learning:* AI systems provide dynamic and personalized learning experiences that support continuous education. For cardiologists, AI-driven educational tools offer updated resources and adaptive learning environments, essential for maintaining high standards of medical practice (Narang et al., 2018).
- *Supporting Teacher Development:* In language education, AI enhances English teachers' abilities to integrate technology effectively, fostering their professional competencies and lifelong learning tendencies (Şen & Yıldız Durak, 2022).
- *Motivation and Competence:* AI also enhances motivation among university students, affecting their professional competencies and success in lifelong learning (Ekşi et al., 2020).

As a lifelong learning and professional development tool, AI supports continuous educational endeavors and enhances individuals' professional competencies, preparing them for sustained success in their respective fields.

Developing Digital Literacy and AI Competency Among Teachers

Developing digital literacy and AI competency is essential for teachers to navigate the evolving technological landscape in education effectively.

- *Building AI Competencies:* Teachers' integration of AI tools is crucial for enhancing educational practices and fostering professional growth. Studies emphasize the importance of self-efficacy in the effective use of technology, suggesting that

confident teachers are more likely to adopt and benefit from AI innovations (Şen & Yıldız Durak, 2022).

- *Role of Motivation:* Educators' motivation significantly impacts their professional competence and adopting lifelong learning practices, with AI supporting these processes (Ekşi et al., 2020).

Developing digital literacy and AI competencies in teachers is fundamental to adapting educational practices to the digital age, enhancing teacher effectiveness, and preparing educators to meet future challenges.

AI's Role in Reflective Practice and Pedagogical Improvement

AI significantly contributes to reflective practice and pedagogical improvement, enabling educators to analyze their teaching methods and outcomes critically through data-informed insights.

- *Supporting Reflective Practice:* AI methodologies facilitate reflective practice among educators, enhancing their teaching skills through critical self-evaluation and continuous feedback (Porayska-Pomsta, 2016).
- *Personalized Learning Support:* AI's ability to tailor learning experiences is crucial in pedagogical improvement, particularly in specialized areas such as motor skills development (Santos, 2016).
- *Improving Teaching Practices:* AI fosters a reflective practice environment, which helps pre-service teachers improve their instructional strategies, which is essential for their professional growth and effectiveness (Cadiz, 2022).

AI's role in reflective practice and pedagogical improvement is instrumental in enhancing the quality of teaching and learning, providing educators with the tools to assess and refine their pedagogical approaches effectively.

Challenges and Opportunities in Adopting AI for Professional Growth

While AI offers significant benefits for professional growth, its adoption comes with challenges that must be carefully managed to maximize its potential.

- *Strategic Implications and Challenges:* Integrating AI within firms introduces both opportunities for growth and challenges in data management, ethical considerations, and organizational adaptation (Dwivedi et al., 2021).

- *Technostress and Ethical Concerns*: The interaction between humans and AI leads to technostress, impacting professionals' well-being. Moreover, ethical challenges must be addressed to ensure AI's responsible use (Lebovitz et al., 2022).
- *Enhancing Job Roles and Competitiveness*: Despite these challenges, AI presents opportunities to enhance professional roles, improve decision-making, and increase competitiveness across various industries (Sharma et al., 2024).

Adopting AI for professional growth offers numerous opportunities to enhance job roles and decision-making processes. However, it also presents challenges that must be addressed to leverage AI's capabilities fully.

Future Competencies for Teachers in an AI-Augmented Educational Landscape

As AI continues to reshape the educational landscape, teachers must develop new competencies to integrate AI into their teaching practices effectively.

- *Future-Oriented Skills*: Developing competencies in digital, data, and AI literacy is crucial for teachers to effectively utilize AI tools and approaches in educational settings (Kreinsen & Schulz, 2023).
- *Ethical and Technical Training*: Teachers must also be well-versed in ethical considerations related to AI to ensure its responsible use in education (Ng et al., 2023; Zhao et al., 2022).
- *Curriculum and Professional Development*: Implementing sustainable curriculum plans that include AI literacy and providing comprehensive professional development are essential for equipping teachers with the necessary skills to navigate the AI-augmented educational landscape (Chiu & Chai, 2020; Heng & Tabunshchyk, 2021).

Preparing teachers for an AI-augmented educational environment involves a multifaceted approach that enhances AI literacy, ethical training, and innovative curriculum development. This ensures that educators are well-prepared to utilize AI effectively.

These sections highlight AI's transformative impact on teacher professional development, illustrating the profound benefits and the complex challenges. By navigating these effectively, educators enhance their professional capabilities and adapt to the continually evolving educational landscape shaped by AI advancements.

Implementing AI in Teacher Education Programs

AI in teacher education programs promises to revolutionize the pedagogical landscape by offering enhanced learning experiences, personalized teaching approaches, and

efficient management of educational resources. This section elaborates on various aspects of AI implementation, from curriculum design to collaborations with technology providers, and discusses the necessary policy implications and ethical considerations.

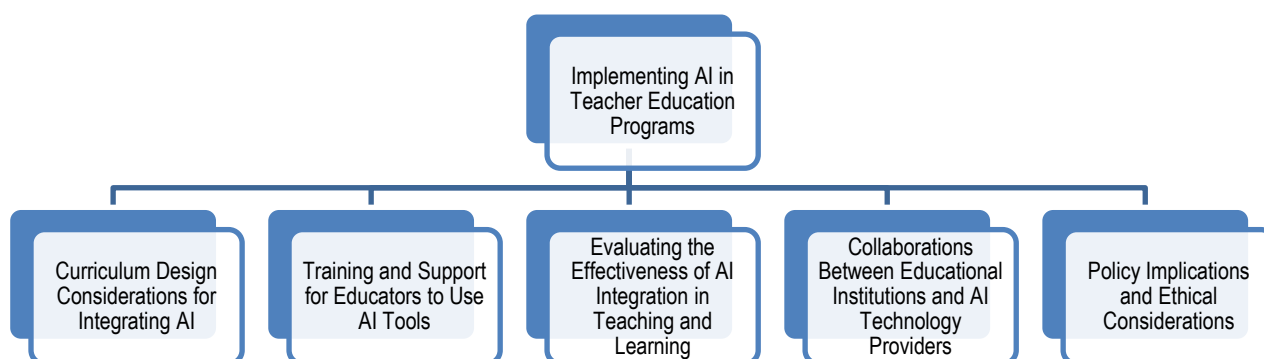


Figure 5. Thematic representation of implementing AI in teacher education programs.

Curriculum Design Considerations for Integrating AI

Integrating AI into curriculum design is critical as it supports innovative teaching and learning methods and introduces challenges that need strategic handling.

- *Ethical and Knowledgeable Implementation:* Implementing AI in dental education curricula, Kim (2023) underscores the importance of ethical considerations, particularly regarding patient safety, highlighting the need for educators to be well-versed in AI technologies to use them responsibly.
- *Integrated Curriculum Framework:* Vergel et al. (2017) stress integrating AI into medical education curricula to modernize medical training and improve educational outcomes, emphasizing that effective curriculum integration plays a crucial role in educational reform.
- *Problem-Based Learning (PBL) Approach:* Bridges et al. (2016) discuss using a PBL framework in dental education, incorporating AI to facilitate team-based learning and improve students' problem-solving skills.
- *Sustainable Curriculum Planning:* Chiu and Chai (2020) explore the implications of AI in curriculum planning from a Self-Determination Theory perspective, highlighting the need for curricula that enhance teacher autonomy and promote student-centered learning experiences.

Integrating AI into educational curricula requires careful consideration of ethical practices, innovative curriculum frameworks, and sustainable planning to enhance teaching and learning experiences effectively.

Training and Support for Educators to Use AI Tools

Training educators to use AI tools is essential for harnessing AI's potential in teaching and requires a comprehensive approach encompassing various competencies.

- *Developing Competencies:* Future skills, mainly digital, data, and AI literacy, are crucial for educators. Kreinsen and Schulz (2023) highlight the growing importance of these skills as central to navigating the AI-enhanced educational landscape.
- *Ethical Training and AI Literacy:* Teachers must also understand AI's ethical implications and learn to use AI tools responsibly. This includes mastering the fundamental concepts of AI and its educational applications (Touretzky et al., 2019; Zhao et al., 2022).
- *Curriculum and Professional Development:* Effective curriculum integration of AI necessitates ongoing professional development and a focus on sustainable practices that recognize AI's role in future educational success (Chiu & Chai, 2020; Heng & Tabunshchyk, 2021).

Equipping educators with AI competencies through targeted training programs and comprehensive professional development plans is crucial for effective AI integration in teaching practices.

Evaluating the Effectiveness of AI Integration in Teaching and Learning

Evaluating AI's integration into teaching and learning is vital to ensure it enhances educational practices effectively.

- *Impact on Teaching Methods:* Wang (2023) discusses how AI influences various aspects of teaching, including resource allocation, pedagogical methods, and classroom management, underscoring the need for strategic integration to enhance educational effectiveness.
- *Personalized Learning Environments:* Research by Lin (2022) and Chassignol et al. supports the idea that AI creates personalized learning environments that cater to individual student needs, thereby improving learning outcomes.
- *AI in Medical Education:* Burney and Ahmad (2022) highlight AI's role in medical education, suggesting that AI improves teaching and assessment methodologies across disciplines.

- *Challenges and Opportunities:* Alasadi and Baiz (2023) and Alenezi (2023) note that while AI offers significant enhancements in educational settings, it also presents challenges that must be meticulously addressed to fully utilize AI's capabilities.

The effective integration of AI in education requires comprehensive evaluation to optimize teaching methods, personalize learning, and overcome inherent challenges.

Collaborations Between Educational Institutions and AI Technology Providers

Collaborations between educational institutions and AI technology providers are crucial for innovating and enhancing educational quality through advanced AI solutions.

- *Enhancing Educational Practices:* Collaborative efforts, as discussed by Ghnemat et al. (2022), focus on integrating AI platforms to improve classroom management and personalize learning, which significantly enhances educational productivity and innovation.
- *Role of Teachers and Systematic Reviews:* Kim et al. (2022) emphasize the evolving role of teachers in facilitating AI-driven learning, which is supported by systematic reviews indicating a surge in AI adoption in higher education (Zawacki-Richter et al., 2019).
- *Pedagogical and Technological Enhancements:* Luckin and Cukurova (2019) and Kuleto et al. (2021) argue for a learning sciences-driven approach in these collaborations, ensuring that AI technologies are pedagogically sound and effectively enhance learning outcomes.

Fostering partnerships between educational institutions and AI technology providers is essential for developing innovative solutions that improve educational practices and outcomes.

Policy Implications and Ethical Considerations

Implementing AI in teacher education programs involves navigating complex policy landscapes and addressing significant ethical considerations to ensure responsible use.

- *Ethical Guidelines and Transparency:* The variability in ethical guidelines across countries necessitates a clear understanding and implementation of ethical AI practices (Jobin & Ienca, 2019; Köbis & Mehner, 2021).
- *Addressing Ethical Risks:* Studies by Mahligawati et al. (2023) and Marino et al. (2023) discuss the technical and ethical challenges in integrating AI, highlighting the need for robust policies that ensure data privacy, system security, and ethical integrity.

- *Promoting Ethical AI Use:* The development of AI in education should focus on transparency, interpretability, and accountability, with educators playing a crucial role in fostering AI literacy and ethical awareness among students (Chaudhry et al., 2022; Holmes et al., 2021).

Carefully considering policy implications and ethical standards is essential for successfully integrating AI into teacher education programs. Educators and policymakers must prioritize ethical practices, transparency, and accountability.

The above themes and sub-themes highlight the multifaceted approach needed to effectively implement AI in teacher education. By considering curriculum integration, educator training, effectiveness evaluation, institutional collaborations, and adhering to ethical standards, educational institutions leverage AI to enhance teaching and learning processes significantly.

Case Studies and Global Perspectives

Integrating AI in teacher education programs offers a vivid landscape of innovations, challenges, and transformative practices across various global contexts. This section explores comparative analyses of AI implementation in different countries, showcases successful integrations, and gleans lessons from these experiences to propose strategies for scaling AI adoption effectively in teacher education.

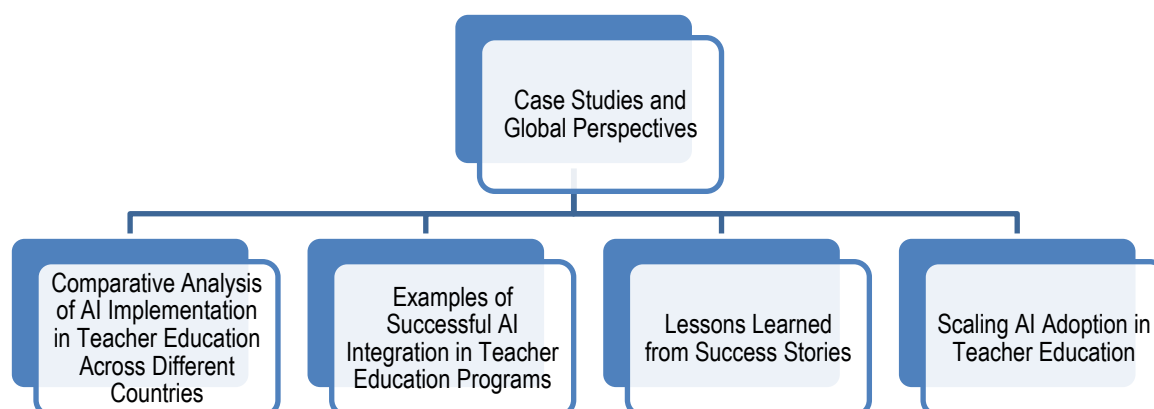


Figure 6. Thematic representation of case studies and global perspectives regarding AI in teacher education.

Comparative Analysis of AI Implementation in Teacher Education Across Different Countries

AI implementation in teacher education varies significantly across countries and is influenced by economic, cultural, and institutional factors that present unique challenges and opportunities.

- *Variability in AI Adoption:* In Vietnam, despite economic development, AI in education lags in more developed provinces, illustrating regional disparities in adoption (Nguyen et al., 2022). Contrastingly, no significant correlation exists in Estonia between teachers' professional experience and their AI adoption, highlighting the universal challenges of AI integration regardless of experience level (Chounta et al., 2021).
- *Challenges in K-12 Education:* The "Turing Teacher" concept emphasizes the need for foundational AI attributes in teaching, suggesting a specialized approach to AI education in K-12 settings (Pelaez et al., 2022).
- *Global Adoption and Professional Development Issues:* Globally, while AI adoption is on the rise, teacher training for AI poses a significant barrier, necessitating enhanced professional development programs (Lee & Perret, 2022; Yau et al., 2022).
- *Importance of AI Literacy:* Enhancing AI literacy among teachers, especially in China, is crucial for successfully implementing AI in classrooms (Zhao et al., 2022).

The comparative analysis highlights the need to tackle professional development gaps, develop core AI competencies, and promote AI literacy to ensure effective AI integration in education systems worldwide.

Examples of Successful AI Integration in Teacher Education Programs

Successful AI integrations into teacher education programs underscore the potential benefits and emphasize the importance of a holistic educational approach.

- *Integrative Educational Practices:* Park and Kwon (2023) highlight the integration of AI in STEM classrooms, showing that a comprehensive approach significantly enhances teacher capabilities and student outcomes.
- *Enhancing Teacher and Student Engagement:* Research indicates a growing initiative to understand teacher perceptions and increase student engagement through AI and robotics, which improve learning outcomes significantly (Polak et al., 2022; Salas-Pilco, 2020).
- *Developing Self-Efficacy and AI Literacy:* Fostering positive self-efficacy among pre-service teachers is crucial for the effective use of AI in classrooms, as confident teachers are more likely to integrate new technologies successfully (Caner & Aydin, 2021; Nazaretsky et al., 2022a, 2022b).

- *Curricular and Pedagogical Improvements:* Collaborative design of AI curricula and the inclusion of computational thinking are pivotal for enhancing educational practices (Amante et al., 2019; Monteiro et al., 2021; Otero et al., 2023).

These examples demonstrate that successful AI integration requires comprehensive training, effective curricular design, and a focus on teacher and student needs to enhance pedagogical practices and learning outcomes.

Lessons Learned from Success Stories

Reflecting on the success stories of various AI implementations provides critical insights and practical strategies for overcoming common challenges in AI adoption.

- *Professional Development Needs:* The lack of adequate professional development for teachers in AI is a recurring theme that needs addressing to enhance their competence and acceptance of AI tools (Lee & Perret, 2022).
- *Building Trust in AI Technology:* It is vital to develop trust among teachers regarding AI technology through comprehensive training and clear demonstrations of AI's educational benefits (Nazaretsky et al., 2022a, 2022b).
- *Importance of Teacher Perspectives:* Understanding and incorporating teacher perspectives in AI education strategies helps craft effective teaching methods and curricula that resonate with educators (Yau et al., 2022).
- *Strategic Curriculum Integration:* Effective AI curriculum integration requires continuous refinement and active participation from educators, ensuring that AI tools are utilized optimally in teaching practices (Chiu & Chai, 2020).

These lessons emphasize the importance of targeted professional development, trust-building, teacher involvement, and strategic curriculum planning to facilitate successful AI integration in teacher education programs.

Scaling AI Adoption in Teacher Education: Strategies and Recommendations

Effective scaling of AI adoption in teacher education involves understanding barriers and enablers and implementing strategic recommendations to foster widespread and practical use.

- *Institutional and Recognition Barriers:* Identifying and overcoming institutional barriers is crucial for effectively enabling teachers to adopt AI-based teaching methods (Gupta & Bhaskar, 2020).

- *Educational Level and AI Adoption:* Higher education levels correlate with better understanding and integration of AI, suggesting the need for advanced AI training and education (Kuo et al., 2011).
- *Preparation Strategies for Technology Use:* Tondeur et al. (2016) recommend using teacher educators as role models, reflecting on ICT's role, and providing continuous feedback to prepare teachers for technological integration, including AI.
- *Didactical Strategies and AI Use:* Understanding the relationship between teacher beliefs and didactical strategies aids in developing effective AI integration methods that improve educational processes (Prieto et al., 2019; Shahzad et al., 2017).

Scaling AI adoption in teacher education requires addressing institutional barriers, enhancing educational strategies, and providing robust training and support frameworks to ensure teachers are well-prepared to integrate AI effectively.

These sections collectively illustrate that while AI presents vast potential for enhancing teacher education, its successful integration depends on comprehensive planning, inclusive training programs, and strategic partnerships. By addressing these factors, institutions maximize the benefits of AI in teacher education, fostering an innovative and effective educational environment.

Discussion

AI in Teacher Education

AI Technologies Used in Teacher Education: Artificial Intelligence (AI) technologies are revolutionizing teacher education by incorporating tools such as Intelligent Tutoring Systems (ITS), Virtual and Augmented Reality (VR/AR), and automated assessment platforms. These technologies offer personalized learning experiences that adapt to the diverse needs of educators and students, promoting engagement and improving learning outcomes. ITS, for example, can tailor educational content to individual learning styles, while VR/AR simulations allow future educators to practice teaching in controlled environments that mimic real-world scenarios (Sapci & Sapci, 2020).

Pedagogical Strategies Enhanced by AI: AI enhances pedagogical strategies by providing data-driven insights into student performance, enabling educators to make informed adjustments to their teaching practices. AI-driven analytics help educators identify areas where students may need additional support, allowing for timely interventions. Moreover,

AI technologies, such as gamification elements, foster student motivation and engagement, making the learning experience more dynamic and interactive (Preiksaitis, 2023).

Impact of AI on Teacher Professional Growth: AI plays a pivotal role in teacher professional development by offering dynamic, personalized learning opportunities that enhance educators' digital literacy and pedagogical competencies. Through AI-based professional development programs, teachers can remain current with evolving educational technologies and methodologies, ultimately benefiting both their practice and their students' learning experiences (Schleiss, 2023). However, challenges such as technostress and ethical considerations must be addressed to fully harness AI's potential (Baskoro, 2023).

Implementing AI in Teacher Education Programs: Successfully integrating AI into teacher education requires comprehensive training that focuses on AI literacy, digital skills, and ongoing evaluation of the effectiveness of AI tools. Collaborative efforts between educational institutions and AI providers can facilitate innovation, while continuous assessment of AI's impact on learning outcomes is crucial for optimizing its use (Rathore, 2023).

Case Studies and Global Perspectives: Global case studies on AI in teacher education illustrate varying degrees of success and challenges. Some countries, such as China and the United States, have made significant advances in AI literacy among educators, while others face challenges in adoption due to socioeconomic and institutional factors (Qin & Ao, 2022; Humble, 2023). These examples demonstrate that comprehensive AI training and a focus on ethical deployment are critical to realizing AI's full potential in education (Heng & Tabunshchyk, 2021).

Identified Research Gaps on AI in Teacher Education

Effectiveness of AI Tools Across Diverse Educational Settings: The effectiveness of AI tools in diverse educational contexts, particularly in underprivileged settings, remains underexplored. Research is needed to assess the scalability and impact of AI technologies across various socioeconomic environments (Betaubun, 2023).

AI-Driven Pedagogical Innovations: While AI has been instrumental in driving pedagogical innovations, more research is necessary to evaluate its long-term impact on teaching practices and its alignment with future skill demands. Personalized learning models and adaptive systems require further refinement to meet industry standards (Jendia, 2023).

Ethical Considerations in AI Deployment: Ethical considerations are crucial in integrating AI into education, particularly regarding algorithmic bias, data privacy, and the

transparency of AI decision-making. Jobin et al. (2019) offer a thorough overview of AI ethics guidelines, which can inform the development of ethical frameworks for education. These frameworks should be incorporated into teacher education to ensure educators use AI responsibly. Comprehensive training programs must address both the technological and ethical aspects of AI, fostering critical thinking to help teachers navigate these challenges. Issues like bias, privacy, and equitable use of AI tools in diverse educational settings require further research (Vasylyuk-Zaitseva et al., 2023).

Teacher and Student Interactions with AI: The interaction between teachers, students, and AI tools is a critical area of study. Understanding how these interactions influence the learning process can inform the design of more effective AI-driven educational tools (Levanova et al., 2020).

Training and Professional Development: There is a need for more comprehensive professional development programs focused on AI literacy and digital skills for teachers. Research should investigate the most effective methods for integrating AI training into both pre-service and in-service teacher education programs (Mehta et al., 2021).

Scalability and Sustainability of AI in Education: The scalability and sustainability of AI in education depend on factors such as technical infrastructure, teacher readiness, and institutional policies. Research in these areas is essential for ensuring that AI tools can be successfully adopted and maintained across various educational contexts (Shin, 2021).

Cultural and Contextual Adaptation of AI Tools: Cultural and contextual differences can significantly affect the successful implementation of AI in education. Future research should focus on developing AI tools that are culturally sensitive and adaptable to different educational environments (Komasawa & Yokohira, 2023).

Impact of AI on Educational Equity: AI's potential to either reduce or exacerbate educational inequality needs further exploration. Research into how AI can bridge gaps in access to quality education for marginalized groups will help ensure that AI deployment contributes to educational equity (Benhayoun & Lang, 2021).

Future Skills and Competencies: AI is reshaping the skills and competencies required for future job markets. Research is needed to identify how AI-driven education can be designed to prepare students for the evolving demands of the workforce (Charow et al., 2021).

In conclusion, while AI presents significant opportunities for enhancing teacher education, addressing these research gaps is critical to ensuring its ethical, effective, and

sustainable integration. As AI continues to influence the educational landscape, it is vital that educators are equipped with the skills and knowledge necessary to maximize its potential.

Conclusion

Summary of Key Findings

AI is revolutionizing teacher education by reshaping pedagogical methods and evaluation techniques. Technologies such as Intelligent Tutoring Systems (ITS), Virtual Reality (VR), Augmented Reality (AR), and automated assessment systems are enhancing personalized learning and creating immersive educational environments. These innovations extend beyond classroom instruction, fostering professional growth among educators and necessitating the development of new competencies. AI's transformative impact on teacher education is evident in how it enhances training, evaluation, and pedagogical strategies, while also requiring a rethinking of professional development.

The integration of AI technologies like ITS provides personalized learning experiences that adapt to individual needs, while VR and AR offer immersive training environments that engage educators in practical, hands-on simulations. Automated assessment systems further streamline the evaluation process by delivering timely and personalized feedback, often utilizing natural language processing (NLP) to improve communication between teachers and learners. AI-driven analytics provide insights into teaching effectiveness, enabling a more adaptive and personalized approach to education. These technologies collectively support a more dynamic and responsive educational system that meets the needs of both educators and students.

In addition to enhancing technical capabilities, AI transforms teaching strategies by fostering personalized content, collaborative learning environments, and gamified experiences that increase student engagement. AI-driven simulations help develop critical thinking skills, allowing educators and students alike to explore complex problems in controlled settings. However, these advancements also raise important ethical concerns. Issues such as algorithmic bias, data privacy, and equitable access to AI tools must be addressed to ensure fairness in education. As AI reshapes the learning environment, careful attention to these ethical dimensions will be essential to maintain an inclusive and effective system.

AI's impact extends to professional growth, encouraging lifelong learning and digital literacy among teachers. Personalized learning experiences provided by AI promote continuous development, while also supporting reflective practices that enhance instructional quality. Educators are increasingly required to develop competencies for navigating digital and AI-enhanced environments, which in turn improves their professional motivation and adaptability in a rapidly changing educational landscape. This shift toward digital literacy and AI proficiency demands targeted professional development to ensure teachers are prepared to integrate AI technologies effectively.

The successful integration of AI into teacher education programs requires thoughtful consideration of both technological and ethical factors. Incorporating AI into pedagogical methods not only personalizes learning but also demands the development of ethical standards and digital literacy among educators. Collaborations between educational institutions and AI providers play a critical role in ensuring that AI technologies are implemented responsibly, enhancing teaching practices and improving educational outcomes. Adherence to ethical guidelines will be essential to the long-term success of AI in teacher education.

Globally, the adoption of AI in teacher education varies, influenced by local contexts and resources. Case studies from different regions highlight the potential of AI to improve engagement and pedagogical outcomes, but also demonstrate the need for professional development and trust-building. Adapting AI strategies to local needs and fostering an innovative environment will be crucial for successful AI integration. Across different educational settings, professional development remains the key to ensuring that educators are equipped with the necessary skills to leverage AI technologies.

AI's integration into teacher education presents both significant opportunities and challenges that require strategic implementation. To harness AI's full potential, educational stakeholders must prioritize ethical considerations, promote AI literacy, and invest in professional development programs. As AI continues to shape global educational practices, its thoughtful integration can lead to more personalized, engaging, and inclusive learning experiences, ultimately transforming the future of education. Comprehensive training programs that address both the technological and ethical dimensions of AI will be essential in preparing teachers to navigate these complexities, while fostering critical thinking skills to address the ethical challenges posed by AI technologies.

Limitations of the Study

Despite its valuable insights, the study acknowledges several limitations. One of the primary constraints is the scope of the literature review, which predominantly focuses on existing literature and qualitative data. The fact that quantitative data and analyses are not included limits the generalizability of the findings.

Furthermore, the study may not fully capture emerging AI technologies or innovative practices that are still under development, thereby limiting the analysis to more established methodologies. The geographical and cultural representation in the reviewed literature tends to focus on higher-income countries, potentially overlooking the unique challenges and opportunities faced by lower-income regions. This lack of diversity in perspectives may skew the findings toward contexts that do not fully reflect global realities.

The study also lacks depth in analyzing the practical implementation challenges of AI integration in education. While the research broadly covers AI's potential, it does not delve into the long-term impacts or practical difficulties that educators might face when adopting these technologies. This gap is critical for fully understanding the effectiveness of AI in teacher education. Furthermore, although the study addresses some ethical concerns, it could benefit from a more comprehensive analysis of issues related to data privacy, security, and algorithmic bias. These ethical considerations are essential for ensuring responsible AI use in education, and their underrepresentation limits the scope of the findings.

Another limitation arises from the study's reliance on secondary data, which may introduce biases and reduce the robustness of the conclusions. Depending primarily on the interpretations of original authors could lead to potential misrepresentations. Moreover, the perspectives of teachers and students—the main beneficiaries of AI in education—are somewhat underrepresented, which is a significant drawback for obtaining a holistic understanding of AI's impact in educational settings. Finally, the focus on teacher education specifically might restrict the applicability of the findings to broader educational contexts, limiting the relevance of the results to other areas of education outside teacher training.

Suggestions for Future Research

To address the limitations mentioned, future research should broaden the geographical and cultural scope of the studies and include more primary data to capture firsthand experiences with AI technologies. Expanding the literature review to reflect the latest advancements in AI will ensure that the findings remain relevant and applicable to

evolving educational practices. The comprehensiveness and applicability of the study's conclusions in both teacher education and the broader educational landscape will be enhanced by addressing these areas.

Future research should also take a multidimensional approach, quantitative data and analyses, incorporating perspectives that align with the study's specific objectives. While this research primarily focuses on teacher education and AI integration, future studies should explore the impact of AI on various educational stakeholders, including administrators, policymakers, and students. Broadening the scope in this way will provide a more comprehensive understanding of AI's influence on the entire educational ecosystem.

Furthermore, future studies should examine AI's role across diverse educational contexts, such as rural versus urban settings or low-income versus high-income countries, to capture a wider range of challenges and opportunities. Including these perspectives will enrich the findings and ensure that AI's implications are more applicable across different educational environments. This expanded research agenda will offer a more nuanced and globally relevant perspective on the integration of AI in education.

Acknowledgement

Due to the scope and method of the study, ethics committee permission was not required.

Author Contribution Statement

Rusen MEYLANI: *Conception, design, literature review, data collection, data analysis, interpretation, writing, and editing.*

References

- Akram, H., Abdelrady, A. H., Al-Adwan, A. S., & Ramzan, M. (2022). Teachers' perceptions of technology integration in teaching-learning practices: A systematic review. *Frontiers in Psychology, 13*, 920317. <https://doi.org/10.3389/fpsyg.2022.920317>
- Alasadi, E. A., & Baiz, C. R. (2023). Generative AI in education and research: Opportunities, concerns, and solutions. *Journal of Chemical Education, 100*(8), 2965–2971. <https://doi.org/10.1021/acs.jchemed.3c00323>
- Alenezi, F. (2023). Artificial intelligence versus Arab universities: An enquiry into the Saudi context. *Humanities and Management Sciences – Scientific Journal of King Faisal University, 1–7*. <https://doi.org/10.37575/h/edu/220038>
- AlKanaan, H. M. N. (2022). Awareness regarding the implication of artificial intelligence in science education among pre-service science teachers. *International Journal of Instruction, 15*(3), 895–912. <https://doi.org/10.29333/iji.2022.15348a>
- Alotaibi, N., & Alshehri, A. (2023). Prospects and obstacles in using artificial intelligence in Saudi Arabia higher education institutions—the potential of AI-based learning outcomes. *Sustainability, 15*(13), 10723. <https://doi.org/10.3390/su151310723>

- Amanda, F. F., Sumitro, S. B., Lestari, S. R., & Ibrohim, I. (2022). The correlation of critical thinking and concept mastery to problem-solving skills: The role of complexity science-problem based learning model. *Pedagogika*, 146(2), 80–94. <https://doi.org/10.15823/p.2022.146.4>
- Amante, L., Batista de Souza, E., Quintas-Mendes, A., Monteiro, A. F., Miranda-Pinto, M., Osório, A., & Araújo, C. (2019). Computational thinking, programming, and robotics in basic education: Evaluation of an in-service teacher's training b-learning experience. *ICERI Proceedings*, 10698–10705. <https://doi.org/10.21125/iceri.2019.2626>
- Baskoro, G. (2023). Innovation to improve critical thinking skills in Generation Z using peeragogy as a learning approach and artificial intelligence (AI) as a tool. *Jurnal Teknik Industri*, 25(2), 121–130. <https://doi.org/10.9744/jti.25.2.121-130>
- Benhayoun, L., & Lang, D. (2021). Does higher education properly prepare graduates for the growing artificial intelligence market? Gaps' identification using text mining. *Human Systems Management*, 40(5), 639–651. <https://doi.org/10.3233/HSM-211179>
- Betaubun, M. (2023). Personalized pathways to proficiency: Exploring the synergy of adaptive learning and artificial intelligence in English language learning. *Technium Romanian Journal of Applied Sciences and Technology*, 17, 60–66. <https://doi.org/10.47577/technium.v17i.10047>
- Boscardin, C. K., Gin, B., Golde, P. B., & Hauer, K. E. (2024). ChatGPT and generative artificial intelligence for medical education: Potential impact and opportunity. *Academic Medicine*, 99(1), 22–27. <https://doi.org/10.1097/ACM.0000000000005439>
- Bridges, S., Yiu, C. K. Y., & Botelho, M. G. (2016). Design considerations for an integrated, problem-based curriculum. *Medical Science Educator*, 26(3), 365–373. <https://doi.org/10.1007/s40670-016-0255-6>
- Bulathwela, S., Pérez-Ortiz, M., Holloway, C., & Shawe-Taylor, J. (2021). Could AI democratise education? Socio-Technical imaginaries of an Ed-Tech. *Revolution*. <https://doi.org/10.48550/arxiv.2112.02034>
- Burney, I. A., & Ahmad, N. (2022). Artificial intelligence in medical education: A citation-based systematic literature review. *Journal of Shifa Tameer-E-Millat University*, 5(1), 43–53. <https://doi.org/10.32593/jstmu/Vol5.Iss1.183>
- Cadiz, A. P. (2022). Pre-service teachers' reflective practice and their teaching practicum beliefs. *Jurnal Inovatif Ilmu Pendidikan*, 3(2), 105–119. <https://doi.org/10.23960/jiip.v3i2.22854>
- Caner, M., & Aydin, S. (2021). Self-efficacy beliefs of preservice teachers on technology integration. *Turkish Online Journal of Distance Education*, 79–94. <https://doi.org/10.17718/tojde.961820>
- Casal-Otero, L., Catala, A., Fernández-Morante, C., Taboada, M., Cebreiro, B., & Barro, S. (2023). AI literacy in k-12: A systematic literature review. *International Journal of Stem Education*, 10(1). <https://doi.org/10.1186/s40594-023-00418-7>
- Charow, R., Jeyakumar, T., Younus, S., Dolatabadi, E., Salhia, M., Al-Mouaswas, D., & Wiljer, D. (2021). Artificial intelligence education programs for health care professionals: Scoping review. *JMIR Medical Education*, 7(4), e31043. <https://doi.org/10.2196/31043>
- Chaudhry, M., Cukurova, M., & Luckin, R. (2022). A transparency index framework for AI in education. <https://doi.org/10.35542/osf.io/bstcf>
- Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, 8, 75264–75278. <https://doi.org/10.1109/ACCESS.2020.2988510>
- Chiu, T. K. F., & Chai, C. (2020). Sustainable curriculum planning for artificial intelligence education: A self-determination theory perspective. *Sustainability*, 12(14), 5568. <https://doi.org/10.3390/su12145568>

- Chiu, T. K. F., Meng, H., Chai, C.-S., King, I., Wong, S., & Yam, Y. (2022). Creation and evaluation of a pretertiary artificial intelligence (AI) curriculum. *IEEE Transactions on Education*, 65(1), 30–39. <https://doi.org/10.1109/TE.2021.3085878>
- Cukurova, M., Kent, C., & Luckin, R. (2019). Artificial intelligence and multimodal data in the service of human decision-making: A case study in debate tutoring. *British Journal of Educational Technology*, 50(6), 3032–3046. <https://doi.org/10.1111/bjet.12829>
- Dergunova, Y., Aubakirova, R. Z., Yelmuratova, B. Z., Gulmira, T. M., Yuzikovna, P. N., & Antikayeva, S. (2022). Artificial intelligence awareness levels of students. *International Journal of Emerging Technologies in Learning (IJET)*, 17(18), 26–37. <https://doi.org/10.3991/ijet.v17i18.32195>
- Dimitriadou, E., & Lanitis, A. (2023). A critical evaluation, challenges, and future perspectives of using artificial intelligence and emerging technologies in smart classrooms. *Smart Learning Environments*, 10(1). <https://doi.org/10.1186/s40561-023-00231-3>
- Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., ... & Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice, and policy. *International Journal of Information Management*, 57, 101994. <https://doi.org/10.1016/j.ijinfomgt.2019.08.002>
- Ekşi, H., Özgenel, M., & Metlilo, E. (2020). The effect of motivation of success of university students on personal-professional competence: Mediation role of lifelong learning tendency. *International Journal of Evaluation and Research in Education*, 9(3), 583–591. <https://doi.org/10.11591/ijere.v9i3.20664>
- Fahimirad, M., & Kotamjani, S. S. (2018). A review on the application of artificial intelligence in teaching and learning in educational contexts. *International Journal of Learning and Development*, 8(4), 106–116. <https://doi.org/10.5296/ijld.v8i4.14057>
- Faria, L., Silva, A., Vale, Z., & Marques, A. (2009). Training control centers' operators in incident diagnosis and power restoration using intelligent tutoring systems. *IEEE Transactions on Learning Technologies*, 2(2), 135–147. <https://doi.org/10.1109/TLT.2009.16>
- Fidan, M., & Gencil, N. (2022). Supporting instructional videos with chatbot and peer feedback mechanisms in online learning: Effects on learning performance and intrinsic motivation. *Journal of Educational Computing Research*, 60(7), 1716–1741. <https://doi.org/10.1177/07356331221077901>
- Fryberg, S. A., & Markus, H. R. (2007). Cultural models of education in American Indian, Asian American, and European American contexts. *Social Psychology of Education*, 10(2), 213–246. <https://doi.org/10.1007/s11218-007-9017-z>
- Ghanim, H. A. A., & Kovács, L. (2021). Development of an ontology-based model to support the learning process in LMS. *Indonesian Journal of Electrical Engineering and Computer Science*, 24(1), 507–518. <https://doi.org/10.11591/ijeecs.v24.i1.pp507-518>
- Ghnemat, R., Shaout, A., & Al-Sowi, A. M. (2022). Higher education transformation for artificial intelligence revolution: A transformation framework. *International Journal of Emerging Technologies in Learning (IJET)*, 17(19), 224–241. <https://doi.org/10.3991/ijet.v17i19.33309>
- Hamal, O., El Faddouli, N. E., Harouni, M. H. A., & Lu, J. (2022). Artificial intelligence in education. *Sustainability*, 14(5), 2862. <https://doi.org/10.3390/su14052862>
- Heng, T., & Tabunshchyk, V. (2021). Teaching tech to talk: K-12 conversational artificial intelligence literacy curriculum and development tools. *Proceedings of the AAAI Conference on Artificial Intelligence*, 35(17), 15655–15663. <https://doi.org/10.1609/aaai.v35i17.17844>
- Humble, N. (2023). Need-based game design: Developing a CT game based on educational needs. *European Conference on Games Based Learning*, 17(1), 269–277. <https://doi.org/10.34190/ecgbl.17.1.1489>

- Huriye, A. Z. (2023). The ethics of artificial intelligence: Examining the ethical considerations surrounding the development and use of AI. *American Journal of Technology*, 2(1), 37–45. <https://doi.org/10.58425/ajt.v2i1.142>
- Jendia, J. (2023). Developing personalised reading materials for Malaysian primary school pupils using ChatGPT: A review. *International Journal of Academic Research in Business and Social Sciences*, 13(12). <https://doi.org/10.6007/ijarbss/v13-i12/20172>
- Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. *Nature Machine Intelligence*, 1(9), 389–399. <https://doi.org/10.1038/s42256-019-0088-2>
- Kang, Y., Forkan, A., Jayaraman, P., Wieland, N., Kollias, E., Du, H., & Li, Y. (2021). An AI-based solution for enhancing the delivery of digital learning for future teachers. *arXiv*. <https://doi.org/10.48550/arxiv.2112.01229>
- Kim, C. S., Samaniego, C. S., Sousa Melo, S. L., Brachvogel, W. A., Baskaran, K., & Rulli, D. (2023). Artificial intelligence (AI) in dental curricula: Ethics and responsible integration. *Journal of Dental Education*, 87(11), 1570–1573. <https://doi.org/10.1002/jdd.13337>
- Kim, J., Lee, H., & Cho, Y. H. (2022). Learning design to support student-AI collaboration: Perspectives of leading teachers for AI in education. *Education and Information Technologies*, 27(5), 6069–6104. <https://doi.org/10.1007/s10639-021-10831-6>
- Köbis, L., & Mehner, C. (2021). Ethical questions raised by AI-supported mentoring in higher education. *Frontiers in Artificial Intelligence*, 4, 624050. <https://doi.org/10.3389/frai.2021.624050>
- Komasawa, N., & Yokohira, M. (2023). Simulation-based education in the artificial intelligence era. *Cureus*, 15(9), e40940. <https://doi.org/10.7759/cureus.40940>
- Kreinsen, M., & Schulz, S. (2023). Towards the triad of digital literacy, data literacy, and AI literacy in teacher education – A discussion in light of the accessibility of novel generative AI. *OSF*. <https://doi.org/10.35542/osf.io/xguzk>
- Kuleto, V., Ilić, M., Dumangiu, M., Ranković, M., Martins, O. M. D., Păun, D., & Mihoreanu, L. (2021). Exploring opportunities and challenges of artificial intelligence and machine learning in higher education institutions. *Sustainability*, 13(18), 10424. <https://doi.org/10.3390/su131810424>
- Kuo, P.-C., Huang, J.-H., & Liu, M.-D. (2011). Avian influenza risk perception and preventive behavior among traditional market workers and shoppers in Taiwan: Practical implications for prevention. *PLOS ONE*, 6(9), e24157. <https://doi.org/10.1371/journal.pone.0024157>
- Lebovitz, S., Lifshitz-Assaf, H., & Levina, N. (2022). To engage or not to engage with AI for critical judgments: How professionals deal with opacity when using AI for medical diagnosis. *Organization Science*, 33(1), 126–148. <https://doi.org/10.1287/orsc.2021.1549>
- Lee, I., & Perret, B. (2022). Preparing high school teachers to integrate AI methods into STEM classrooms. *Proceedings of the AAAI Conference on Artificial Intelligence*, 36(11), 12783–12791. <https://doi.org/10.1609/aaai.v36i11.21557>
- Lee, S., Mott, B., Ottenbreit-Leftwich, A., Scribner, A., Taylor, S., Park, K., Rowe, J., Glazewski, K., Hmelo-Silver, C. E., & Lester, J. (2021). AI-infused collaborative inquiry in upper elementary school: A game-based learning approach. *Proceedings of the AAAI Conference on Artificial Intelligence*, 35(17), 15591–15599. <https://doi.org/10.1609/aaai.v35i17.17836>
- Levanova, E., Galustyan, O., Seryakova, S., Pushkareva, T., Serykh, A., & Yezhov, A. (2020). Students' project competency within the framework of STEM education. *International Journal of Emerging Technologies in Learning (IJET)*, 15(21), 268. <https://doi.org/10.3991/ijet.v15i21.15933>
- Lin, H. (2022). Influences of artificial intelligence in education on teaching effectiveness. *International Journal of Emerging Technologies in Learning (IJET)*, 17(24), 144–156. <https://doi.org/10.3991/ijet.v17i24.36037>

- Luckin, R., & Cukurova, M. (2019). Designing educational technologies in the age of AI: A learning sciences-driven approach. *British Journal of Educational Technology*, 50(6), 2824–2838. <https://doi.org/10.1111/bjet.12861>
- Mahligawati, F., Allanas, E., Butarbutar, M. H., & Nordin, N. A. N. (2023). Artificial intelligence in physics education: A comprehensive literature review. *Journal of Physics: Conference Series*, 2596(1), 012080. <https://doi.org/10.1088/1742-6596/2596/1/012080>
- Mårell-Olsson, E. (2022). Teachers' perception of gamification as a teaching design. *Interaction Design and Architecture(s)*, 53, 70–100. <https://doi.org/10.55612/s-5002-053-004>
- Marino, M. T., Vasquez, E., Dieker, L., Basham, J., & Blackorby, J. (2023). The future of artificial intelligence in special education technology. *Journal of Special Education Technology*, 38(3), 404–416. <https://doi.org/10.1177/01626434231165977>
- Mehta, N., Harish, V., Bilimoria, K., Morgado, F., Ginsburg, S., Law, M., & Das, S. (2021). Knowledge and attitudes on artificial intelligence in healthcare: A provincial survey study of medical students. *MedEdPublish*, 10(1). <https://doi.org/10.15694/mep.2021.000075.1>
- Memduhoğlu, H. B., & Keleş, E. (2016). Evaluation of the relation between critical-thinking tendency and problem-solving skills of pre-service teachers. *Journal of Educational Sciences Research*, 6(2), 75–94. <https://doi.org/10.12973/jesr.2016.62.5>
- Monteiro, A. F., Miranda-Pinto, M., Osório, A. J., & Araújo, C. (2021). Coding as literacy: Case studies at pre-primary and elementary school. *INTED Proceedings*, 3458–3464. <https://doi.org/10.21125/inted.2021.0718>
- Narang, A., Velagapudi, P., Rajagopalan, B., LeBude, B., Kithcart, A. P., Snipelisky, D., & Sinha, S. S. (2018). A new educational framework to improve lifelong learning for cardiologists. *Journal of the American College of Cardiology*, 71(4), 454–462. <https://doi.org/10.1016/j.jacc.2017.11.045>
- Nazaretsky, T., Ariely, M., Cukurova, M., & Alexandron, G. (2022a). Teachers' trust in AI-powered educational technology and a professional development program to improve it. *British Journal of Educational Technology*, 53(4), 914–931. <https://doi.org/10.1111/bjet.13232>
- Nazaretsky, T., Bar, C., Walter, M., & Alexandron, G. (2022b). Empowering teachers with AI: Co-designing a learning analytics tool for personalized instruction in the science classroom. *Proceedings of the ACM on Human-Computer Interaction*, 6(CSCW1), 1–23. <https://doi.org/10.1145/3506860.3506861>
- Ng, D. (2023). Design and validation of the AI literacy questionnaire: The affective, behavioural, cognitive, and ethical approach. *British Journal of Educational Technology*, 55(3), 1082–1104. <https://doi.org/10.1111/bjet.13411>
- Ng, D. T. K., Leung, J. K. L., Su, J., Ng, R. C. W., & Chu, S. K. W. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. *Educational Technology Research and Development*, 71(1), 137–161.
- Ng, D., Leung, J., Chu, K., & Qiao, M. (2021). AI literacy: Definition, teaching, evaluation and ethical issues. *Proceedings of the Association for Information Science and Technology*, 58(1), 504–509. <https://doi.org/10.1002/pra2.487>
- Nguyen, A., Ngo, H. N., Hong, Y., Dang, B., & Nguyen, B. T. (2023). Ethical principles for artificial intelligence in education. *Education and Information Technologies*, 28(4), 4221–4241. <https://doi.org/10.1007/s10639-022-11316-w>
- Nguyen, G., Nguyen, N., & Giang, N. T. H. (2022). Situation and proposals for implementing artificial intelligence-based instructional technology in Vietnamese secondary schools. *International Journal of Emerging Technologies in Learning (ijET)*, 17(18), 53–75. <https://doi.org/10.3991/ijet.v17i18.31503>
- Nwana, H. (1990). Intelligent tutoring systems: An overview. *Artificial Intelligence Review*, 4(4), 251–277. <https://doi.org/10.1007/BF00168958>

- Olivares Funes, J., Valero Kari, E. R., & Martin, P. (2024). Description of parameter variation learning with artificial intelligence and GeoGebra in students of a differential equations course. *Journal of Physics: Conference Series*, 2701(1), 012049.
- Ouyang, F., Wu, M., Zheng, L., Zhang, L., & Jiao, P. (2023). Integration of artificial intelligence performance prediction and learning analytics to improve student learning in an online engineering course. *International Journal of Educational Technology in Higher Education*, 20(1), 4. <https://doi.org/10.1186/s41239-022-00372-4>
- Park, W., & Kwon, H. (2023). Implementing artificial intelligence education for middle school technology education in Republic of Korea. *International Journal of Technology and Design Education*, 33(1), 73–98. <https://doi.org/10.1007/s10798-023-09812-2>
- Pelaez, A., Jacobson, A., Trias, K., & Winston, E. (2022). The Turing teacher: Identifying core attributes for AI learning in K-12. *Frontiers in Artificial Intelligence*, 5, 1031450. <https://doi.org/10.3389/frai.2022.1031450>
- Polak, S., Schiavo, G., & Zancanaro, M. (2022). Teachers' perspective on artificial intelligence education: An initial investigation. *Proceedings of the 2022 ACM Conference on Innovation and Technology in Computer Science Education V.1*, 349–354. <https://doi.org/10.1145/3491101.3519866>
- Popenici, S. A. D., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning*, 12(1), 22. <https://doi.org/10.1186/s41039-017-0062-8>
- Porayska-Pomsta, K. (2016). AI as a methodology for supporting educational praxis and teacher metacognition. *International Journal of Artificial Intelligence in Education*, 26(2), 679–700. <https://doi.org/10.1007/s40593-016-0101-4>
- Portugal, R. C., Guerrero, L. A., & Fuller, D. A. (2000). Desktop, a system based on virtual spaces to support and to promote collaborative learning (poster session). *Proceedings of the ACM Conference on Computer Supported Cooperative Work*, 351006–351045. <https://doi.org/10.1145/351006.351045>
- Preiksaitis, C. (2023). Opportunities, challenges, and future directions of generative artificial intelligence in medical education: Scoping review. *JMIR Medical Education*, 9, e48785. <https://doi.org/10.2196/48785>
- Priya Gupta, K., & Bhaskar, P. (2020). Inhibiting and motivating factors influencing teachers' adoption of AI-based teaching and learning solutions: Prioritization using analytic hierarchy process. *Journal of Information Technology Education: Research*, 19, 693–723. <https://doi.org/10.28945/4640>
- Qin, Q., & Ao, L. (2022). A new world of open space: Reflections and perspectives of Chinese scholars on the digital transformation of education and future education research. *International Conference on Web-Based Learning*, 302-313. Cham: Springer International Publishing. <https://doi.org/10.55162/mcet.05.153>
- Rathore, A. (2023). Artificial intelligence and curriculum prospects for elementary school. *Pakistan Journal of Humanities and Social Sciences*, 11(4). <https://doi.org/10.52131/pjhss.2023.v11i4.1909>
- Rigley, E. (2023). Evaluating international AI skills policy: A systematic review of AI skills policy in seven countries. *Global Policy*, 15(1), 204–217. <https://doi.org/10.1111/1758-5899.13299>
- Sajinčič, N., Sandak, A., & Istenič, A. (2022). How do Slovenian educators feel about gamification? Interested to know more. *Education and Self Development*, 17(1), 99–109. <https://doi.org/10.26907/esd.17.1.09>
- Salas-Pilco, S. Z. (2020). The impact of AI and robotics on physical, social-emotional, and intellectual learning outcomes: An integrated analytical framework. *British Journal of Educational Technology*, 51(5), 1808–1825. <https://doi.org/10.1111/bjet.12984>

- Sánchez-Prieto, J. C., Cruz-Benito, J., Therón, R., & García-Peñalvo, F. J. (2019). How to measure teachers' acceptance of AI-driven assessment in eLearning. *Proceedings of the 2019 ACM Symposium on Information Visualization in Data Science*, 233–242. <https://doi.org/10.1145/3362789.3362918>
- Santos, O. C. (2016). Training the body: The potential of AIED to support personalized motor skills learning. *International Journal of Artificial Intelligence in Education*, 26(2), 730–755. <https://doi.org/10.1007/s40593-016-0103-2>
- Sapci, A., & Sapci, H. (2020). Artificial intelligence education and tools for medical and health informatics students: Systematic review. *JMIR Medical Education*, 6(1), e19285. <https://doi.org/10.2196/19285>
- Schleiss, J. (2023). AI course design planning framework: Developing domain-specific AI education courses. *Education Sciences*, 13(9), 954. <https://doi.org/10.3390/educsci13090954>
- Sedrakyan, G., Malmi, L., Verbert, K., Järvelä, S., & Kirschner, P. A. (2020). Integrating learning analytics into learning design: A systematic review and research agenda. *Educational Technology and Society*, 23(1), 58–76.
- Şen, N., & Yıldız Durak, H. (2022). Examining the relationships between English teachers' lifelong learning tendencies with professional competencies and technology integrating self-efficacy. *Education and Information Technologies*, 27(5), 5953–5988. <https://doi.org/10.1007/s10639-021-10867-8>
- Seo, K., Tang, J., Roll, I., Fels, S., & Yoon, D. (2021). The impact of artificial intelligence on learner–instructor interaction in online learning. *International Journal of Educational Technology in Higher Education*, 18(1), 54. <https://doi.org/10.1186/s41239-021-00292-9>
- Shahzad, A., Hussain, I., Ali, R., Valcke, M., & Khurshid, K. (2017). Typologies of didactical strategies and teachers' pedagogical beliefs: A theoretical review. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(10), 6645–6658. <https://doi.org/10.12973/ejmste/78159>
- Shaik, T., Tao, X., Li, Y., Dann, C., McDonald, J., Redmond, P., & Galligan, L. (2022). A review of the trends and challenges in adopting natural language processing methods for education feedback analysis. *IEEE Access*, 10, 56720–56739.
- Sharma, S., Singh, G., Islam, N., & Dhir, A. (2024). Why do SMEs adopt artificial intelligence-based chatbots? *IEEE Transactions on Engineering Management*, 71, 1773–1786.
- Shih, S. C., Tsai, H. Y., & Chen, M. L. (2021). The effect of a one-on-one dialogue-based mathematical intelligent tutoring system for learning equivalent fractions. *Proceedings of the 2021 International Conference on Educational Data Mining*, 451–456.
- Shin, S. (2021). A study on the framework design of artificial intelligence thinking for artificial intelligence education. *International Journal of Information and Education Technology*, 11(9), 392–397. <https://doi.org/10.18178/ijiet.2021.11.9.1540>
- Su, J., & Yang, W. (2023). Unlocking the power of ChatGPT: A framework for applying generative AI in education. *ECNU Review of Education*, 6(3), 355–366. <https://doi.org/10.1177/20965311231168423>
- Sudjitjoo, W., Hengprapohm, S., & Hengprapohm, K. (2022). AI learning modules for elementary students. *International Journal of Health Sciences*, 12239(12249), 512. <https://doi.org/10.53730/ijhs.v6nS4.11859>
- Tapalova, O., & Zhiyenbayeva, N. (2022). Artificial intelligence in education: AIED for personalised learning pathways. *Electronic Journal of e-Learning*, 20(5), 639–653. <https://doi.org/10.34190/ejel.20.5.2597>
- Tondeur, J., van Braak, J., Siddiq, F., & Scherer, R. (2016). Time for a new approach to prepare future teachers for educational technology use: Its meaning and measurement. *Computers and Education*, 94, 134–150. <https://doi.org/10.1016/j.compedu.2015.11.009>



- Touretzky, D., Gardner-McCune, C., Martin, F., & Seehorn, D. (2019). Envisioning AI for K-12: What should every child know about AI? *Proceedings of the AAAI Conference on Artificial Intelligence*, 33(1), 9795–9799. <https://doi.org/10.1609/aaai.v33i01.33019795>
- Tubino, L., & Adachi, C. (2022). Developing feedback literacy capabilities through an AI-automated feedback tool. *ASCILITE Publications*. <https://doi.org/10.14742/apubs.2022.39>
- Vasylyuk-Zaitseva, S., Kosenyuk, H., Tanasiichuk, I., & Boyko, J. (2023). Application of artificial intelligence in Ukrainian education of the future. *Futurity Education*, 3(3), 79–107.
- Vergel, J., Stentoft, D., & Montoya, J. (2017). Extending the theoretical framework for curriculum integration in pre-clinical medical education. *Perspectives on Medical Education*, 6(4), 246–255. <https://doi.org/10.1007/s40037-017-0348-y>
- Wang, R., Sun, Z., & Zhou, Y. (2023). Research on the new model of “internet + education” based on artificial intelligence. *Proceedings of SPIE*, 36(7), 1–12. <https://doi.org/10.1117/12.2670426>
- Wang, S. (2023). Improving college teachers (CT) information-based teaching ability in the era of artificial intelligence (AI). *Proceedings of the International Conference on Educational Technology and Computers*, 11, 1188–1192. https://doi.org/10.2991/978-94-6463-040-4_177
- Webb, P., Sellar, S., & Gulson, K. (2019). Anticipating education: Governing habits, memories and policy-futures. *Learning Media and Technology*, 45(3), 284–297. <https://doi.org/10.1080/17439884.2020.1686015>
- Williamson, B., & Eynon, R. (2020). Historical threads, missing links, and future directions in AI in education. *Learning, Media and Technology*, 45(3), 223–235.
- Wu, C., Li, Y., Li, J., Zhang, Q., & Wu, F. (2021). Web-based platform for K-12 AI education in China. *Proceedings of the AAAI Conference on Artificial Intelligence*, 35(17), 15687–15694.
- Xu, W., & Ouyang, F. (2022). The application of AI technologies in STEM education: A systematic review from 2011 to 2021. *International Journal of STEM Education*, 9(1), 17–34.
- Yan, X., & Song, B. (2015). An intelligent tutoring system based on EGL. *Proceedings of the International Conference on Machine Learning and Computing*, 23, 101–107. <https://doi.org/10.2991/meici-15.2015.265>
- Yu, L., & Yu, Z. (2023). Qualitative and quantitative analyses of artificial intelligence ethics in education using VOS viewer and CitNet Explorer. *Frontiers in Psychology*, 14, 1061778. <https://doi.org/10.3389/fpsyg.2023.1061778>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – Where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 1–27.
- Zhang, H., Lee, I., Ali, S., DiPaola, D., Cheng, Y., & Breazeal, C. (2022). Integrating ethics and career futures with technical learning to promote AI literacy for middle school students: An exploratory study. *International Journal of Artificial Intelligence in Education*, 33(2), 1–35. <https://doi.org/10.1007/s40593-022-00293-3>
- Zhang, J., & Zhang, Z.-M. (2023). Ethics and governance of trustworthy medical artificial intelligence. *BMC Medical Informatics and Decision Making*, 23(1), 7. <https://doi.org/10.1186/s12911-023-02103-9>
- Zhao, L., Wu, X., & Luo, H. (2022). Developing AI literacy for primary and middle school teachers in China: Based on a structural equation modeling analysis. *Sustainability*, 14(21), 14549. <https://doi.org/10.3390/su142114549>

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article/Araştırma Makalesi

An Alternative Perspective on Integrating the Prediction-Observation-Explanation Teaching Method into Mathematics Education: Technology-Supported Prediction-Observation-Explanation-Evaluation

Mehmet İhsan YURTYAPAN^{1*}  Gül KALELİ YILMAZ² 

¹ Ministry of Education, Kocaeli, Turkey, asimptot10@yandex.com

² Uludağ University, Education Faculty, Bursa, Turkey, gulkaleli@uludag.edu.tr


* Corresponding Author: asimptot10@yandex.com

Article Info

Received: 25 June 2024

Accepted: 21 September 2024

Keywords: Prediction-Observation-Explanation, POE, technology, GeoGebra, function

 10.18009/jcer.1504515

Publication Language: Turkish

Abstract

The study aims to present the technology-supported POEE teaching method developed through integration into mathematics education using GeoGebra. GeoGebra is a dynamic software serving as a virtual laboratory. POEE is based on the POE method, used as a laboratory teaching method in science education. The study, using a descriptive literature review method, examined works related to the teaching method by searching for "Prediction-Observation-Explanation," "POE," and "Mathematics education" in various national and international databases. The literature review conducted showed that using POE with added stages and technology in mathematics teaching yields positive results. It is thought that technology-supported teaching, carried out with the "Evaluation" stage added to TGA within the scope of the research, will be effective in generalizing and consolidating knowledge. Researchers are recommended to investigate the effects of technology-supported POEE on different variables in mathematics teaching, and a lesson plan based on this method is provided.



To cite this article: Yurtyapan, M.İ., & Kaleli-Yılmaz, G. (2024). Tahmin-gözlem- açıklama öğretim yönteminin matematik eğitime entegre edilmesinde alternatif bir bakış: Teknoloji destekli tahmin-gözlem-açıklama-değerlendirme. *Journal of Computer and Education Research*, 12 (24), 638-665. <https://doi.org/10.18009/jcer.1504515>

Tahmin- Gözlem- Açıklama Öğretim Yönteminin Matematik Eğitime Entegre Edilmesinde Alternatif Bir Bakış: Teknoloji Destekli Tahmin-Gözlem-Açıklama-Değerlendirme

Makale Bilgisi

Geliş: 25 Haziran 2024

Kabul: 21 Eylül 2024

Anahtar kelimeler: Tahmin-Gözlem-Açıklama, TGA, teknoloji, GeoGebra, fonksiyon

 10.18009/jcer.1504515

Yayın Dili: Türkçe

Öz

Çalışmanın amacı GeoGebra aracılığıyla matematik eğitime entegre edilerek geliştirilen teknoloji destekli TGAD öğretim yöntemini sunmaktır. GeoGebra sanal bir laboratuvar işlevi gören dinamik bir yazılımdır. TGAD temelini fen eğitiminde bir laboratuvar öğretim yöntemi olarak kullanılan TGA' dan almaktadır. Betimsel alan yazın tarama yöntemiyle yürütülen araştırmada ulusal ve uluslararası bazı veri tabanlarında "Tahmin-Gözlem-Açıklama", "TGA" ve "Matematik eğitimi" anahtar kelimeleri taranarak öğretim yöntemiyle ilgili olduğu düşünülen çalışmalar incelenmiştir. Yapılan alan yazın taraması TGA' ya aşamalar eklenerek teknolojiyle birlikte kullanılmasının matematik öğretiminde olumlu sonuçları olduğunu göstermiştir. Araştırma kapsamında TGA'ya eklenen "Değerlendirme" aşamasıyla gerçekleştirilen teknoloji destekli öğretimin bilginin geliştirilmesi ve pekiştirilmesinde etkili olacağı düşünülmektedir. Araştırmacılara teknoloji destekli TGAD'nin matematik öğretiminde farklı değişkenler üzerindeki etkilerini araştırmaları önerilmiş ve teknoloji destekli TGAD öğretim yöntemine göre hazırlanan bir ders planı sunulmuştur.

Summary

An Alternative Perspective on Integrating the Prediction-Observation-Explanation Teaching Method into Mathematics Education: Technology-Supported Prediction-Observation-Explanation-Evaluation

Mehmet İhsan YURTYAPAN ^{1*}  Gül KALELİ YILMAZ ² 

¹ Ministry of Education, Kocaeli, Turkey, asimptot10@yandex.com

² Uludağ University, Education Faculty, Bursa, Turkey, gulkaleli@uludag.edu.tr

* Corresponding Author: asimptot10@yandex.com

Introduction

Different approaches have been used in education programs from past to present, and in recent years, the constructivist approach, in which the student structures the knowledge, has replaced the traditional learning approach (MoNE, 2018). Although this is the basic philosophy, it is known that many teachers conduct their lessons with traditional approaches (Temizöz & Özgün-Koca, 2010). At this point, it can be thought that teachers need alternative approaches. One of these approaches is the POE teaching method. Prediction-Observation-Explanation (POE) method is an effective method often used in teaching abstract concepts in science (Bolat & Karamustafaoğlu, 2021; Yurtyapan, 2018). POE is a teaching method based on a laboratory approach based on classical research (invention) (Çelik, 2018). Therefore, it can be said that this method is compatible with the inquisitive structure of mathematics. In addition, considering that teaching mathematics concepts is difficult and abstract, the integration of POE into mathematics is thought to be important. However, when the literature on POE is examined, it is seen that the number of studies on mathematics teaching remains limited (Elmas-Baydar, 2023; Yurtyapan, 2023). This situation can be explained by the fact that mathematics educators do not sufficiently understand the theoretical structure of POE and the limited number of case studies on how POE can be integrated into mathematics education (Elmas-Baydar, 2023; Yurtyapan, 2023). As a matter of fact, the fact that POE is a laboratory teaching method that was first used in physics teaching in 1979 and has been developed and survived until today explains this situation. When the relevant literature is examined, it is seen that POE has been developed over time and used in teaching in different ways (Gunstone & White, 1981). It shows that especially adding stages to POE and using it by integrating it with

different teaching methods and techniques has positive reflections in teaching (Koparan, 2019; Rani, 2021; Tahir et al., 2020). In this context, the aim of the study is to introduce the POE teaching method and to present the technology-supported POEE teaching method as an alternative in integrating it into mathematics education.

Method

Since the research was a compilation study, it was conducted with the descriptive literature review method. While collecting the data of the study, the keywords "Prediction-Observation-Explanation", "POE" and "Mathematics education" were searched in some national and international databases. The studies obtained as a result of the screening were analyzed in depth after being selected according to their suitability for the subject content. Then, the studies thought to be related to the POE teaching method were read and evaluated by the researchers.

Results, Discussion and Conclusion

In the light of the literature review conducted in the study, it was found in some studies that there was a need to add stages to the POE teaching method and that when applied by adding stages to the POE teaching method, it had positive reflections on teaching. Therefore, it has been concluded that the evaluation phase is necessary in integrating the POE teaching method into mathematics teaching. In the POE teaching method, in general, after students make their predictions and observations about the subject to be learned, they learn by doing by making explanations in the explanation stage about whether there is a difference between their predictions and observations or whether their thoughts have changed. However, these stages may not be sufficient to learn all problem situations related to the subject. For this reason, it has been concluded that in integrating the POE teaching method into mathematics teaching, it is necessary to add an evaluation phase, which is a stage where students can individually apply and evaluate the knowledge they have learned at the end of the POE teaching process. During the evaluation phase, students are given product-related tasks (projects, research and extracurricular assignments, etc.), and then the mistakes made in these assignments are examined and evaluated as a class within the framework of ethical rules and corrected. In this sense, the evaluation phase is a phase in which the target acquisition that needs to be learned is institutionalized. Another striking finding when the literature on POE

is examined is that, in some studies, the use of POE teaching method with technology support has positive results in teaching mathematics. It is thought that this may be due to the frequent inclusion of abstract concepts in mathematics subjects. Therefore, it was concluded that since mathematics has an abstract structure, the POEE teaching method should be used in technology-supported teaching. In this sense, GeoGebra, Cabri, Desmos, etc., which we can call a kind of virtual laboratory applications used in mathematics dynamic software can be used. It is thought that POE is a teaching method based on the classical research-based laboratory approach and is suitable for integration with this type of dynamic software. Therefore, in this study, technology-supported POEE is presented as an alternative in integrating POE into mathematics education. In line with these results, researchers were advised to use technology-supported POEE in mathematics teaching and investigate its effects in terms of various variables. In this context, it is thought that the results of the studies will contribute to the relevant literature by increasing the number of studies on POE in the field of mathematics education. In addition, a lesson plan prepared according to the technology-supported POEE teaching method for teaching the concept of function in graphics was also shared as an example for researchers in the study. Since the concept of function in graphics is discussed in this lesson plan, GeoGebra dynamic software was used in the context of technology. However, in lesson plans that can be prepared for different subjects of mathematics, technologies such as Cabri and Desmos can be used, depending on the concepts in the subject.

Giriş

Geçmişten günümüze öğretim programlarında çok farklı yaklaşımlar kullanılmıştır. Son yıllarda ise sorumluluğun öğretilmekte olduğu geleneksel öğrenme yaklaşımı yerine bilginin öğrenci tarafından yapılandırıldığı yapılandırmacı yaklaşımın benimsendiği bilinmektedir (Milli Eğitim Bakanlığı [MEB], 2018). Her ne kadar temel felsefe bu olsa da birçok öğretmen derslerini geleneksel yaklaşımlarla yürütmektedir (Temizöz & Özgün-Koca, 2010). Dolayısıyla öğretmenlerin alternatif yaklaşımlara ihtiyacı olduğu düşünülebilir. Bu yaklaşımlardan biri de Tahmin-Gözlem-Açıklama (TGA) öğretim yöntemidir. Yöntem ile ilgili alan yazın incelendiğinde yapılan çalışmaların çoğunun fen eğitimine yönelik olduğu (Bolat & Karamustafaoğlu, 2021; Yurtyapan, 2018; Yurtyapan & Kandemir, 2022), matematik öğretilmesine yönelik çalışmaların sınırlı sayıda kaldığı görülmektedir (Baltacı & Yıldız, 2018; Elmas-Baydar, 2023; Yurtyapan, 2023). Bu anlamda matematik öğretilmesine yönelik TGA ile ilgili yapılan çalışmalara ihtiyaç olduğu ve bu alanda yapılan çalışmaların artması ile ilgili literatüre katkı sağlayacağı söylenebilir. İlgili alan yazında matematik eğitiminde TGA öğretim yöntemine yönelik yapılan çalışmaların sınırlı olmasının sebebi olarak TGA teorik yapısının matematik eğitimcileri tarafından yeteri kadar anlaşılabilmesi ve TGA'nın matematik eğitime entegrasyonunun nasıl gerçekleştirilebileceğine yönelik örnek çalışmaların az olması gösterilebilir (Elmas-Baydar, 2023; Yurtyapan, 2023). Nitekim TGA'nın ilk defa fizik öğretilmesinde kullanılması ve temelini klasik araştırmaya (buluş) dayalı laboratuvar yaklaşımdan alan bir öğretim yöntemi olması bu durumu destekler niteliktedir. Bu bakımdan TGA'nın teorik yapısının ve aşamalarının tanıtımı, ilgili alan yazın bağlamında matematik eğitime nasıl entegre edilmesi gerektiğine ilişkin değerlendirmelerin yapılmasının önemli olduğu düşünülmektedir. TGA'nın öğretilmeye entegre edilmesi noktasında yapılan çalışmaların bazılarında dersin içeriğindeki kavramlara bağlı olarak TGA'ya aşamalar eklenmesi ya da farklı öğretim yöntem ve teknikleri ile desteklenmesi ihtiyacı hissedilmiştir (Elmas-Baydar, 2023; Rani, 2021). Matematik dersi yapısı gereği soyut kavramlardan oluştuğu ve TGA temelini araştırmaya (buluş) dayalı laboratuvar yaklaşımından aldığı için teknoloji ile bütünleştirilmesinin uygun olduğu düşünülmektedir. Bu anlamda GeoGebra, Cabri vb. dinamik yazılımlar önemli fırsatlar sunmaktadır. Dolayısıyla bu çalışmanın amacı alan yazına dayanarak TGA öğretim yönteminin aşamalarının özelliklerini vererek tanıtımını yapmak, matematik öğretilmesine entegre edilmesinde bir

alternatif olarak sunulan teknoloji destekli Tahmin-Gözlem-Açıklama-Değerlendirme (TGAD)'nın tanıtımı ve matematik öğretiminde nasıl uygulanması gerektiğini geliştirilen örnek bir ders planı ile ortaya koymaktır.

Yöntem

Bu çalışmada, TGA öğretim yönteminin matematik eğitime entegre edilmesinde alternatif bir bakış olarak teknoloji destekli TGAD öğretim yöntemi ile ilgili alan yazındaki çalışmaların derlenerek sunulması amaçlandığından çalışma betimsel alan yazın tarama yöntemi ile yürütülmüştür. Betimsel alan yazın tarama; birbirinden bağımsız olarak yapılan nitel ve nicel çalışmaların birlikte incelenmesi, düzenlenmesi ve alandaki genel eğilimlerin belirlenmesi amacıyla yapılan tanımlayıcı sistematik çalışmalardır (Çalık & Sözbilir, 2014; Çalık ve diğ., 2008). Ancak, betimsel alan yazın taramasında alandaki genel eğilimler belirlenirken incelenen araştırma sayısı fazla olduğu için derinlemesine yorum ve sentez yapmak çoğunlukla pek mümkün değildir (Çalık, 2019). Yürütülen çalışmanın konusu olan TGA ve teknoloji destekli TGAD öğretim yöntemlerine yönelik matematik eğitimi alan yazınında sınırlı sayıda çalışma bulunmaktadır. Bu nedenle çalışmalar, konu içeriğine uygunluğa göre araştırmacılar tarafından seçildikten sonra analiz edilerek elde edilen sonuçlar uzun tartışmalar neticesinde derlenmiştir. Dolayısıyla bu çalışma, matematik eğitiminde TGA ve teknoloji destekli TGAD öğretim yöntemlerine yönelik araştırmaların genel anlamda ne yönde olduğu belirtmektedir. Ayrıca çalışma araştırmacılar tarafından derinlemesine yorumlar ve sentezlemeler yapılarak sunulan bir derleme olduğu için betimsel alan yazın taramasına uygun olduğu düşünülmektedir. Öyle ki yapılan bu derlemenin sonuçlarına bağlı olarak teknoloji destekli TGAD öğretim yönteminin nasıl kullanılması gerektiğini anlatmak amacıyla matematiğin bir konusu belirlenerek teknoloji destekli TGAD öğretim yöntemine göre tasarlanan örnek bir ders planı Ek-1'de paylaşılmıştır. Alan yazın tarama türlerinde meta analiz çalışmalarında ilgili konudaki nicel (deneysel), meta sentez çalışmalarında ise nitel araştırmalar ele alınırken, betimsel alan yazın taramasında nitel ve nicel araştırmalar birlikte ele alınmaktadır (Çalık & Sözbilir, 2014; Çalık ve diğ., 2008). Bu çalışmada matematik eğitiminde TGA ve teknoloji destekli TGAD öğretim yöntemlerine yönelik alan yazındaki nicel ve nitel araştırmaların birlikte değerlendirilmesi yürütülen çalışmanın betimsel alan yazın taraması olduğunu destekler niteliktedir. Betimsel alan yazın

taraması sistematik bir yöntem olduğundan bu çalışma yürütülürken izlenen yol şu şekildedir;

- Alandaki ulusal ve uluslararası veri tabanlarında (SSCI, ERIC, ULAKBİM) “Tahmin-Gözlem-Açıklama”, “Predict-Observe-Explain”, “TGA”, “POE” ve “Matematik eğitimi” anahtar kelimeleri taranarak öğretim yöntemine ilişkin makale, kitap, kitap bölümü ve tez çalışmaları bulunmuştur.
- Ele alınan çalışmalar, konu içeriğine uygunluğa göre seçildikten sonra derinlemesine analiz edilmiştir.
- Bu çalışma kapsamında değerlendirilecek olanlar, konu içeriğinin uygunluğuna göre araştırmacılar tarafından incelenerek seçilmişlerdir.

Belirlenen çalışmalar okunarak bu çalışma kapsamında belirlenen başlıklara uygun şekilde derinlemesine analiz edilerek sonuçlar uzun tartışmalar sonucu derlenmiştir.

Bulgular

Tahmin- Gözlem- Açıklama (TGA) Öğretim Yöntemi

Günümüzde öğretim ortamlarında pek çok şekilde kullanılan TGA temelinin, bir hipotezin ifade edildiği ve bu hipotezin neden doğru olabileceğine ilişkin argümanların ortaya konulduğu, ilgili verilerin toplanarak sonuçların tartışılıp sorgulandığı klasik araştırmaya (buluşa) dayalı laboratuvar yaklaşımından alır (Çelik, 2018). TGA yöntemi, Pittsburgh Üniversitesinde başlangıçta “Gösteri-Gözlem-Açıklama” (GGA) [DOE (Demonstrate-Observe-Explanation)] olarak adlandırılan bir tekniğin geliştirilmiş şeklidir (Kearney, 2004; Yaman, 2012). TGA öğretim yöntemi, öğrencilere belirli bir konu veya deney hakkında gerekçeli tahminler yapma, ardından ilgili konuyu veya deneyi gözleme ve yaptıkları tahminlerle gözlemleri birlikte açıklama temeline dayanan üç aşamalı bir öğretim yöntemidir. TGA ilk olarak 1979 yılında Champagne ve arkadaşları tarafından fizik öğrenimi gören öğrencilerin, düşünme becerilerini incelemek amacıyla “Gösteri-Gözlem-Açıklama” (GGA) şeklinde tasarlanarak kullanılmıştır (Güngör & Özkan, 2017). Daha sonra bu yöntem Gunstone ve White (1981) tarafından yürütülen bir başka çalışmada “Tahmin-Gözlem-Açıklama” (TGA) olarak değiştirilerek bugünkü şeklini almıştır. İlgili alan yazında TGA’dan bazı çalışmalarda TGA stratejisi olarak bahsedildiği görülse de (Elmas-Baydar, 2023; İpek ve diğ., 2010), yaygın

olarak teknik veya yöntem olduğu belirtilmektedir (Bilen, 2009; Ergül ve diğ., 2020; Nalkıran & Karamustafaoğlu, 2020; Yaman, 2012). Alan yazında bu şekilde ifade edilmesi nedeninin TGA'nın öğretim ortamlarından kullanımına ve yapılan çalışmalarının amaçlarına bağlı olduğu düşünülmektedir. Bu durum TGA'nın öğrenme ortamlarında kullanımı başlığı altında daha detaylı açıklanmıştır. Ancak yukarıda gelişim sürecinde de belirtildiği gibi TGA bir laboratuvar yöntemi olarak tasarlanmıştır. Dolayısıyla bu çalışmada ders planı tasarlanırken TGA öğretim yöntemi olarak ele alınıp örnek bir öğretim etkinliği geliştirilmiştir.

Tahmin-Gözlem-Açıklama (TGA)'nın Öğretim Ortamlarında Kullanılması

İlgili alan yazın incelendiğinde TGA'nın öğretim ortamlarında farklı amaçlarla kullanıldığı görülmüştür. Özellikle laboratuvar derslerinde çalışma yapıları TGA'ya göre tasarlanarak öğretim amaçlı kullanılmaktadır (Güngör & Özkan, 2017; Yurtyapan, 2018). Ayrıca çalışmalarda öğretim süreci tamamlandıktan sonra araştırmacılar TGA çalışma yapılarını değerlendirebilir. Bu bakımdan TGA, dersin sadece etkili bir şekilde öğrenilmesine yardımcı olmakla kalmayıp aynı zamanda öğrencilerin değerlendirilmesi için alternatif bir değerlendirme yöntemidir (Güven, 2011; Kozcu-Çakır ve diğ., 2017). Öğretim ortamları tasarlanırken TGA tek başına ya da kavram öğretimindeki bazı yöntem ve tekniklerle birlikte de kullanılabilir. Özyılmaz-Akamca & Hamurcu (2009), TGA'yı analogiler ve kavram karikatürleriyle, Barut (2020) kavram ağları, Yurtyapan (2018) ise kavram karikatürleri, Tao & Gunstone (1999) simülasyonlarla, Yaşar ve Baran (2020) oyunlarla birlikte kullanmayı tercih etmişlerdir. Ayrıca yapılan çalışmalarda kavram yanılgılarının belirlenmesinde ve bu yanılgıların giderilmesinde etkili olan bir kavramsal değişim stratejisi olarak da TGA'dan bahsedilmektedir (İpek ve diğ., 2010; Küçüközer, 2008). Bu çalışmada Ek-1'de sunulan örnek ders planı TGA öğretim yöntemine alternatif bir bakış açısı getirerek ilköğretim matematik öğretmeni adaylarına fonksiyon grafiklerinin dönüşümünün öğretimi ve grafik okuryazarlık becerilerinin geliştirilmesine yönelik hazırlanmıştır.

TGA öğretim yöntemiyle laboratuvarlarda veya alanda yapılacak etkinliklerde öğrencilere öğrendiklerini uygulama fırsatının verilmesi amaçlanmıştır (White & Gunstone, 1992). Yöntem aynı zamanda; sınıf içerisinde sunulacak olay, gösteri, deney ya da laboratuvar etkinliklerine yönelik öğrencilerin tahminde bulunmaları (nedeniyle birlikte), olayı gözlemlenmeleri ve süreç başındaki tahminleri ile gözlemlerini beraberce açıklamaları sürecine dayanmaktadır (Kearney & Treagust, 2001; White & Gunstone, 1992). Dolayısıyla TGA'nın

gözlem aşaması, öğrencilerin tahmin aşamasındaki duruma yönelik deneyler yapmasını gerektirmektedir. Ancak bazı soyut kavramların öğretiminde öğrencilerin somut deneyler yapması her zaman mümkün olmayabilir. Bu bakımdan TGA öğretim yöntemi bilgisayar tabanlı bir ortama uygulanabilir. Nitekim ilgili alan yazınında TGA'nın teknolojik öğrenme ortamlarında kullanılarak olumlu sonuçlar alındığını gösteren pek çok çalışma bulunmaktadır (Baltacı & Yıldız, 2018, Elmas-Baydar, 2023; Tao & Gunstone, 1999). Baltacı ve Yıldız (2018) tarafından yapılan çalışmada ilköğretim matematik öğretmeni adaylarının geometrik yer problemlerini GeoGebra dinamik matematik yazılımıyla çözümleri esnasında TGA stratejisinin nasıl işlediği incelenmiştir. Araştırmada öğretmen adaylarının çoğunun yanlış tahminlerde buldukları tespit edilmiştir. Gözlem aşamasında ise öğretmen adayları GeoGebra yazılımıyla oluşturulan geometrik yerleri gözlemleyerek tahminlerini düzeltmeye çalıştıkları ve hepsinin tahminlerini doğru cevapla değiştirdikleri belirlenmiştir. Çalışmada araştırmacıların geometrik yer problemlerinin GeoGebra yazılımı destekli çözümleri esnasında TGA stratejisinin kullanımının, ilköğretim matematik öğretmeni adaylarına istenilen geometrik yerleri göstermede etkin bir araç olduğu sonucuna ulaştıkları görülmektedir. Elmas-Baydar (2023) ise istatistik öğretiminin doğasına uygun olduğunu düşünerek TGA stratejisinin, bilgisayar teknolojileriyle desteklendiği bir öğrenme ortamının (BiDeTGA), normal dağılım ve örnekleme dağılımı konularının öğrenilmesine etkisini incelemeyi amaçlamıştır. Çalışmanın gözlem aşamasında Microsoft Excel, GeoGebra dinamik yazılımı ve SamplingSIM simülasyon yazılımı kullanılmıştır. Araştırmadan elde edilen bulgular, BiDeTGA stratejisine uygun tasarlanan öğrenme ortamının, öğrencilerin normal dağılım ve örnekleme dağılımı konularındaki akademik başarılarında deney grubu lehine anlamlı bir farklılık oluşturduğunu göstermiştir. Elde edilen sonuçlar, BiDeTGA stratejisinin kullanıldığı öğrenme ortamında yapılan çalışmaların, öğrencilerin normal dağılım ve örnekleme dağılımı kavramlarını daha etkili bir şekilde öğrenmelerine yardımcı olduğunu ortaya çıkarmıştır. Elmas-Baydar (2023) ile Baltacı ve Yıldız (2018) tarafından yapılan çalışmalarda TGA'nın üç aşamalı şekilde kullanıldığı görülmektedir. Bu durumun araştırmacılar tarafından çalışılan konuların yapılarıyla ilişkili olduğu söylenebilir. Nitekim yürütülen bu çalışmada tasarlanan öğretim ortamının fonksiyon dönüşümünün öğretimi ve grafik okuryazarlık becerilerini geliştirmeye yönelik olduğu göz önüne alındığında konunun çok bileşenli bir yapısının olduğunu söylemek mümkündür. Özellikle grafik çizme becerisi,

grafik okuma ve yorumlama becerisini içerisinde alan üst düzey bir beceridir. Bu bakımdan temel olarak grafiklere yönelik becerilerin geliştirilmesine odaklanan bu çalışmada öğrencilerin çizdikleri grafiklere yönelik bir geri dönüt sağlanması açısından değerlendirme aşamasının eklenmesine ihtiyaç duyulmuştur. Dolayısıyla fonksiyon dönüşümünün öğretime yönelik grafik okuryazarlık becerilerinin geliştirilmesi amacıyla tasarlanan bu çalışmadaki öğretim ortamı TGA öğretim yöntemine Değerlendirme aşaması eklenerek TGAD şeklinde teknoloji destekli olarak yürütülmüştür. Ayrıca Elmas-Baydar (2023) ile Baltacı ve Yıldız (2018)'in çalışmalarından farklı olarak bu çalışmada etkinlikler GeoGebra Ders ortamında tasarlanarak teknolojinin bütün aşamalarda kullanılması sağlanmıştır.

TGA ve TGAD öğretim sürecinin etkili bir şekilde gerçekleşmesi için öğretmen ve öğrencilerin rollerinin araştırmacılar ve uygulayıcı öğretmenler tarafından iyi anlaşılması gerekmektedir. Ayas ve diğerleri (1997) yaptıkları çalışmada TGA öğretim yönteminden beklenen etkilerin belirlenmesinde, sürecin yönetiminde ve özellikle açıklanması aşamalarında ortaya çıkan sonuçların açıklanmasında sorunlar yaşandığına dikkat çekmektedir. Bu durum TGA öğretim yönteminin aşamalarının özellikleri ve uygulanma şeklinin araştırmacılar tarafından iyi anlaşılmasından kaynaklanabilir. Dolayısıyla öğretim ortamlarında TGA'nın etkili olabilmesi için nasıl uygulanması gerektiği ve bu aşamaların özelliklerinin bilinmesinin önemli olduğu düşünülmektedir. Ayrıca grafik okuryazarlık becerilerinin geliştirilmesi kapsamında araştırmacılar tarafından geliştirilen TGAD öğretim sürecinin tanıtılması bu alanda çalışacak araştırmacılar ve öğretmenlere katkı sağlayacağı düşünülmektedir. Bu kapsamda TGAD öğretim yönteminin aşamaları ayrıntılı bir şekilde aşağıda açıklanmaktadır.

Tahmin Aşaması: Tahmin aşaması, öğrencilerin konuya dikkatinin çekilmesi gereken bir aşamadır (Sağiremekçi, 2016). Bu aşamada öğretmen tarafından geliştirilen etkinliğe (deney, gösteri) yönelik öğrencilerden tahmin geliştirmeleri ve tahminlerinin gerekçelerini açıklamaları beklenmektedir. Tahminde bulunmak aynı zamanda öğrencinin fikirlerinin alınması açısından "Benim fikirlerim önemli" düşüncesini harekete geçirmektedir. Böylece öğrenci öğrenmenin sorumluluğunu alarak sürece dâhil olmaktadır. Bu durum öğrencilerin fikir ve inanışları arasından konuyla ilgili olanları seçme ve karar verme yeteneğini geliştirmektedir (Gunstone, 1995). Tahmin aşaması için geliştirilen etkinlikte deney yapılabileceği gibi açık uçlu sorular üzerinden de etkinlik yürütülebilir (White & Gunstone,

1992). Nitekim Liew ve Treagust (1998) çalışmalarında tahmin için açık uçlu soruların yöneltilmesinin daha uygun olduğunu belirtmişlerdir. Çünkü tahmin sürecinde olaya yönelik seçeneklerin sunulması halinde öğrencilerin zihin dünyalarında oluşan tahminler kısıtlanabilir. Bu kapsamda kullanılacak soruların, öğrencilerin tahmin ve gözlemlerini sınırlandıracak, yönlendirecek şekilde kısa cevaplı olmamasına özen gösterilmesi gerektiği önerilmektedir (Liew & Treagust, 1998; Yurtyapan, 2018). Dolayısıyla bu çalışma kapsamında geliştirilen etkinlikte tahmin aşamasında fonksiyon grafiklerini okuma- yorumlamaya yönelik açık uçlu sorular yöneltilerek verdikleri cevapların gerekçelerini açıklamaları istenmiştir. Buradaki amaç öğretmen adaylarının bilgilerini açığa çıkarmak için motive etmektir. Tahmin aşaması öğretilmesi hedeflenen kavrama yönelik öğrencilerin ön bilgilerinin nasıl, ne düzeyde olduğu ve varsa kavram yanlışlarının tespiti açısından da önem arz etmektedir (Searle, 1995). Bu aşama sayesinde öğrenci konuya yönelik bilgilerindeki eksiklerle yüz yüze kalarak cevaplarının doğru olup olmadığı kontrol etmek amacıyla ikinci aşama olan gözlem aşamasına istekli bir şekilde geçmesi hedeflenmektedir.

Gözlem Aşaması: Gözlem aşamasında, tahmin aşamasında gerçekleştirilen etkinlikte geçen olayla ilgili öğrencilerden deneyler yaparak süreci aktif bir şekilde gözlemlemeleri istenmektedir. İki aşama bu yönüyle birbirlerine sıkı bir şekilde bağlıdır. Dolayısıyla geliştirilen etkinlikteki deneyin öğrenci tarafından hem açık bir şekilde gözlemlenebilecek yapıda hem de öğrencinin zihninde çelişki oluşturabilecek özellikte olması önem arz etmektedir (White & Gunstone, 1992). Gözlem aşaması bu yönüyle öğrencilere tahminlerini kontrol etme ve çıkarımda bulunma imkânı sağlamaktadır. Ayrıca öğrencilerin gözlemlerini sözel ve sayısal anlamda yazarak ifade etmeleri ve gerekirse deneyi tekrar etmeleri istenebilir (Köseoğlu ve diğ., 2002). Bu sayede öğrencilerin tahmin ve gözlemlerini karşılaştırıp düşüncelerindeki değişimi kâğıda aktararak bilimsel bir sürecin nasıl gözlemlenmesi gerektiği hakkında bir alışkanlık edinmeleri sağlanmaktadır. Gözlem aşaması bu yönüyle öğrencinin kendi kendine öğrenmesini sağlayan en kritik aşamalardan biridir (Yaman, 2012). Matematiğin çoğu konusunda soyut kavramların öğretimi söz konusu olduğu için gerçek ortamda deneylerin ve gözlemlerin yapılması pek verimli ve mümkün olmamaktadır. Bu durumu gidermek için araştırma kapsamında sunulan örnek ders planının gözlem aşamasında grafiklerde fonksiyon dönüşümüne yönelik GeoGebra dinamik yazılımı kullanılarak teknoloji destekli bir yaklaşım izlenmiştir. Nitekim ilgili alan yazında

matematikteki pek çok soyut kavramın öğretimini konu alan çalışmalarda gözlem aşaması için teknolojik uygulamalardan faydalanılmıştır (Baltacı & Yıldız, 2018; Elmas-Baydar, 2023). Ayrıca her bireyin öğrenme hızının farklı olduğu düşünüldüğünde GeoGebra'nın öğretmen adaylarına sınırsız deneme yapma imkânı vermesinin keşfederek öğrenme açısından önemli katkı sağlayacağı düşünülmektedir.

Gözlem aşaması keşfederek öğrenmeyi ön planda tutmasına rağmen bu durum öğrencilerin her zaman doğru gözlemler yapacağı anlamına da gelmemektedir. Çünkü yapılan çalışmalarda öğrencilerin incelenen duruma yönelik ön bilgileri, tahminlerini, gerekçelerini, beklentilerini ve gözlemlerini olumlu ya da olumsuz yönde etkileyebildiği tespit edilmiştir (Kearney, 2004; Liew & Treagust, 1998; White & Gunstone, 1992). Bu durum öğrencilerin ön bilgilerinin doğru veya yanlış olmasıyla ilişkilidir. Dolayısıyla öğrencilerin yaptıkları gözlemlerden elde ettikleri sonuçları sınıfla paylaşmaları, fikirlerini ifade etmeleri düşüncelerindeki eksik noktaları görmek açısından bir gereklilik oluşturmaktadır. Bu nedenle gözlem aşamasından sonra diğer bir aşama olan açıklama aşamasına geçilmektedir.

Açıklama Aşaması: Bu aşamada öğrencilerden tahmin ve gözlemleri arasında fark olup olmadığına ilişkin bilgi vermeleri ve eğer fark varsa bunun nedenlerini kendi cümleleri ile açıklayarak yazmaları beklenir (Kearney, 2004). Ayrıca bu aşamada öğrencilerden sınıfta sözel olarak tahmin ve gözlemlerini ifade etmeleri varsa eksik ya da çelişkili durumları tartışmaları beklenir ve böylece çelişkilerin giderilmesi sağlanmalıdır (Yurtyapan, 2018). Öğrencilerin süreç içerisinde geliştirdikleri açıklamaları sınıf içerisinde tartışmaları, kavramları kendilerince yapılandırılmaları, fikirlerini savunmaları ve gerekçelendirmeleri açısından önemlidir. Ayrıca sınıf içerisinde tartışma, öğrenciye karşı tarafın fikrini dinleyerek anlamaya çalışma, katıldığı ve katılmadığı noktaları ifade etme ve bu yolla düşüncelerini sunma imkânı vermektedir. Böylece öğrencinin sadece kendi düşüncesinin değil, arkadaşlarının düşüncelerinin de önemli olduğunu hissetmesine, duyuşsal açıdan empatik bir bakış açısı benimsemesine katkı sağlanabilir. Nitekim ilgili alan yazında TGA'nın duyuşsal özellikler üzerinde olumlu yansımalar oluşturduğunu gösteren pek çok çalışma bulunmaktadır (Akarsu, 2018). Öğrenciler açıklama aşamasında tahmin ve gözlemlerini karşılaştırarak not aldıkları ve bu düşüncelerini sınıf ortamında tartıştıkları için bu aşamayı zor bulurlar (Kearney, 2004). Bu noktada öğretmene önemli görevler düşebilmektedir. Öğretmenin sürecin verimliliğini sağlamak adına bu aşamada yapılandırmacı bir bakış açısı çerçevesinde

öğrencilere rehberlik etmesi önemlidir. Öğretmen varılacak sonuca yönelik direkt açıklamalarda bulunmamalı daha çok öğrencilere alternatif fikirler ve yorumlar geliştirmesi için onlara yol göstermesi ve teşvik edici olması gerekmektedir (Köse ve diğ., 2003; White & Gunstone, 1992). Bunun için öğretmenler çeşitli sorular sorarak öğrencilerle diyaloga geçebilir. Yapılan araştırmalar bireylerin düşüncelerini sözel olarak ifade etmelerini sağlayan didaktik konuşmaların öğrenmeye olumlu yönde katkı sağladığını göstermektedir (Egin, 2010). Ayrıca bu aşamanın mülakatlar ile desteklenmesi öğrenci anlamaları hakkında daha ayrıntılı bilgilerin tespit edilmesini sağlar (Liew & Treagust, 1998). Bu çalışmada geliştirilen ders planındaki etkinlikte açıklama aşamasında öğrencilerle birlikte tahmin ve gözlemlerin neler olduğuna yönelik sınıf içi tartışmalar yapılması gerektiği özellikle belirtilmektedir. Sınıf içinde açıklamaların paylaşılması ve tartışılması, öğrencilere farklı bakış açılarını düşünme imkânı sunar, yeni düşüncelerin önemini anlamalarına yardımcı olur ve bu taze fikirleri çeşitli durumlarda uygulama şansı verir. Genellikle, birçok açıklama eşit derecede geçerlidir ve bu açıklamalar yeni soruların doğmasına yol açabilir (Baird & Northfield, 1992). Dolayısıyla bu durum açıklama aşamasından sonra yeni tahminlerin yapılmasına ve TGA'nın bir döngü şeklinde işlemesine neden olmaktadır. TGA'nın nasıl işlediğini gösteren döngüsel yapı Şekil 1'de verilmiştir.



Şekil 1. TGA'nın döngüsel yapısı (Elmas-Baydar, 2023, s. 27)

Şekil 1'de görüldüğü üzere açıklama aşaması sonunda ortaya çıkabilecek yeni sorular sürecin tekrar başa dönmesini sağlayabilir. Bu noktada öğretmen, öğrencileri bilimsel kaynaklara ulaşmalarını sağlamak için çeşitli yönlendirmeler yapabilir. Özellikle ele alınan

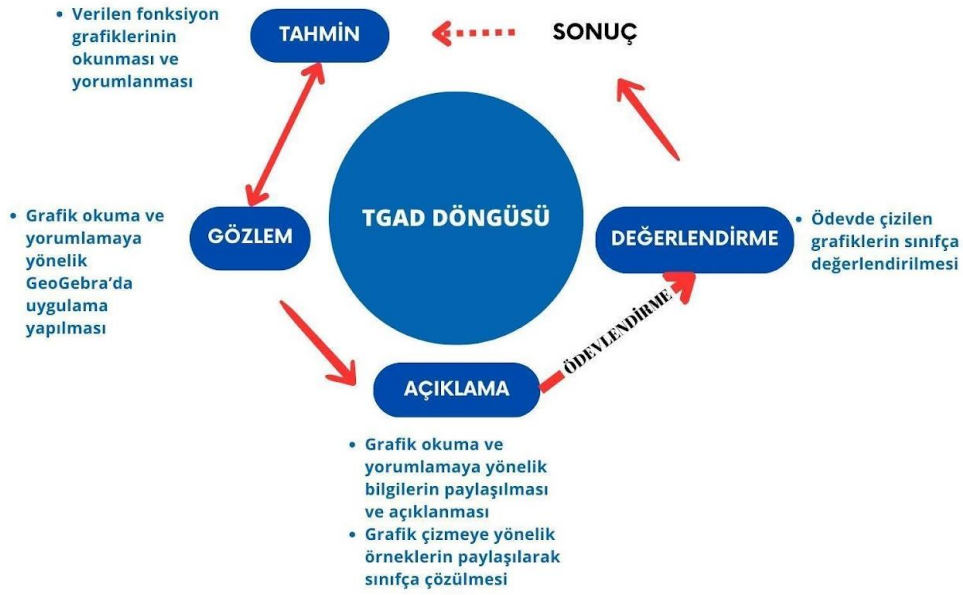
Tahmin- Gözlem-Açıklama-Yazma [TGAY] (Sani & Anggryani-Sinaga, 2012) şeklinde kullanıldığı görülmektedir. Fizik eğitiminde yapılan bir diğer araştırmada ise yöntem animasyon aşaması eklenerek [TGAA] (Tahir ve diğ., 2020), matematik eğitiminde yöntem Detaylandırma, Yazma ve Değerlendirme aşamaları eklenerek [TGADYD] (Rani, 2021) kullanıldığı görülmektedir. Dolayısıyla TGA'nın esnek ve işlevsel bir yapıya sahip olduğu söylenebileceği gibi araştırmacıların yöntem ek aşama ekleme ihtiyacı da hissettikleri görülmektedir.

Bu çalışma kapsamında hazırlanan ders planında konu olarak içerisinde pek çok kuramsal soyut kavramın bulunduğu fonksiyonların dönüşümü ele alındığı için ek bir aşamaya ihtiyaç duyulmuştur. Ayrıca ders planındaki kazanımlarda fonksiyon konusuna yönelik grafik okuryazarlık becerilerinin geliştirilmesi amaçlandığından öğretim yönteminin her aşamasında ayrı bir becerinin geliştirilmesi hedeflenmiştir. Grafik okuma ve yorumlama nispeten daha kolay ve temel bir beceri olduğundan tahmin ve gözlem aşamasına yerleştirilmiştir. Grafik çizme becerisi ise grafik okuma ve yorumlamayı kapsayan daha üst düzey bir beceridir. Bu nedenle öğretim sürecinin son aşamalarına yerleştirilmesi uygun görülmüştür. Ancak grafik çizme becerisinin kapsamlı yapısı ve üst düzey bir beceri olması göz önüne alındığında açıklama aşamasında grafik çizmeye yönelik öğretmen adaylarıyla birlikte yapılan etkinlikler ve örnekler yeterli olmayabilir. Dolayısıyla öğretmen adaylarının grafik çizmeye yönelik kendi performanslarını ortaya koyabilecekleri ek bir aşamaya ihtiyaç duyulmuştur. Yöntem aşama ekleme ihtiyacının altında konunun yapısı, araştırmacının öğrenmeye bakışı, öğrencinin ihtiyaçları, öğretimin değerlendirilmesi gibi birçok durum olabileceği söylenebilir. Nitekim kavram karikatürü destekli TGA öğretim yönteminin kullanıldığı Yurtyapan (2018) tarafından gerçekleştirilen çalışmada öğretim süreci sonunda konu ile ilgili değerlendirme soruları sorulduğu, bu sorulara verilen cevapların sadece yapılan öğretimi değerlendirmek adına kullanıldığı görülmektedir. Ancak öğretim sonrasında öğretimin değerlendirilmesinin yanı sıra öğrenciye dönüt vermenin de önemli olduğu yadsınamaz bir gerçektir. Bu sayede öğrenciler değerlendirme sorularına verdikleri cevaplarda doğru, eksik ya da yanlış noktaları fark ederek cevaplarını düzeltme fırsatı bulabilir. Böylece öğretimin kalitesinin arttırılacağı düşünülmektedir. Bu nedenle TGA öğretim yöntemine Değerlendirme aşaması eklenerek TGAD şeklinde geliştirilmiştir.

Değerlendirme Aşaması: Değerlendirme aşaması öğrencilerin TGA öğretim süreci sonunda öğrendikleri bilgileri bireysel olarak uygulayabilecekleri bir aşamadır. Dolayısıyla bu aşamada öğrencilere ürüne dönük görevler (proje, araştırma ve ders dışı ödevlendirme vb.) verilmelidir. Öğrencilere verilen görevler sınıf içi ya da ders dışı uygulamalar olabilir. Bu görevler öğrenciler tarafından tamamlandıktan sonra sınıf ortamında paylaşarak yapılan hataların değerlendirilmesi yapılır. Dolayısıyla bu aşama öğrencilerin hem TGA öğretim sürecinden elde ettiği bilgiyi uygulayarak dönüt aldığı hem de arkadaşlarının bilgilerini değerlendirerek yapılabilecek farklı hataları gördüğü bir aşama olduğu için her yönüyle değerlendirme yaptığı bir aşamadır. Değerlendirme aşamasında ödevlerde yapılan hatalar sınıf tarafından doğrudan görülemiyorsa bu hataların neler olabileceğine yönelik tahminler alınır. Daha sonra yapılan tahminlerin gözlemlenmesi ve son olarak tartışmalar yoluyla açıklanması sağlanır. Dolayısıyla TGAD'nin döngüsel bir yapısı olduğu için bilginin kurumsallaştırılmadığı durumlarda süreç devam eder. Bu çalışmada fonksiyon grafiklerinin öğretimine ve grafik okuryazarlık becerilerinin geliştirilmesine yönelik tasarlanan TGAD'a dayalı teknoloji destekli öğretim ortamında TGAD'nin nasıl uygulandığı aşağıda detaylı olarak açıklanmıştır.

Tahmin-Gözlem-Açıklama-Değerlendirme (TGAD)'nin Öğretim Ortamlarında Kullanılması

Teknoloji destekli TGAD'nin uygulanmasını açıklamak amacıyla çalışma kapsamında bir matematik konusu araştırmacılar tarafından seçilmiştir. Bunun için konu olarak fonksiyon dönüşümleri belirlenerek öğretmen adaylarına öğretimi hedeflenmiştir. Ayrıca TGAD'nin uygulanmasına yönelik döngüsel yapıyı gösteren diyagram Şekil 3'te verilmiştir.



Şekil 3. TGAD döngüsü (Yurtyapan, 2023, s. 28.)

Çalışma kapsamında hazırlanan ders planında grafiklerde fonksiyon dönüşümüne yönelik grafik okuryazarlık becerilerinin geliştirilmesi amaçlandığından TGAD öğretim yönteminin her aşamasında ayrı bir becerinin yer aldığı Şekil 4'te görülmektedir. Tahmin aşamasında öğrencilerden verilen grafiklerini okumaları ve yorumlamaları, ardından yaptıkları tahminleri yazılı olarak kaydetmeleri istenir. Daha sonra öğrenciler tahminlerini kısaca sınıfla paylaşır. Yapılan paylaşım sonrasında gözlem aşamasına geçilir. Gözlem aşamasında, tahmin aşamasında verilen her grafiğe yönelik GeoGebra uygulamaları bulunmaktadır. Bu uygulamaları yaparak gözlemlerini ve tahmin aşamasındaki düşüncelerinin değişip değişmediğine yönelik bir bölümü doldurarak açıklamalarını yazılı olarak kaydetmeleri istenir. Açıklama aşamasında ise öğrencilerle birlikte tahminler ve gözlemlerin neler olduğuna yönelik sınıf içi tartışmalar yapılır. Tahminler ve gözlemler arasındaki çelişkili durumları gidermek için öğretmen öğrencilerle birlikte GeoGebra yazılımı kullanarak gözlemler ve iskele sorular aracılığıyla didaktik konuşmalar gerçekleştirir. Böylece öğretmen grafik okuma yorumlamaya yönelik bilginin genelleştirilmesini sağlamayı amaçlamaktadır. Ek olarak bu aşamada grafik çizme becerisini geliştirebilmek için konu ile ilgili temel bilgiler vererek bazı grafiklerin çizimine yönelik öğrencilerle birlikte gerek GeoGebra yazılımını kullanarak gerekse sınıf tahtasını kullanmak suretiyle örnekler çözülür. Değerlendirme aşamasında öğretmen adaylarına grafik çizmeye yönelik ders dışı ödevlendirmeler yapılarak onlara verilen sürede yaptıkları ödevleri teslim etmeleri istenir.

Burada amaç öğretmen adaylarına daha önceki aşamalarda grafik okuma ve yorumlamaya dair öğrendikleri bilgileri uygulamaya koyarak kendi performanslarını ortaya çıkarabilecekleri ayrı bir zaman tanımaktır. Daha sonra dersi yürüten öğretmen tarafından bu ödevler kontrol edilerek yapılan hatalar sınıflandırılır ve etik kurallar çerçevesinde öğrencilere “ödevlerinizde yaptığınız çizimler” şeklinde sunulur. Öğrencilerden çizimleri yorumlamaları varsa yapılan hataları incelemeleri istenir. Daha sonra hataların neler olduğuna yönelik sınıf içi tartışmalar gerçekleştirilir. Bu aşama öğretmen adaylarının ders dışı bir zamanda tahmin, gözlem ve açıklama aşamasında öğrendikleri bilgileri, grafik çizmeye yönelik yaptıkları hatalarla yüzleştiği ve didaktik konuşmalarla doğrularını öğrendiği bir aşama olduğu için gerek kendini gerekse öğretim sürecini değerlendirdiği bir aşamadır. Bu nedenle “Değerlendirme” aşaması olarak isimlendirilmiştir. Sonuç olarak grafik okuryazarlığına yönelik bütünsel olarak bir öğrenme gerçekleştirmek ve bilginin öğretmen adayları tarafından kavramsallaştırılması ve içselleştirilmesini sağlamak için değerlendirme aşamasının eklenmesinin önemli ve uygun olduğu düşünülmüştür.

Tartışma, Sonuç ve Öneriler

TGA, tahmin, gözlem ve açıklama aşamalarıyla öğrencinin bilgiyi kendisinin yapılandırmasına imkân tanıyan önemli bir öğretim yöntemidir. Bu yöntem öğrencilerin bilimsel süreç becerilerini, eleştirel düşüncelerini, problem çözme yeteneklerini ve yaratıcılıklarını geliştirmektedir (Bilen & Aydoğdu, 2012). Alan yazın incelendiğinde yöntemin sıklıkla fen eğitiminde bir laboratuvar yöntemi olarak kullanıldığı ve olumlu sonuçlar verdiği görülmektedir (Kozcu-Çakır ve diğ., 2017). TGA öğretim yönteminin kullanıldığı matematik öğretimine yönelik çalışmaların sınırlı olması (Baltacı & Yıldız, 2018; Elmas-Baydar, 2023) ve öğretimde elde edilen sonuçların olumlu olduğu göz önüne alındığında bu öğretim yönteminin kullanıldığı matematik öğretimine yönelik daha fazla çalışmaya ihtiyaç duyulduğu söylenebilir.

İlgili alan yazında matematik eğitime yönelik TGA ile ilgili çalışmaların sınırlı sayıda olması nedeniyle TGA'nın çeşitli öğretim yöntem ve tekniklerle birlikte kullanıldığı çalışmaların da az sayıda olduğu görülmektedir (Koparan, 2019; Tahir ve diğ., 2020). Kılınç ve Yazıcı (2022) tarafından Türkiye’de fen eğitimi alanında TGA tekniği kullanılarak yapılan lisansüstü tezlerin analiz edildiği çalışmada TGA'nın çeşitli öğretim yöntem ve tekniklerle birlikte kullanıldığında daha başarılı olduğu belirtilmiştir. Bu bağlamda TGA'nın matematik

eđitimine entegre edilmesinde farklı öğretim yöntemleri ile birlikte kullanılması olumlu sonuçlar verebilir. Özellikle matematiđin soyut yapısı geređi somut deneylerin yapılamadığı durumlarda teknoloji önemli bir alternatif olmaktadır. Nitekim matematik eğitiminde teknoloji (animasyon, simülasyon vb.) ile TGA'nın birlikte kullanıldığı çalışmaların sonuçları incelendiğinde olumlu sonuçlar elde edildiđi görölmektedir (Koparan, 2019; Tahir ve diđ., 2020). Matematik eğitiminde teknolojinin TGA ile birlikte kullanılması noktasında animasyon ve simülasyonlardan ziyade öğrencilerin deđişkenleri deđiştirmek suretiyle onlara sınırsız deney yapma imkânı veren matematik eğitiminin adeta laboratuvarı diyebileceğimiz dinamik yazılımların kullanılmasının da önemli olduđu düşünölmektedir. Bir çeşit sanal laboratuvar uygulamaları da diyebileceğimiz bu yazılımlar TGA'nın temelini aldıđını klasik araştırmaya (buluşa) dayalı laboratuvar yaklaşımı yapısıyla da örtüşmektedir. Nitekim matematik eğitiminde teknoloji ve TGA'nın birlikte kullanıldığı bazı çalışmalarda bu yazılımlardan faydalanıldığı ve olumlu sonuçların elde edildiđi görölmektedir (Baltacı & Yıldız, 2018; Elmas-Baydar, 2023). Dolayısıyla araştırmacılara örnek olması açısından bu çalışma kapsamında sunulan örnek ders planında seçilen konu grafiklerde fonksiyon dönüşümleri olduđu için gözlem aşamasında dinamik yazılımlardan GeoGebra kullanılmıştır. Farklı matematik konularının çalışılması durumunda diđer dinamik yazılımlardan (Cabri, Desmos, vb.) faydalanılabilir. Bu yazılımlarla birlikte TGA'nın kullanıldığı çalışmalar matematik eğitimi alan yazınına katkı sağlayacağı düşünölmektedir.

Keşfetmeye (buluşa) dayalı öğretimde yapılan tartışma, sorgulama ve gözlemler sonucunda öğrenciler matematik kavramları üzerinde pek çok özgün sonuç elde edebilir. Ancak her öğrencinin kendi süzgecinden geçirerek oluşturduđu bilgilerin bilimselliđe ulaşması bakımdan kontrol edilmeye ve genelleştirilmeye muhtaçtır. Temelini klasik araştırma (buluş) dayalı laboratuvar yaklaşımından alan TGA öğretim yönteminde de öğrenci o ders sürecinde karşısına gelen problem durumları hakkında tahminleri ile yaptıđı gözlemlerden elde ettiđi verileri karşılaştırır, açıklama aşamasında ise bilimsel doğrular ile ilişkilendirerek açıklamaya çalışır. Ancak bu üç aşama öğrencilerin öğretim sürecindeki deneyimlerini bilimsel doğrular ile sentezleyebilmesi için her zaman yeterli olmaz. Özellikle de matematiđin pek çok konusunda yer alan analiz, sentez ve deđerlendirme düzeyinde ki bilişsel davranışların kazandırılmaya çalışıldığı durumlarda ek aşamalara ihtiyaç duyulabilir. Öyle ki Balaydın ve Altınok (2018) tarafından Türkiye'de fen eğitiminde TGA stratejisine

yönelik yapılan bir metasentez araştırmasında da bu durumdan bahsedilerek yapılan bazı çalışmalarda zaman zaman TGA öğretim yöntemine farklı aşamalar eklenmesine gerek duyulduğu belirtilmektedir. Nitekim matematik eğitimi alan yazınında da benzer şekilde TGA öğretim yöntemine farklı aşamaların eklenerek kullanıldığı görülmüştür (Rani, 2021). Bu durumun fen ve matematiğin pek çok konusunda analiz, sentez ve değerlendirme gibi üst düzey bilişsel kazanım ve davranışların bulunmasından kaynaklandığı düşünülmektedir. Dolayısıyla bu çalışmada da TGA öğretim yönteminin matematik öğretiminde kullanılmasında değerlendirme aşamasının eklenerek teknoloji destekli TGAD şeklinde uygulanması gerektiği belirtilmiştir. Araştırmacılara ve öğretmenlere örnek olması açısından bu çalışma kapsamında teknoloji destekli TGAD öğretim yöntemine göre hazırlanan ders planında konu olarak grafiklerde fonksiyon dönüşümleri ele alınmıştır. Matematiğin pek çok konusunda olduğu gibi grafiklerde fonksiyon dönüşümlerinin öğretiminde de grafik, okuma, yorumlama ve çizme becerileri düşünüldüğünde analiz, sentez ve değerlendirme düzeyinde davranışlar bulunmaktadır. Üst düzey bilişsel davranışların öğretimi diğer bilişsel davranışların öğretimine göre daha fazla zaman gerektirmektedir. Teknoloji destekli TGAD öğretim yönteminin temelini klasik araştırmaya (buluş) dayalı öğrencinin aktif olduğu bir laboratuvar yaklaşımından geldiği düşünüldüğünde, bu durumlarda öğrencilerin bireysel olarak o öğretim sürecinde, neleri öğrenip neleri öğrenmediğini düşündürmeye yönelik üst bilişsel faaliyetlere ihtiyaç vardır. Bu anlamda tahmin ve gözlem aşamalarında temel bilişsel beceriler, açıklama ve değerlendirme aşamalarında ise üst düzey bilişsel becerilerin kazandırılması hedeflenmelidir. Özellikle TGA öğretim yönteminin matematik eğitime entegre edilmesinde bir alternatif olarak önerilen teknoloji destekli TGAD öğretim yönteminin değerlendirme için öğrencilerin üst bilişsel faaliyetlerini harekete geçirmede en önemli yöntemlerden biri olarak bireysel ödevlendirmeler önerilmektedir. Değerlendirme aşamasının eklenmesinin diğer bir hedefi ise bilginin kurumsallaştırılmasını sağlamaktır. Geleneksel öğretimde bireysel ödevler verilip öğrencilere tanınan süre bittikten sonra çoğunlukla bu ödevlerdeki sorular gönüllü öğrenciler tarafından sınıfta çözülür. Bu durum belki her öğrencinin kendi ödevindeki yaptığı hatayı görmesini sağlayabilir. Ancak yapılabilecek diğer pek çok hatanın ise görülmesini engelleyen bir durumdur. Bu anlamda değerlendirme aşamasında her hatanın bütün öğrenciler tarafından görülmesi amacıyla öncelikle öğretmen tarafından öğrencilerin bireysel ödevlerindeki hatalar incelenerek, gruplandırılır, daha sonra

etik kurallar çerçevesinde sınıf ortamında paylaşılarak yapılan hatalar neler olduğu, doğru çözümünün nasıl olması gerektiği öğrencilerle birlikte tartışılmalıdır. Böylece gerek geleneksel öğretimdeki ödevlendirmeden farklı bütün hataların görülmesi gerekse yapılabilecek hatalar üzerinden bilginin kurumsallaştırılması sağlanmış olacaktır. Ayrıca bu alanda çalışma yapacak araştırmacı ve öğretmenler tarafından değerlendirme aşamasında yapılması gerekenlerin daha iyi anlaşılabilmesi için ilgili alan yazında bazı çalışmalarda farklı matematik konularına yönelik örnek ders planları da yer almaktadır (Yurtyapan & Kaleli-Yılmaz, 2024a; Yurtyapan & Kaleli-Yılmaz, 2024b). İlgili alanda çalışma yapacak araştırmacı ve öğretmenler bu çalışmalardan faydalanabilir.

Bilgilendirme

Bu çalışma, birinci yazarın ikinci yazar danışmanlığında hazırladığı doktora tezinden üretilmiştir.

Etik kurul izin bilgileri

Etik Kurul Komisyon Adı: Bursa Uludağ Üniversitesi Sosyal ve Beşeri Bilimler Araştırma ve Yayın Etik Kurulu

Etik Kurul Belge Tarihi ve Sayı: 25. 11. 2022 tarih ve 22-10/Karar No: 52 sayılı kararı

Yazar Katkı Beyanı

Mehmet İhsan YURTYAPAN: *Kavramsallaştırma, metodoloji, verilerin toplanması, işlenmesi, analizi, yorumlanması, denetim, inceleme-yazma ve düzenleme.*

Gül KALELİ YILMAZ: *Kavramsallaştırma, metodoloji, denetim, verilerin incelenmesi, yazımın kontrol edilmesi ve düzenleme.*

Kaynaklar

- Akarsu, A. H. (2018). *Sosyal bilgiler öğretiminde tahmin et-gözle-açıkla (TGA) uygulamaları* (Yayımlanmamış yüksek lisans tezi). Recep Tayyip Erdoğan Üniversitesi, Rize.
- Ayas, A., Çepni, S., Turgut, F., & Johnson, P. (1997). *Kimya öğretimi öğretmen eğitimi dizisi*. Yüksek Öğretim Kurumu.
- Baird, J. R., & Northfield, J. R. (1992). *Learning from the PEEL experience*. Monash University.
- Balaydın, H. T., & Altınok, O. (2018). Türkiye’de fen eğitiminde TGA stratejisi: Bir meta sentez. *Recep Tayyip Erdoğan Üniversitesi Sosyal Bilimler Dergisi*, 4(8), 427-444.
- Baltacı, S., & Yıldız, A. (2018). Geometrik yer problemlerinin yazılım destekli çözümleri esnasında Tahmin Et-Gözle-Açıkla (TGA) stratejisinin kullanımı. *Kırşehir Eğitim Fakültesi Dergisi*, 19(3), 1873-1890. <https://doi.org/10.29299/kefad.2018.19.03.003>
- Barut, D. B. (2020). *Kavram ağlarıyla desteklenmiş TGA etkinliklerinin fen bilgisi öğretmen adaylarının laboratuvar tutumlarına, kaygılarına ve bilimsel süreç becerilerine etkisi* (Yayımlanmamış yüksek lisans tezi). Gazi Üniversitesi, Ankara.

- Bilen, K. (2009). *Tahmin et-gözle-açıkla yöntemine dayalı laboratuvar uygulamalarının öğretmen adaylarının kavramsal başarılarına, bilimsel süreç becerilerine, tutumlarına ve bilimin doğası hakkındaki görüşlerine etkisi* (Yayınlanmamış doktora tezi). Gazi Üniversitesi, Ankara.
- Bolat, A., & Karamustafaoğlu, S. (2021). Kütle ve ağırlık kavramlarının öğretimi: Tahmin-gözlem-açıklama. *Milli Eğitim Dergisi*, 50(230), 663-687.
- Çalık, M. (2019). Alanyazın tarama. H. Özmen & O. Karamustafaoğlu (Ed.), *Eğitimde araştırma yöntemleri* (1. Baskı, s. 19-39). Pegem Akademi.
- Çalık, M. & Sözbilir, M. (2014). İçerik analizinin parametreleri. *Eğitim ve Bilim*, 39(174). <https://doi.org/10.15390/EB.2014.3412>
- Çalık, M., Ünal, S., Coştu, B., & Karataş, F. (2008). Trends in Turkish science education. *Essays in Education*, 24(1). <https://openriver.winona.edu/eie/vol24/iss1/4>
- Çelik, H. (2018). Laboratuvar yaklaşımları ile fen öğretimi. O. Karamustafaoğlu, Ö. Tezel & U. Sarı (Editörler), *Güncel yaklaşım ve yöntemlerle etkinlik destekli fen öğretimi içinde* (ss. 240-272). Pegem Akademi.
- Coştu, B., Ayas, A., & Niaz, M. (2012). Investigating the effectiveness of a POE-based teaching activity on students' understanding of condensation. *Instructional Science*, 40(1), 47-67. <https://doi.org/10.1007/s11251-011-9169-2>
- Coştu, F. (2021). *Tahmin et-açıkla-gözle-tartış-açıkla destekli laboratuvar etkinliklerinin fen bilgisi öğretmen adaylarının başarılarına, kavramsal anlamalarına ve bilimsel süreç becerilerine etkisinin incelenmesi* (Yayımlanmamış doktora tezi). Marmara Üniversitesi, İstanbul.
- Egin, M. (2010). *Öğrencilerin grafik okuma ve oluşturma becerilerinin fonksiyonel anlamda incelenmesi* (Yayımlanmamış yüksek lisans tezi). Marmara Üniversitesi, İstanbul.
- Elmas-Baydar, H. (2023). *Bilgisayar destekli tahmin-gözlem-açıklama stratejisinin normal dağılım ve örnekleme dağılımı konularının öğrenilmesine etkisi* (Yayımlanmamış doktora tezi). Trabzon Üniversitesi, Trabzon.
- Ergül, S., Sarıtaş, D., & Özcan, H. (2020). Hipotetik TGA (Tahmin-Gözlem-Açıklama) döngüsü ile kimyasal değişimin doğasının öğretimi; Asit-baz indikatör tepkimesi örneği. *Balıkesir Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, 22(2), 490-506.
- Güngör, S. N., & Özkan, M. (2017). Fen bilgisi öğretmen adaylarına ağızda nişasta sindiriminin TGA (Tahmin-Gözlem-Açıklama) yöntemiyle öğretimi: Amilaz örneği. *Atatürk Üniversitesi Kazım Karabekir Eğitim Fakültesi Dergisi*, (34), 30-54.
- Gunstone, R. F. (1995). The importance of specific science content in the enhancement of metacognition. In P. J. Fensham, R. F. Gunstone, & R. T. White (Eds.), *The content of science: A constructivism approach to its teaching and learning* (pp. 131-146). The Falmer Press.
- Gunstone, R. F., & White, R. T. (1981). Understanding of gravity. *Science Education*, 65(3), 291-299.
- Güven, E. (2011). *Çevre eğitiminde tahmin-gözlem-açıklama destekli proje tabanlı öğrenme yönteminin farklı değişkenler üzerine etkisi ve yöntemle ilişkin öğrenci görüşleri* (Yayımlanmamış doktora tezi). Gazi Üniversitesi, Ankara.
- Hilario, J. S. (2015). The use of predict-observe-explain-explore (POEE) as a new teaching strategy in general chemistry-laboratory, *International Journal of Education and Research*, 3(2), 37-48. Retrieved from <http://www.ijern.com/journal/2015/February-2015/04.pdf>
- İpek, H., Kala, N., Yaman, F., & Ayas, A. (2010). Using POE strategy to investigate student teachers' understanding about the effect of substance type on solubility. *Procedia-Social and Behavioral Sciences*, 2(2), 648-653. <https://doi.org/10.1016/j.sbspro.2010.03.078>

- Kearney M., & Treagust, D. F. (2001). Constructivism as a referent in the design and development of a computer program using interactive digital video to enhance learning in physics. *Australian Journal of Educational Technology*, 17(1), 64-79. Retrieved from https://ascilite.org/conferences/coffs00/papers/matthew_kearney.pdf
- Kearney, M. (2004). Classroom use of multimedia supported Predict-Observe-Explain tasks in a social constructivist learning environment. *Research in Science Education*, 34(4), 427-453.
- Kılınc, B., & Yazıcı, M. (2022). Türkiye’de fen eğitimi alanında TGA tekniği kullanılarak yapılan lisansüstü tez çalışmalarının analizi. *Mersin Üniversitesi Eğitim Fakültesi Dergisi*, 18(3), 276-300. <https://doi.org/10.17860/mersinefd.1137261>
- Koparan, T. (2019). Teaching game and simulation based probability. *International Journal of Assessment Tools in Education*, 6(2), 235-258.
- Köse, S., Coştu, B., & Keser Ö.F., (2003). Fen konularındaki kavram yanlışlarının belirlenmesi: TGA yöntemi ve örnek etkinlikler. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi*, 13(13), 43-53. <https://dergipark.org.tr/en/pub/pauefd/issue/11130/133113>
- Köse, N. Y. (2008). *İlköğretim 5. sınıf öğrencilerinin dinamik geometri yazılımı cabri geometriyle simetriyi anlamlandırılmalarının belirlenmesi: bir eylem araştırması* (Yayınlanmamış doktora tezi). Anadolu Üniversitesi, Eskişehir.
- Köseoğlu, F., Tümay, H., & Kavak, N. (2002, Eylül). *Yapılandırıcı öğrenme teorisine dayanan etkili bir öğretim yöntemi tahmin et-gözle-açıkla, buz ile su kaynatılabilir mi?* V. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresinde sunuldu, Ankara.
- Kozcu-Çakır, N., Güven, G., & Özdemir, O. (2017). TGA stratejisinin genel biyoloji laboratuvar uygulamalarında etkililiğine ilişkin bir araştırma. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi*, 17(4), 2014-2035.
- Küçüközer, H. (2008). The effects of 3D computer modelling on conceptual change about seasons and phases of the Moon. *Physics Education*, 43(6), 632-636.
- Lawson, A. E. (1995). *Science teaching and the development of thinking*. Watsworth Pub. Comp.
- Lawson, A. E., Alkhoury, S., Benford, R., Clark, B. R., & Falconer, K. A. (2000). What kinds of scientific concepts exist? Concept construction and intellectual development in college biology. *Journal of Research in Science Teaching*, 37(9), 996-1018.
- Liew, C-W., & Treagust, D.F. (1998, April). *The effectiveness of predict-observe-explain tasks in diagnosing students’ understanding of science an identifying their levels of achievement* Paper Presented at the Annual Meeting of the American Educational Research Association, San Diago, CA.
- Nalkıran, T., & Karamustafaoğlu, S. (2020). Prediction-observation-explanation (POE) method and its efficiency in teaching “work, energy, power” concepts. *International Journal of Assessment Tools in Education (JATE)*, 7(3), 497-521.
- Özyılmaz-Akamca, G., & Hamurcu, H. (2009). Analojiler, kavram karikatürleri ve tahmin-gözlem-açıklama teknikleriyle desteklenmiş fen ve teknoloji eğitimi. *Education Sciences*, 4(4), 1186-1206.
- Rani, O. M. (2021). *Pengaruh model pembelajaran prediction, observation, explanation, elaboration, write, and evaluation (POE2WE) dalam meningkatkan kemampuan pemecahan masalah dan penalaran matematis* (Undergraduate Thesis), UIN Raden Intan Lampung.
- Sağiremekçi, H. (2016). *“Tahmin-Gözlem-Açıklama” (TGA) stratejisine dayalı Fen ve Doğa etkinliklerinin, okul öncesi öğrencilerinin bilimsel süreç becerilerine ve bilişsel alan yeteneklerine etkisi* (Yayımlanmamış yüksek lisans tezi). Mustafa Kemal Üniversitesi, Hatay.

- Sani, R. A., & Anggryani-Sinaga, L. F. (2012). Improvement of student competency in physics using Predict-Observe-Explain-Write (POEW) learning model at senior high school. *Jurnal Penelitian Inovasi Pembelajaran Fisika*, 4(2), 1-7.
- Searle, P. (1995). Teaching the senior physics topic of force and motion using conceptual change approaches. In B. Hand, ve V. Prain (Eds.), *Teaching and learning in science. The constructivist classroom* (pp. 170-192). Harcourt Brace
- Tahir, F. M., Nasri, N. M., & Halim, L. (2020). The effectiveness of Predict-Observe-Explain-Animation (POE-A) strategy to overcome students' misconceptions about electric circuits concepts. *Learning Science and Mathematics Journal*, 1(15), 1-15.
- Tao, P. K., & Gunstone, R. F. (1999). Conceptual change in science through collaborative learning at the computer. *International Journal of Science Education*, 21(1), 39-57.
- Temizöz, Y., & Özgün-Koca, S. (2010). Matematik öğretmenlerinin kullandıkları öğretim yöntemleri ve buluş yoluyla öğrenme yaklaşımı konusundaki görüşleri. *Eğitim ve Bilim*, 33(149), 89-103.
- White, R., & Gunstone, R. (1992). *Probing understanding* (First edition). The Falmer Pres.
- Yaman, F. (2012). *Bilgisayara dayalı tahmin-gözlem-açıklama (TGA) etkinliklerinin öğrencilerin asit-baz kimyasına yönelik kavramsal anlamalarına etkisi: Türkiye ve ABD örneği* (Yayınlanmamış doktora tezi). Karadeniz Teknik Üniversitesi, Ankara.
- Yaşar, Ş., & Baran, M. (2020). Oyunlarla desteklenmiş TGA (Tahmin Et-Gözle -Açıkla) yöntemine dayalı etkinliklerin 10. sınıf öğrencilerinin fizik başarısına etkisi. *Marmara Üniversitesi Atatürk Eğitim Fakültesi Eğitim Bilimleri Dergisi*, 52(52), 420-441.
- Yurtyapan, E. (2018). *Fen bilgisi öğretmen adaylarının biyoloji konularına yönelik kavram karikatürü destekli tahmin-gözlem-açıklama uygulamalarının başarı ve üst biliş becerilerine etkisi* (Yayımlanmamış yüksek lisans tezi). Amasya Üniversitesi, Amasya.
- Yurtyapan, E., & Kandemir, N. (2022). Developing sample activity based on prediction-observation- explanation (POE) teaching method supported by concept cartoons in science teaching laboratory applications. *International Journal of Humanities and Education (IJHE)*, 8(17), 1-35. <https://dergipark.org.tr/en/pub/ijhe/issue/69713/1017614>
- Yurtyapan, M. (2023). *Fonksiyon Grafiklerine Yönelik TGAD'ye Dayalı Teknoloji Destekli Öğrenme Ortamının Tasarlanması, Uygulanması ve Grafik Okuryazarlık Becerilerine Etkisinin İncelenmesi* (Yayımlanmamış doktora tezi). Bursa Uludağ Üniversitesi, Bursa.
- Yurtyapan, M. & Kaleli-Yılmaz (2024a, Haziran). *Grafik okuryazarlık becerilerinin geliştirilmesine yönelik teknoloji tabanlı bir öğretim etkinliği: Fonksiyon kavramı örneği*. Uluslararası Bilimsel Araştırma ve Yenilik Kongresinde sunuldu, Ankara.
- Yurtyapan, M. & Kaleli-Yılmaz (2024b, Haziran). *Grafiklerde birebir-örten fonksiyon olma durumunun öğretimine yönelik teknoloji destekli bir öğretim etkinliği çalışması*. III. Bilsel Uluslararası Ahlat Bilimsel Araştırmalar Kongresinde sunuldu, Bitlis.

Ek:

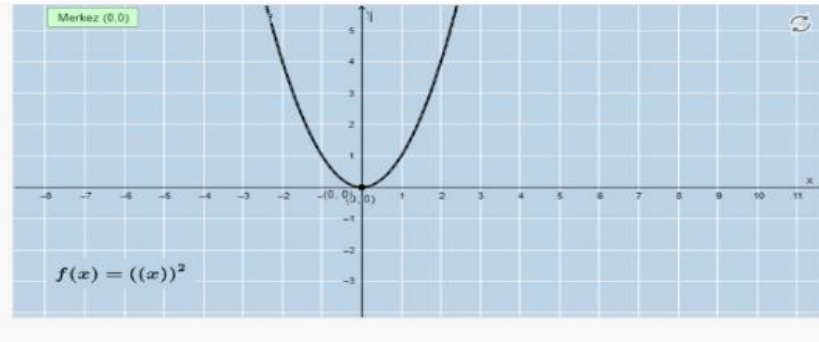
DERS PLANI	
Dersin Adı	Grafik Okuryazarlığı
Konu	Fonksiyon dönüşümü
Kavramlar	İkinci dereceden fonksiyon grafikleri ve dönüşümleri
Öğrenci Kazanımları	<p>Kazanım 1: İkinci dereceden bir fonksiyonun cebirsel ifadesindeki değişimlerin okuma ve yorumlama yoluyla fonksiyon grafiğini nasıl etkileyeceğini belirler. (Tahmin ve Gözlem aşaması)</p> <p>Kazanım 2: Cebirsel ifadesi verilen ikinci dereceden bir fonksiyon grafiğini $f: R \rightarrow R f(x) = x^2$ grafiğinden faydalanarak çizer ve çizimini nasıl yaptığını gerekçeleri ile açıklar. (Açıklama ve Değerlendirme Aşaması)</p>
Kullanılan Teknolojik Ortam	GeoGebra Dinamik Yazılımı

TAHMİN AŞAMASI

Tahmin aşamasında, öğretmen adaylarından <https://www.geogebra.org/classroom> linkine tıklamaları ve ders için tanımlanan şifreyi bu bölüme girmeleri istenir. Bu aşamada öğretmen adaylarından ekranlarında verilen grafikteki h ve k değerlerinin değişmesi durumunda grafikte meydana gelen değişimleri tahmin etmeleri ve tahminlerini gerekçeleriyle birlikte açıklamaları istenir. Tahmin aşamasında grafiklerin dönüşümüne yönelik sorulan soruya bir örnek Şekil 1' de verilmiştir.

TAHMİN

Aşağıda $f(x) = (x-h)^2 + k$ grafiği veriliyor. Buna göre aşağıdaki soruları cevaplayınız

**1. SORU**

Yukarıda verilen $f(x)$ fonksiyonunun h değeri değiştiğinde fonksiyon grafiğinde ne gibi bir değişiklik olabilir? Cevabınızı gerekçenizi belirterek açıklayınız.

A

fx

Şekil 1. Tahmin aşamasında sorulan örnek bir grafik dönüşüm sorusu

Tahmin aşaması için verilen çalışma süresi sonunda, öğretmen adaylarının görüşleri alınmaya başlanır. Bu süre tahmin aşamasında kaç soru yöneltildiğine, öğrencilerin bilgi seviyelerine bağlı olarak ayarlanmalıdır. Ancak ders planlanırken tahmin aşamasına tanınan sürenin, gözlem aşamasına göre daha az olmasına dikkat edilmelidir. Çünkü gözlem aşaması öğrencilerin uygulama yaptığı bir aşama olduğu için daha fazla süre alacaktır. Tahmin aşamasında öğretmen adaylarının her görüşü ve ifadesi tartışılmaya çalışılır. Görüş ayrılıkları olduğunda öğrencilerin birbirlerini ikna etmeleri için bilimsel anlamda kanıt ve gerekçelerini paylaşmaları konusunda teşvik edilir. Bu aşamada amaç bütün öğrencilerin görüşlerini gerekçelerini sunarak tartışmaya katılmalarını sağlamaktır. Böylece her öğrenci savunduğu görüşün doğru mu yanlış mı olduğunu merak ederek bir sonraki aşamada yapılacak etkinliğe motive olacaktır. Öğretmen bu aşamada moderatör rolünde

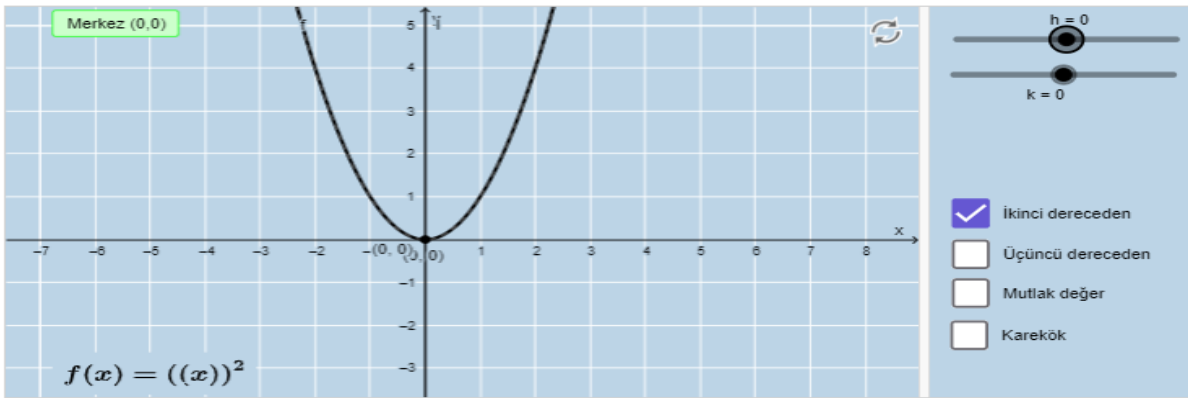
hareket etmelidir. Cevabı söylemek yerine öğrencilerin takıldığı noktalarda tartışmayı ve karmaşıklığın yaşandığı noktaları öğrenci gibi ifade ederek öğretmen adaylarının zihninde soru işareti oluşturarak kavramsal anlamda dengesizliği ve merakı tetiklemelidir.

GÖZLEM AŞAMASI

Gözlem aşamasında, öğretmen adaylarından <https://www.geogebra.org/classroom> linkine tıklamaları ve ders için tanımlanan şifreyi bu bölüme girmeleri istenir. Bu aşamadaki temel amaç öğretmen adaylarının sunulan teknolojik ortam ile ikinci dereceden bir fonksiyonun cebirsel ifadesindeki değişimin fonksiyonun grafiğine nasıl yansıdığını gözlem ve uygulama yaparak keşfetmesini sağlamaktır. Bu amaç doğrultusunda öğretmen adaylarının tahmin aşamasında cevapladıkları ve tartıştıkları dönüşümlere ilişkin verdikleri yanıtları kontrol etmeleri için GeoGebra uygulamalarını yapmaları istenir. Öğretmen adaylarına gözlem aşamasında sunulan GeoGebra uygulamalarından bir örneğin yapılmadan önceki hali Şekil 2’de gösterilmiştir.

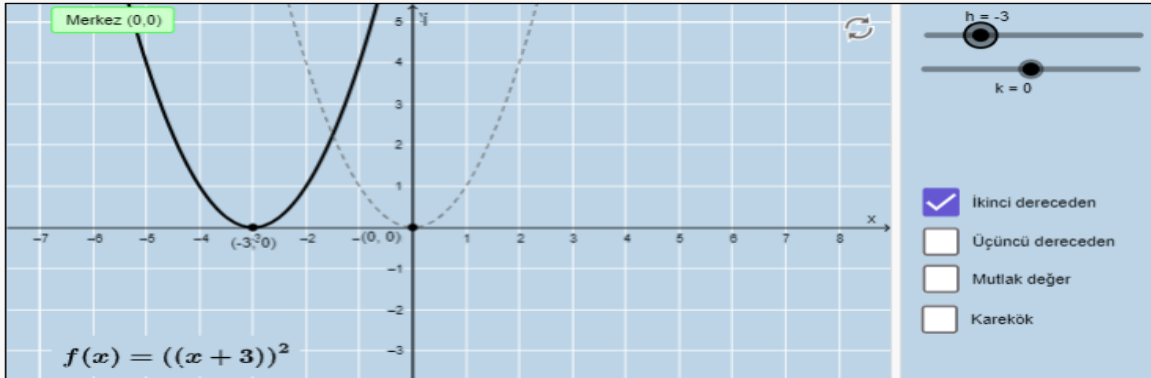
YÖNERGELER

$f(x) = (x-h)^2 + k$ grafiği veriliyor. h ve k sürgülerini ayrı ayrı kullanarak gözlem yapınız.

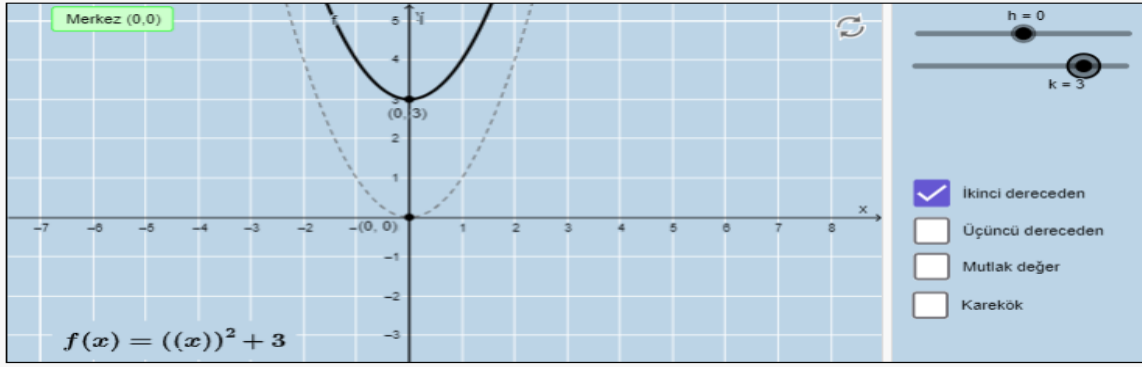


Şekil 2. GeoGebra’deki fonksiyon dönüşüm etkinliğinin ilk hali

Öğretmen adaylarından Şekil 2’de verilen yönerge doğrultusunda fonksiyon dönüşüm etkinliğini yapmaları istenmiştir. Fonksiyon dönüşüm etkinliği yapılırken uygulamanın ekran görüntüleri Şekil 3 ve Şekil 4’de verilmiştir.



Şekil 3. Fonksiyon dönüşüm etkinliğinde h sürgüsü hareket ettirildiğinde uygulamanın ekran görüntüsü

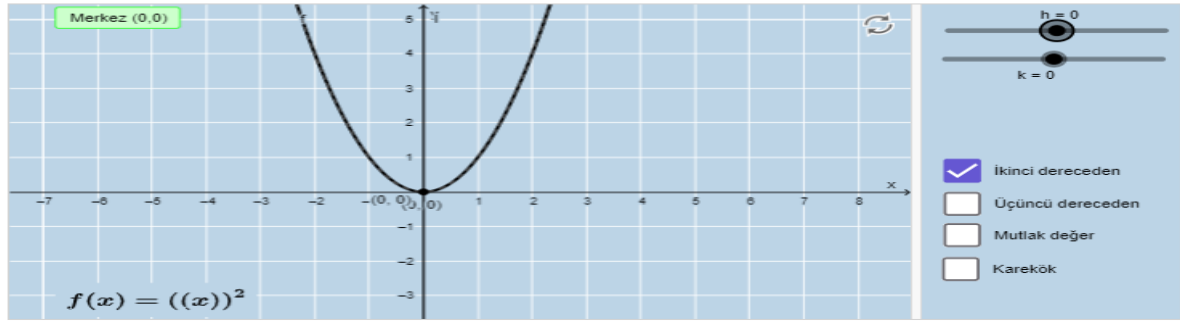


Şekil 4. Fonksiyon dönüşüm etkinliğinde k sürgüsü hareket ettirildiğinde uygulamanın ekran görüntüsü

Öğretmen adayları tarafından fonksiyon dönüşüm etkinliği yapıldıktan sonra etkinliğe yönelik gözlem ve tahmin aşamasındaki düşüncelerinin ne yönde etkilendiğini açıklamalarını gerektiren bölüm Şekil 5’de verilmiştir.

YÖNERGELER

$f(x) = (x-h)^2 + k$ grafiği veriliyor. h ve k sürgülerini ayrı ayrı kullanarak gözlem yapınız.



Yukarıdaki Etkinliğe Yönelik Yaptığınız Açıklamalar ve Gözlemler

(Tahminimdeki düşüncem değişti ya da değişmedi. Çünkü gözlemledim, fark ettim.)

A	
f _x	

Şekil 5. GeoGebra'daki fonksiyon dönüşüm etkinliğine yönelik “Düşüncem Değişti/ Değişmedi” bölümü

Şekil 5’de gösterildiği gibi örnek olarak verilen GeoGebra uygulamasını yaptıktan sonra öğretmen adaylarından uygulamanın altında yer alan uygulamadaki gözlemlerini ve bu grafiğe ait tahmin aşamasındaki düşüncesinin değişip değişmediğine yönelik açıklamalarını Şekil 5’de verilen “Düşüncem Değişti/ Değişmedi” bölümüne yazmaları istenir. Tahmin aşamasında verilen bütün grafikler için yukarıda anlatılan bütün uygulamalar yapıldıktan sonra gözlem aşaması tamamlanır.

AÇIKLAMA

Gözlem aşamasında öğretmen adaylarından her bir soru için “düşüncem değişti/ değişmedi” bölümüne gerekli açıklamalar ve uygulamada yaptıkları gözlemleri yazmaları istenmiştir. Açıklama aşamasında ise her bir soru için öğretmen adaylarının gözlem aşamasında yazdıkları bu düşünce ve gözlemleri sınıf arkadaşları ile paylaşmaları istenir. Böylece öğretmen adaylarının arkadaşlarının düşüncelerini aktif bir şekilde dinlemeleri, hatalarını fark etmeleri sağlanması amaçlanmaktadır. Öğretmen adaylarının gözlem aşamasında yaptıkları uygulamalar ve açıklama aşamasında yapılan sınıf içi tartışmalara rağmen bazı grafiklerin dönüşümleri konusunda çeşitli fikir ayrılıkları olabilir. Bu tip durumların giderilmesi için öğretimin yürütücüsü olan öğretmenin rolü büyük öneme sahiptir. Öğretmen adaylarının her bir grafik dönüşümü için yaptıkları fikir paylaşımından sonra sınıfça genel bir kaniya varılması için öğretmen, gözlem aşamasındaki uygulamaları aşama aşama öğretmen adaylarıyla birlikte tekrar yapar. Bu uygulamaları yaparken fikir ayrılıklarının yaşandığı



yerlere, hataları buldurmaya ya da grafiğin doğru yorumlanabilmesi için keşfetmeye yönelik bazı sorular öğretmen adaylarına sorulabilir. Örneğin “ h değeri negatif olduğunda fonksiyon grafiği ne yönde hareket eder? Neden? k değerinin değişmesi grafiği nasıl etkiler?” şeklindeki sorular yöneltilebilir. Tahmin aşamasındaki her bir sorunun öğretmen adayları ile bu şekilde birlikte incelenmesinden sonra ikinci dereceden bir fonksiyonun denklemindeki h ve k değerlerinin grafiği nasıl etkilediğine yönelik öğretmen tarafından genel bir tekrar yapılarak grafiğin okunması ve yorumlanmasına yönelik olan öğretim tamamlanır. Daha sonra öğretmen adaylarına $f: R \rightarrow R f(x) = x^2$ grafiğinden faydalanarak cebirsel ifadesi verilen ikinci dereceden başka bir fonksiyon grafiğinin nasıl çizildiğine yönelik örnek sorular yöneltilir. Gönüllü olan öğretmen adaylarının cevaplarını sınıfla paylaşmaları sağlanır. Yapılan sınıf paylaşımından sonra öğretmen gerek GeoGebra’da gerekse tahtaya sorudaki grafiği aşama aşama çizerek gösterir. Ancak bu çizim gerçekleştirilirken noktasal bir bakış açısından çok (x yerine değer vererek) bütünsel bir bakış açısı ile daha çok grafiğin dönüşümsel olarak çizimi nasıl yapılır vurgulanır. Burada amaç öğretmen adaylarının grafik çizme becerilerinin geliştirilmesini sağlamaktır. Grafik çizmeye yönelik yapılan öğretimden sonra açıklama aşaması tamamlanır.

DEĞERLENDİRME

Bu aşamada öğretmen adaylarına <https://www.geogebra.org/m/rj9wccgx> linkine tıklamaları, karşlarına gelen ekranda yer alan fonksiyon dönüşümüne yönelik grafik çizme sorularını defterlerine cevaplamaları istenir. Bu bölüm ders dışı ödev olarak verilmiştir. Çizdikleri grafiklerin fotoğraflarını öğretmenin daha sonra incelemesi için Google Classroom’daki sınıf çalışmaları bölümüne yüklemeleri istenir. Dersin yürütücüsü olan öğretmen ödev teslim süresi tamamlandığında ödevleri inceleyerek yapılan hataları sınıflandırarak bu hatalı çözümleri bir sunum haline getirir. Daha sonra öğretmen adaylarının yaptıkları hatalar etik kurallar çerçevesinde ayrı bir derste sınıf ortamında tartışılarak hataların görülmesi ve yorumlanması sağlanır. Yapılan etkinlik sonunda dersi yürüten öğretmen tarafından her bir sorudaki grafiğin çizimi öğretmen adayları ile birlikte GeoGebra’da yapılır. Grafiğin yorumlanması noktasında ihtiyaç duyulduğunda dersi yürütülen öğretmen tahtayı kullanarak da bu grafiklerin çizimlerdeki detayları gösterebilir. Grafik çiziminin pekiştirilmesine yönelik yapılan öğretimden sonra değerlendirme aşaması tamamlanır.

Research Article/Araştırma Makalesi

Examination of Secondary School Students' Knowledge Construction Processes Related to Geometric Concepts within the Framework of APOS Theory

Şafak YILDIZ¹  Ridvan EZENTAŞ^{* 2} 

¹ Bursa Uludağ University, Department of Mathematics and Science Education, Bursa, Turkey, safakyildiz@windowslive.com

² Bursa Uludağ University, Department of Mathematics and Science Education, Bursa, Turkey, rezentas@uludag.edu.tr


* Corresponding Author: rezentas@uludag.edu.tr

Article Info

Received: 09 July 2024

Accepted: 10 September 2024

Keywords: APOS theory, knowledge construction processes, polygon, quadrilateral, circle

 10.18009/jcer.1512998

Publication Language: Turkish

Abstract

The aim of this study is to examine the knowledge construction processes of 10th grade students about the concepts of polygon and quadrilateral and 11th grade students about the concept of circle within the framework of APOS theory. The study was designed with a cases study. The study group of the research consists of 10 students attending the 10th and 11th grades at a state secondary education institution. At the end of the study, it was seen that the majority of students could not use the concept of polygon effectively. It was determined that the majority of the students could not establish a relationship between the angle of the circle and the angle of the triangle, the length of the arcsegment and "ratio-proportion". It was observed that none of the students could ensure the coordination between the area of the circleslice and ratio. At the end of the study, some results were obtained regarding the areas of special quadrilaterals.



To cite this article: Yıldız, Ş., & Ezentaş, R. (2024). Ortaöğretim öğrencilerinin geometrik kavramlara ilişkin bilgi oluşturma süreçlerinin apos teorisi çerçevesinde incelenmesi. *Journal of Computer and Education Research*, 12 (24), 666-688. <https://doi.org/10.18009/jcer.1512998>


Ortaöğretim Öğrencilerinin Geometrik Kavramlara İlişkin Bilgi Oluşturma Süreçlerinin APOS Teorisi Çerçevesinde İncelenmesi

Makale Bilgisi

Geliş: 09 Temmuz 2024

Kabul: 10 Eylül 2024

Anahtar kelimeler: APOS teorisi, bilgi oluşturma süreçleri, çokgen, dörtgen, daire

 10.18009/jcer.1512998

Yayın Dili: Türkçe

Öz

Bu çalışmanın amacı 10. Sınıf öğrencilerinin çokgen ve dörtgen, 11. Sınıf öğrencilerinin ise çember kavramına ilişkin bilgi oluşturma süreçlerini APOS teorisi çerçevesinde incelemektir. Çalışma durum çalışması ile desenlenmiştir. Araştırmanın çalışma grubunu bir devlet ortaöğretim kurumunda 10. ve 11. Sınıfa devam etmekte olan 10 öğrenci oluşturmaktadır. Çalışma sonunda öğrencilerin çoğunluğunun çokgen kavramını etkin bir şekilde kullanamadığı görülmüştür. Öğrencilerin çoğunluğunun eşkenar dörtgenin alanı ile üçgenin alanı, yamuğun alanı ile üçgen ve dikdörtgenin alanları arasında ilişki kuramadıkları tespit edilmiştir. Hiçbir öğrencinin dikdörtgenin alanı ile üçgenin alanı, karenin alanı ile üçgenin alanı ve dikdörtgenin alanı ile karenin alanı arasında ilişki kuramadığı görülmüştür. Öğrencilerin çoğunluğunun çemberin açısı ile üçgenin açısı, yay parçasının uzunluğu ile "oran-orantı" arasında ilişki kuramadığı tespit edilmiştir. Öğrencilerin hiçbirinin daire diliminin alanı ile oran-orantı arasındaki koordinasyonu sağlayamadıkları görülmüştür.

Summary

Examination of Secondary School Students' Knowledge Construction Processes Related to Geometric Concepts Within the Framework of APOS Theory

Şafak YILDIZ¹  Ridvan EZENTAŞ^{* 2} 

¹ Bursa Uludağ University, Department of Mathematics and Science Education, Bursa, Turkey, rezentas@uludag.edu.tr

² Bursa Uludağ University, Department of Mathematics and Science Education, Bursa, Turkey, safakyildiz@windowslive.com

* Corresponding Author: rezentas@uludag.edu.tr

Introduction

APOS theory (Action(A), Process(P), Object(O), Schema(S)) emerged by extending Piaget's reflective abstraction study, which reveals how children learn, to the level of mathematics learning (Dubinsky & McDonald, 2001). According to the basic principle advocated by APOS theory, an individual's understanding of a mathematical subject is the construction or restructuring of certain mental structures by thinking about problems in a social context and the solutions to these problems. It also develops by organizing these structures into schemas in order to use them in coping with problem situations (Çetin& Dubinsky, 2017).

There are various studies on APOS theory in the literature (Açıl, 2015; Borji et al., 2018; Chimhande et al., 2017; Kemp & Vidakovic, 2023; Parraguez & Oktaç, 2010; Salgadoa & Trigueros, 2015; Stewart, 2008; Tziritas, 2011; Weller et al., 2009). However, when the literature was examined, no research was found that examined the knowledge creation processes of secondary school students on the subjects of polygons, quadrilaterals, circles and circles according to the APOS theory. The aim of the study is to conduct an in-depth examination to reveal the cognitive structure created for these concepts after 10th grade students study or learn the subjects of polygons and quadrilaterals and 11th grade students about circles according to traditional teaching.

Method

In this research, students' knowledge creation processes will be examined in detail through interviews, and how students create structures in their minds will be revealed. For

this reason, the research was designed with a case study, one of the qualitative research methods. The study group of the research consists of 10 students attending the 10th and 11th grades at a state secondary education institution in the Aegean region. The participants of the research were determined by the criterion sampling method, which is one of the purposeful sampling methods.

In this study, data were obtained from semi-structured interviews. The semi-structured interview form consists of open-ended questions. To create the semi-structured interview form, learning outcomes for 10th grade polygons and quadrilaterals and 11th grade circle topics were determined. Then, open-ended questions were selected from sources recommended by the Ministry of National Education to be used as textbooks in high schools for these achievements. While choosing these questions, care was taken to ensure that they would enable students to observe actions, processes and object structures regarding the relevant topics.

The data obtained in this study were examined with content analysis. The students' conversations during the interviews were converted into written text with the help of audio recordings. To ensure credibility in the research, strategies such as variation, expert review, long-term observation, and researcher biases were used. In order to ensure transferability in the study, all steps that enable the research to be carried out, such as participant selection, data collection tools, application process, and data analysis process, were explained in detail. Expert opinion was sought to ensure consistency in the study.

Results, Discussion and Conclusion

In our study, it is seen that most students cannot use the concept of polygon effectively in the questions aimed at using it effectively by considering it from a holistic perspective. In addition, it is seen that a limited number of students can establish a relationship between the area of a rhombus and the area of a triangle, between the area of a trapezoid and the area of a triangle and the area of a rectangle, and the majority of students use the area formulas of rhombuses and trapezoids. As a result of Güreffe's (2018) study, it was determined that most of the students used the area of a triangle, square or rectangle when calculating the area of a rhombus and trapezoid, and they generally used formulas in area problems related to rectangles. As a result of their study on prospective teachers, Baturo and Nason (1996) found

that very few of the students could make sense of the relationship between triangles and rectangles.

In our study, students are expected to use their knowledge about angles in triangles in questions about interior and exterior angles in a circle. However, it is seen that very few students can establish a relationship between the angle of a circle and the angle of a triangle, and the majority of students use formulas that give the interior and exterior angles of the circle. In the question asking to calculate the area of the circle slice, students are expected to use ratio-proportion knowledge to calculate the area of the circle slice. However, it is seen that none of the students can coordinate between the area of the circle segment and ratio-proportion and they use the formula that gives the area of the circle segment. Bekdemir (2012), at the end of his study on classroom teacher candidates regarding the circle sub-learning domain, determined that the students' success levels for procedural knowledge were better than their success levels for concept knowledge. He found that although they did not know how these formulas were obtained, they could use them in operational expressions, and that their generalization and abstraction skills were insufficient. According to these results, it can be said that the majority of the students are at the process level in creating knowledge of geometric concepts according to APOS theory.

In the study, the knowledge formation processes of 10th grade students regarding the concepts of polygon and quadrilateral and of 11th grade students regarding the concepts of circle were examined within the framework of APOS theory. Based on this, the research results and relevant literature were examined and the following suggestions were made to shed light on future studies:

- Conducting similar studies at different grade levels and different mathematics subjects can be of significant help to educators.
- In teaching concepts related to polygon, quadrilateral, circle and circle, rote learning can be abandoned and activities can be organized where students can discover the concepts themselves.

Giriş

Anlamak, çeşitli zihinsel süreçlerin meydana geldiği ve etkileşime girdiği uzun bir öğrenme etkinlikleri dizisine dayanır ve anlamak, bilmekten veya becerikli olmaktan daha fazlasıdır (Dreyfus, 1991). Pirie ve Kieren'a (1989, s.8) göre "matematikselsel anlama, seviyeli ama doğrusal olmayan olarak nitelendirilebilir. Bu yinelenen bir olgudur ve fikir karmaşık düzeyler arasında hareket ettiğinde yinelemenin meydana geldiği görülür. Gerçekten her anlama düzeyi, sonraki düzeylerin içinde yer alır."

APOS teorisi (Action(A) Eylem, Process(P) Süreç, Object(O) Nesne, Schema(S) Şema) Piaget'nin çocukların nasıl öğrendiğini ortaya koyan yansıtıcı soyutlama çalışmasının matematik öğrenme düzeyine kadar genişletilmesiyle ortaya çıkmıştır (Dubinsky ve McDonald, 2001). APOS teorisinin savunduğu temel ilkeye göre, bir bireyin matematikselsel bir konuya ilişkin anlayışı, sosyal bir bağlamda yer alan problemler ve bu problemlerin çözümleri üzerine düşünerek belirli zihinsel yapıları inşa etmesi veya yeniden yapılandırması ve bu yapıları bu problem durumlarıyla baş etmede kullanabilmek için şemalar halinde düzenlemesi yoluyla gelişir (Çetin & Dubinsky, 2017). APOS teorisi, nesnelere üzerinde bir dönüşüm uygulandığında diğer nesnelere elde edildiğini ve böylece matematikselsel bir kavramın oluşmaya başladığını varsayar (Dubinsky vd., 2005). APOS teorisine göre ileri matematikselsel düşünmenin gelişimi için içselleştirme (interiorization), koordine etme (coordination), kapsülleme (encapsulation), genelleme (generalization), tersine çevirme (reversal) olmak üzere beş tür yansıtıcı soyutlama mekanizması vardır (Dubinsky, 1991). İçselleştirme, bir dizi maddi eylemin benimsenmiş işlemler sistemine dönüştürülmesidir (Piaget, 1980, akt. Paschos & Farmaki, 2006). Dubinsky'ye (1991) göre içselleştirme, algılanan olgulara anlam vermek amacıyla içsel süreçlerin inşa edilmesidir. Koordinasyon, zihindeki iki veya daha fazla mevcut yapının eş güdümlü kullanılarak yeni bir yapı oluşturulmasıdır (Dubinsky & Lewin, 1986). Kapsülleme bireyin zihninde soyut bir nesne elde edebilmek için bir süreç üzerinde zihinsel olarak hareket etmesidir (Selden & Selden, 1992). Genelleme, bireyin sahip olduğu bir şemayı daha geniş bir olgu topluluğuna uygulamayabilmesidir (Dubinsky, 1991). Birey, yeni karşılaştığı bir bilişsel besinin zihnindeki dengeyi bozduğunu düşünürken sonradan uyum sağlayabileceğini fark eder ve bu bilişsel besine sahip olduğu mevcut yapıları uygularken, besin ne kadar farklı görünse de yalnızca belirli niteliklere sahip olması gerektiğini kabul eder (Dubinsky & Lewin, 1986). Tersine çevirme, birey bir süreci içsel

olarak sahiplendikten sonra, bireyin onu tersten düşünerek, orijinal süreci tersine çeviren yeni bir süreç inşa etmesidir (Dubinsky, 1991). APOS teorisi, bireyin algıladığı matematiksel problem durumlarının üstesinden gelebilmek için zihinsel eylemler, süreçler, nesnelere oluşturularak ve bunları şemalar halinde düzenleyerek, durumları anlamlandırma ve problemleri çözmeye eğilimlerinden matematiksel bilginin oluştuğunu savunur (Dubinsky & McDonald, 2001). APOS teorisi eylemlerle başlar, süreçler boyunca kapsüllenmiş nesnelere doğru hareket eder ve bunlar daha sonra kendileri nesnelere olarak kapsüllenebilen şemalara entegre edilir (Tall, 1999).

Eylem, yeni nesnelere elde etmek için zihindeki mevcut nesnelere dönüşümünü sağlayan tekrarlanabilir fiziksel veya zihinsel manipülasyonlardır (Breidenbach vd., 1992). Bu aşamada birey tarafından, dışsal olarak algılanan ve açıkça ya da zihinden işlemin nasıl gerçekleştirileceğine ilişkin adım adım yönergelerin verildiği nesnelere dönüştürülür (Dubinsky & McDonald, 2001). Birey bir eylemi tekrarladıkça ve yansıttıkça, bu eylem zihinsel bir süreç içerisinde içselleştirilebilir (Dubinsky vd., 2005). Bireyin zihninde bir süreç bazı eylemlerle dönüştürülebiliyorsa, süreç kapsüllenecek bir nesne haline gelir (Breidenbach vd., 1992). Bir süreçten bir nesne inşa edildiğinde birey, bu sürecin tamamına hâkimdir (Dubinsky & McDonald, 2001). Bir bireyin belirli bir matematiksel kavram hakkındaki bilgisinin bütününe şema denir (Reed, 2007).

Alanyazında ortaokul, lise ve üniversite düzeyinde, matematiksel kavramların nasıl oluşturulduğunu APOS teorisi çerçevesinde inceleyen çeşitli çalışmalar bulunmaktadır (Açıl, 2015; Borji vd., 2018; Chimhande vd., 2017; Kemp & Vidakovic, 2023; Parraguez & Oktaç, 2010; Salgado & Trigueros, 2015; Stewart, 2008; Tziritas, 2011; Weller vd., 2009). Fakat alanyazın incelendiğinde ortaöğretim öğrencilerinin çokgenler, dörtgenler, çember, daire konularına yönelik APOS teorisine göre bilgi oluşturma süreçlerini inceleyen bir araştırmaya rastlanılmamıştır. Bu çalışmada, 10. sınıf öğrencilerinin çokgenler ve dörtgenler, 11. sınıf öğrencilerinin ise çember ve daire kavramlarına yönelik bilgi oluşturma süreçlerinin APOS teorisi çerçevesinde incelenmesi amaçlanmaktadır. Çalışmada 10. sınıf öğrencilerinin çokgenler ve dörtgenler, 11. sınıf öğrencilerinin ise çember ve daire konularını geleneksel öğretime göre işlemeden ya da öğrenmesinden sonra, bu kavramlara yönelik oluşturulan bilişsel yapının ortaya çıkartılması için derinlemesine inceleme yapılması amaçlanmaktadır. Çalışmanın dörtgenler, çember ve daire kavramlarının soyutlanmasının nasıl

değerlendirilebileceğine yönelik fikir vermesi ve ilgili kavramların öğretiminde öğretmenlere uygun öğrenme ortamlarını tasarlamada yol göstermesi bakımından alanyazına önemli katkı sunacağı düşünülmektedir.

Yöntem

Araştırmanın Modeli

Bu çalışmada öğrencilerin bilgi oluşturma süreçleri görüşmeler yoluyla ayrıntılı incelenerek, öğrencilerin zihinlerinde yapıları nasıl oluşturdukları ortaya çıkartılacağından, araştırma nitel araştırma yöntemlerinden durum çalışması ile desenlenmiştir. Durum çalışması, güncel bir olguyu derinlemesine ve gerçek yaşam bağlamında araştıran, olgu ve bağlam arasındaki sınırların net bir şekilde belli olmadığı durumlarda kullanılan görgül bir araştırma yöntemidir (Yin, 2009).

Çalışma Grubu

Araştırmanın çalışma grubunu Ege bölgesinde yer alan bir devlet ortaöğretim kurumunda 10. ve 11. sınıfa devam etmekte olan 10 öğrenci oluşturmaktadır. Araştırmanın katılımcıları amaçlı örnekleme yöntemlerinden biri olan ölçüt örnekleme yöntemiyle belirlenmiştir. Amaçlı örnekleme, seçkisiz olmayan bir örnekleme türüdür ve çalışmanın amacına bağlı olarak veri çeşitliliği bakımından fazla olan durumların seçilerek detaylı incelenmesini sağlar (Büyüköztürk vd., 2016). Ölçüt örneklemede ise, katılımcılar önceden belirlenen kriterler göz önünde bulundurularak seçilir (Yıldırım & Simsek, 2018). Bu çalışmada çalışmanın amacına hizmet edecek şekilde veri çeşitliliği sağlamak ve yeterli veri toplayabilmek için çalışmaya katılacak öğrencileri belirlemede 3 ölçüt kullanılmıştır. Bu ölçütler, (1) öğrencilerin dörtgenler, çember ve daire konularını derste işlemiş olmaları, (2) birinci dönem sınav notlarının ortalamasının 50 ve üzerinde olması, (3) dersine giren öğretmenin iletişim yönünden öğrenciler hakkında olumlu görüş bildirmesi şeklindedir.

Veri Toplama Aracı

Bu çalışmada veriler yarı yapılandırılmış görüşmelerden elde edilmiştir. Yarı yapılandırılmış görüşme formu açık uçlu sorulardan oluşmaktadır. Yarı yapılandırılmış görüşme formunu oluşturmak için 10. sınıf çokgenler ve dörtgenler, 11. sınıf çember ve daire konularına yönelik kazanımlar belirlenmiştir. Daha sonra bu kazanımlara yönelik Milli Eğitim Bakanlığı tarafından liselerde ders kitabı olarak kullanılması önerilen kaynaklardan açık uçlu sorular seçilmiştir. Bu sorular seçilirken öğrencilerin ilgili konulara yönelik eylem, süreç ve

nesne yapılarının gözlemlenmesini sağlayacak nitelikte olmasına dikkat edilmiştir. Hazırlanan formun uygunluğu için daha önce bu alanda çalışmalar yapmış olan iki akademisyenin görüşüne başvurulmuştur. Daha sonra 2022-2023 eğitim-öğretim yılı 2. döneminde 10. sınıf ve 11. sınıfa devam eden ikişer öğrenci ile pilot çalışması yapılmış ve görüşme formuna son şekli verilmiştir. Çalışmanın uygulaması 11. sınıflarda 2022-2023 eğitim öğretim yılı 2. döneminde yapılırken, 10. sınıflarda 2023-2024 eğitim öğretim yılı 1. döneminde yapılmıştır.

Verilerin Toplanması ve Analizi

Bu çalışmada elde edilen veriler içerik analizi ile incelenmiştir. İçerik analizinde elde edilen nitel veriler verilerin kodlanması, temaların bulunması, kodların ve temaların düzenlenmesi, bulguların tanımlanması ve yorumlanması olmak üzere dört aşamada analiz edilir (Çepni, 2018). Öğrencilerin görüşmeler sırasındaki konuşmaları ses kayıtları yardımıyla yazılı metine dönüştürülmüştür. Veri kaybını önlemek için ses kayıtları farklı zamanlarda tekrar incelenmiştir. Bu metinler birkaç kez okunarak analiz edilmiştir. Ses kayıtlarıyla birlikte görüşme formundan elde edilen veriler de analiz sürecine dâhil edilmiştir. Ses kayıtlarından elde edilen yazılı metinlerden kodlar çıkartılmış, kodlar belirli kategoriler altında toplanmış ve temalar belirlenmiştir. İki araştırmacı belirlenen kodları, kategorileri ve temaları incelemiş ve farklı düşünülen durumlarda ortak bir fikir birliğine varılmıştır. Miles & Huberman (1994) tarafından önerilen Güvenirlik = Görüş birliği / (Görüş birliği + Görüş ayrılığı) formülü kullanılarak araştırmacının güvenirliliği hesaplanabilir ve sonucun %70'in üzerinde çıkması, araştırmacının güvenirliliği için yeterlidir (akt. Yenilmez & Yıldız, 2018). Bu çalışmanın güvenirliliği ise %75 olarak hesaplanmıştır.

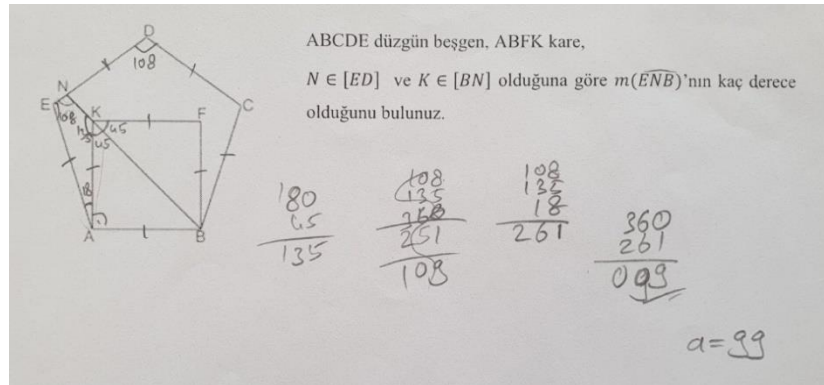
Araştırmada inandırıcılığı sağlamak için çeşitleme, uzman incelemesi, uzun süreli gözlem, araştırmacının önyargıları stratejileri kullanılmıştır. Uzman incelemesinde, veri toplama aracının geliştirilmesinde ve elde edilen verilerin yorumlanmasında uzman görüşüne başvurulmuş ve uzmanların önerileri doğrultusunda gerekli düzenlemeler yapılmıştır. Uzun süreli gözlemlerde, araştırmada tek bir uygulama yapılması yerine uzun bir süreç takip edilmiştir. Araştırmacının sınırlılıkları, varsayımları ve araştırmacının önyargıları, araştırmacı tarafından belirlenmiştir. Çalışmada aktarılabirliği sağlamak için araştırmacının gerçekleşmesini sağlayan katılımcı seçimi, veri toplama araçları, uygulama süreci, verilerin analiz süreci gibi tüm adımlar ayrıntılı bir şekilde açıklanmıştır. Çalışmada tutarlılığı

sağlamak için uzman görüşüne başvurulmuştur. Araştırmacının elde ettiği bulgular ve bulgulara ait elde ettiği sonuçlar başka bir uzman tarafından incelenmiştir. İki araştırmacının değerlendirmeleri karşılaştırılarak ortak bir fikir birliğine varılmıştır. Çalışmada, onaylanabilirliği sağlamak için, yarı yapılandırılmış görüşmelerde öğrencilerden elde edilen veriler bulgular kısmında sunulmuştur.

Bulgular

Bu kısımda bazı öğrencilerin dersin kazanımlarına göre sorulan sorulara verdikleri cevaplar ve çözüm yöntemlerine ilişkin görüşmelere yer verilecektir. Araştırmaya katılan öğrencilerden bazılarının APOS teorisi çerçevesinde çokgen, dörtgen, çember ve daire kavramlarına ilişkin bilgi oluşturma süreçleri aşağıda verilmiştir. Burada kullanılan öğrenci isimleri takma olup, xyH kodlaması, x: hangi soru, y: çözüm adımları ve H: öğrenci adının ilk harfini ifade etmektedir.

Resim 1’de verilen soru “çokgen kavramını açıklayarak işlemler yapar” (Millî Eğitim Bakanlığı [MEB], 2018) kazanımına yöneliktir. Çokgen kavramını açıklamaya yönelik olan bu soruda, öğrencilerin çoğunluğu süreç düzeyinde davranış sergilediği görülmüştür. Örnek olarak Damla’nın bu sorunun çözümüne yönelik yaklaşımı aşağıda sunulmuştur.



Resim 1. Çokgen sorusu ve Damla'nın soruya yönelik çözümü

11D: “Karenin bütün kenarları birbirine eş. Düzgün beşgen olduğu içinde onlarda eş olur şu kenarı çakışık” {karenin ve beşgenin ortak kenarları arasında ilişki kuruyor}.

12D: “Burası 90 $\{\widehat{KAB}\}$ 'ni kastediyor}, beşgenin bir açısı 108, çıkarınca burası 18 kalıyor $\{\widehat{EAK}\}$ 'ni kastediyor.”

13D: “Şu köşegen olmuş 45, 45 $\{m(\widehat{AKB})\}$ 'nü ve $m(\widehat{BKF})\}$ 'nü yazıyor.”

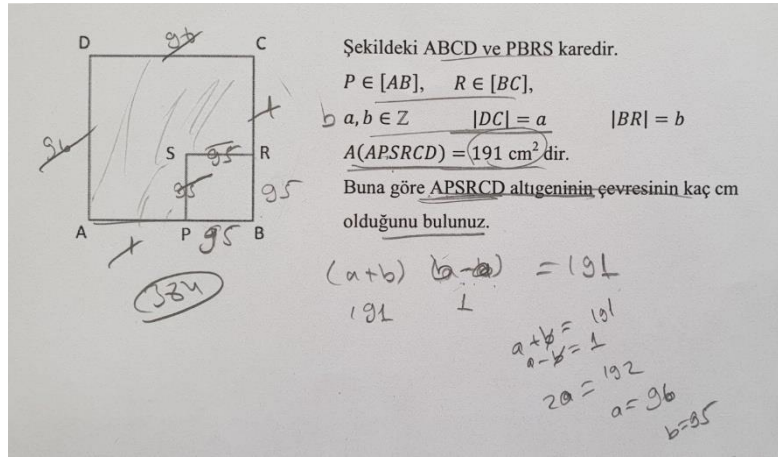
14D: “Buraya 180'den 45 çıkarınca 135 kalıyor $\{\widehat{AKN}\}$ 'ni kastediyor.”

15D: “Şurası zaten 108 idi $\{\widehat{E}\}$ 'ni kastediyor.”

16D: "Hepsini toplayıp 360'tan çıkaracağız çünkü bu bir dörtgen 261 {AENK dörtgenini kastediyor}. {Burada 108+135+18=261işlemine yapıyor}, 360'dan 261'i çıkarttım 99."

Damla bu soruda ABNE dörtgenine odaklanarak soruyu çözebileceğini fark edememiştir. Bu durum Damla'nın soruya bütüncül bakmadığının göstergesidir. Damla'nın sorunun çözümünde açı, üçgen, dörtgen, kare ve beşgen kavramlarına yönelik bilgilerini kapsülden çıkartarak yeni duruma uyarladığı ve bu kavramları koordineli kullandığı fakat soruya bütüncül bakmadığı görülmektedir. Çokgen kavramını açıklamaya yönelik olan bu soruda, Damla'nın süreç düzeyinde davranış sergilediği görülmektedir.

Resim 2'deki soru "özel dörtgenlerin açı, kenar, köşegen ve alan özelliklerini açıklayarak problemler çözer" (MEB, 2018) kazanımına yöneliktir. Özel dörtgenlerin açı, kenar, köşegen ve alan özelliklerini açıklayarak problemler çözer kazanımına yönelik olan bu soruda, öğrencilerin çoğunluğu süreç düzeyinde davranış sergilediği görülmüştür. Örnek olarak Büşra'nın bu sorunun çözümüne yönelik yaklaşımı aşağıda sunulmuştur.



Resim 2. Özel dörtgen sorusu ve Büşra'nın soruya yönelik çözümü

31B: "İki tane kare verilmiş bize ve bu karelerden iki kare farkı yapmış bu şeyde eşitmiş 191 demiş. Şuranın alanını vermiş iki kare farkından bulabiliriz."

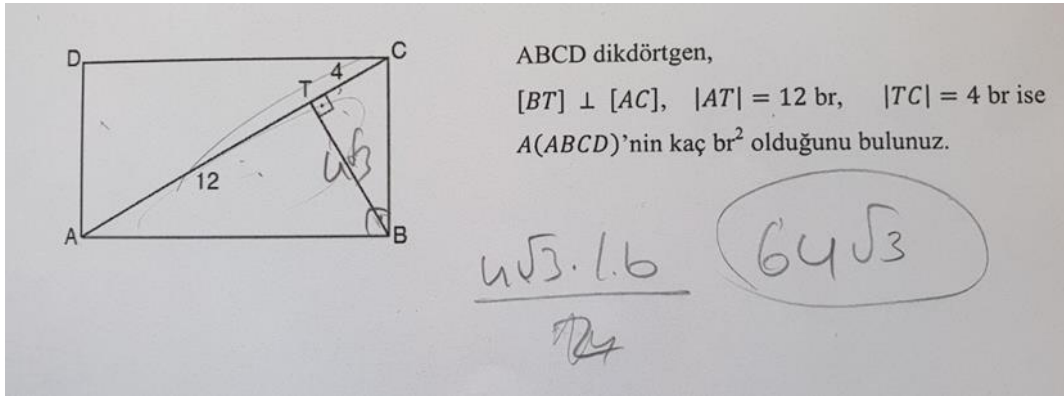
32B: "Burası a olsun, büyük karemizde b olsun."

33B: "a artı b çarpı b eksi a eşit 191'miş. 191'e 1 olarak ayırırız. a artı b, 191 olur, b eksi a, 1 olur. Bunları da iki bilinmeyenli denklem çözümünden götürerek bulacağız. {burada sesli bir şekilde denklem çözüyor.} Buda 96 olur a'mız burada. b'mizde 95 kalır."

34B: "Bunun çevresini sormuş. 95'e 1 deriz, 95 deriz 1 deriz, 96 deriz. Bunları toplayacağız şimdi. 384 eder çevremiz."

Büşra soruya bütüncül bir şekilde bakmamaktadır. Çünkü Büşra, APSRCD altıgenin kenarları ile PBRS karesinin kenarları arasında ilişki kuramamıştır. Bu yüzden Büşra, APSRCD altıgeninin çevresini hesaplarken, altıgenin kenar uzunluklarını toplamıştır. Büşra $|PS|$ ile $|BR|$ ve $|SR|$ ile $|PB|$ arasında ilişki kurabilseydi, APSRCD altıgeninin çevresinin ABCD karesinin çevresine eşit olduğunu fark edebilirdi. Büşra'nın sorunun çözümünde karenin alanı, cebirsel ifadeler ve denklem kavramlarına yönelik bilgilerini kapsülünden çıkartarak yeni duruma uyarladığı ve bu kavramları koordineli kullandığı fakat soruya bütüncül bakmadığı anlaşılmaktadır. Özel dörtgenlerin açı, kenar, köşegen ve alan özelliklerini açıklayarak problemler çözer kazanımına yönelik olan bu soruda, Büşra'nın süreç düzeyinde davranış sergilediği görülmektedir.

Resim 3'te verilen soru "özel dörtgenlerin açı, kenar, köşegen ve alan özelliklerini açıklayarak problemler çözer" (MEB, 2018) kazanımına yöneliktir. Özel dörtgenlerin açı, kenar, köşegen ve alan özelliklerini açıklayarak problemler çözmeye yönelik olan bu soruda, öğrencilerin çoğunluğu süreç düzeyinde davranış sergilediği görülmüştür. Örnek olarak Furkan'ın bu sorunun çözümüne yönelik yaklaşımı aşağıda sunulmuştur.



Resim 3. Özel dörtgen sorusu ve Furkan'ın bu soruya yönelik çözümü

71F: "Buradan burası diktir $\{\{\hat{B}\}'\text{nı kastediyor}\}$."

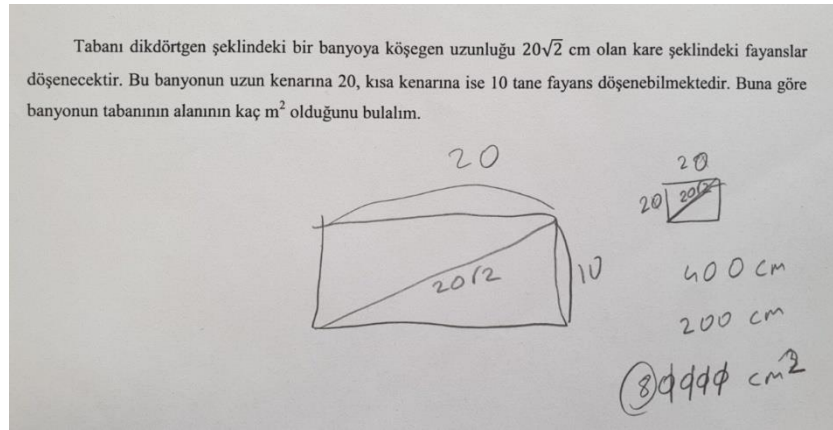
72F: "Dikten dik inmiş $12 \cdot 4 = 48$, o zaman burası $4\sqrt{3}$ 'tür, çünkü öklid. $\{\{BT\}'\text{nu kastediyor}\}$."

73F: "Alan ABCD'nin kaç br olduğunu bulun söylüyor. Ben doğrudan bunun alanını bulup 2 ile çarparsam, $\frac{4\sqrt{3} \cdot 16}{2}$, aslında çarparsam 2'ye bölmeme gerek kalmaz. Çarpımı da $64\sqrt{3}$ gelir."

Furkan bir tane üçgenin alanını hesaplamış ve bulduğu sonucun iki katını alarak istenilen sonucu elde etmiştir. Yani Furkan, dikdörtgenin alanını üçgenin alanına kapsüllemiştir. Furkan, sorunun çözümü için herhangi bir dışsal yardıma ihtiyaç

duymamıştır. Furkan sorunun çözümünde, üçgen ve dikdörtgen kavramlarına yönelik bilgilerini koordineli kullanmıştır. Özel dörtgenlerin açı, kenar, köşegen ve alan özelliklerini açıklayarak problemler çözmeye yönelik olan bu soruda, Furkan'ın nesne düzeyinde davranış sergilediği görülmektedir.

Resim 4'deki soru "özel dörtgenlerin açı, kenar, köşegen ve alan özelliklerini açıklayarak problemler çözer" (MEB, 2018) kazanımına yöneliktir. Özel dörtgenlerin açı, kenar, köşegen ve alan özelliklerini açıklayarak problemler çözmeye yönelik olan bu soruda, öğrencilerin çoğunluğu süreç düzeyinde davranış sergilediği görülmüştür. Örnek olarak Halil'in bu sorunun çözümüne yönelik yaklaşımı aşağıda sunulmuştur.



Resim 4. Özel dörtgen sorusu ve Halil'in onuncu soruya yönelik çözümü

81H: "Bir dikdörtgen çizeyim."

82H: "Köşegen uzunluğu $20\sqrt{2}$ 'ymiş, $20\sqrt{2}$ olan kare şeklinde fayans. Şu $20\sqrt{2}$ imiş."

83H: "Bu banyonun uzun kenarı, burası 20, kısa kenarı, buraya 10 tane fayans döşenecekmiş."

84H: "Köşegenin uzunluğu buraya x dersek, $x\sqrt{2}$ olduğundan, burası 20 olur. Yani bir fayansın bir kenar uzunluğu, 20'imiştir."

85H: "Buraya 20 tane döşeyeceğimiz için, 400 cm, burası ise 200 cm bulunur."

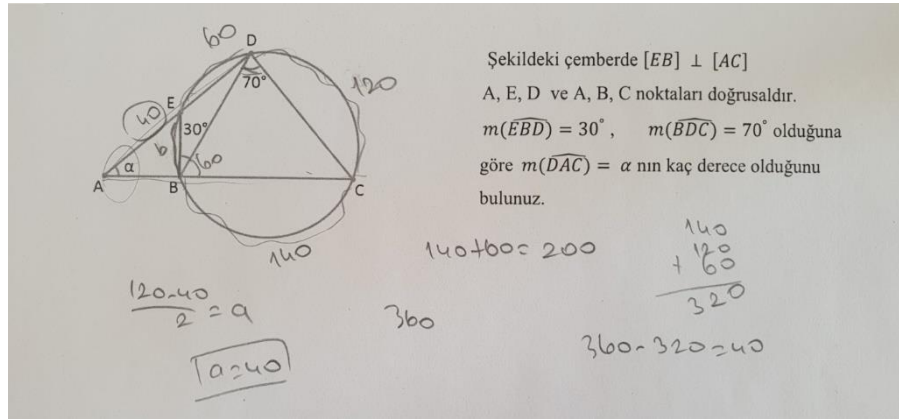
86H: "Çarptığımızda 80000 cm^2 elde edilir."

87H: "Bunu da metrekareye çevirmek için 4 tane sıfır atacağız, yani 8 m^2 bulunur."

Halil dikdörtgenin alanının, bir tane karenin alanı ile dikdörtgenin içine yerleştirilebilecek kare sayısının çarpımına eşit olduğunu fark edememiştir. Halil sorunun çözümünde, cebirsel ifadeler, alan ölçüleri, kare ve dikdörtgen kavramlarına yönelik bilgilerini kapsülde çıkartarak koordine etmiştir. Halil'in sorunun çözümünde, dikdörtgenin alanını, karenin alanına kapsüllemek yerine dikdörtgenin alan formülünü kullandığı

dışsal yardıma ihtiyaç duymamıştır. Taner'in çemberin açısını, üçgenin açısına kapsülleyebildiği görülmektedir. Çemberde açılarının özelliklerini kullanarak işlemler yapmaya yönelik olan bu soruda, Taner nesne düzeyinde davranış sergilemektedir.

Resim 6'da verilen soru "bir çemberde merkez, çevre, iç, dış ve teğet-kiriş açılarının özelliklerini kullanarak işlemler yapar" (MEB, 2018) kazanımına yöneliktir. Çemberde açılarının özelliklerini kullanarak işlemler yapmaya yönelik olan bu soruda, öğrencilerin çoğunluğu süreç düzeyinde davranış sergilediği görülmüştür. Örnek olarak Merve'nin bu sorunun çözümüne yönelik yaklaşımı aşağıda sunulmuştur.



Resim 6. Çember sorusu ve Merve'nin bu soruya yönelik çözümü

21M: "Burası 70 ise $\{\widehat{BDC}\}$ 'ni kastediyor} burası da 140 olur {BC yayını kastediyor}.

Burası 30'sa $\{\widehat{EBD}\}$ 'ni kastediyor} burası da 60 olur {ED yayını kastediyor}."

22M: "Buraya b desek {BE yayını kastediyor} buraya c dersek {CD yayını kastediyor} şuraya kadar, $(c - b)$ 'nin 2'ye bölümü buradaki açığı vermesi gerekiyor $\{\widehat{CAD}\}$ 'ni kastediyor}."

23M: "EB, AC'ye dikse, 60° olur $\{m(\widehat{DBC})\}$ 'nü kastediyor}."

24M: "Burası 60 olduğu için şu yayını {CD yayını kastediyor} uzunluğu 120 olur.

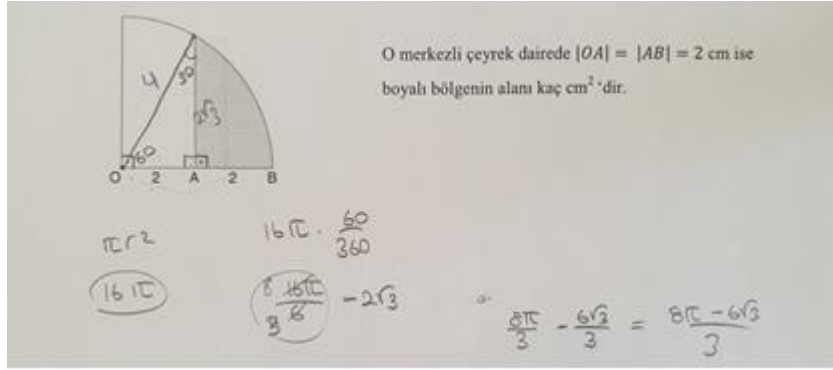
25M: "60, 120, 140 {yayların ölçülerini söylüyor} topladığımızda 320 yapar. Buraya b demiştik, 360'tan 320'yi çıkardığımızda 40 olur o da b olur."

26M: " $\frac{120-40}{2}$ 'de α 'yı verir. α 'da 40 olur."

Merve üçgen şemasını işe koşarak $m(\hat{C})$ 'nü, buradan yola çıkarak çemberde açı ve üçgen bilgilerini koordine ederek $m(\widehat{ADB})$ 'nü bulabilirdi. Merve, daha sonra ABD üçgenini kullanarak istenilen açının ölçüsüne ulaşabilirdi. Merve'nin, çemberin açısını, üçgenin açısına kapsülleyemediği için çemberde dış açı formülünü kullandığı görülmektedir. Çemberde

açıların özelliklerini kullanarak işlemler yapmaya yönelik olan bu soruda, Merve süreç düzeyinde davranış sergilemektedir.

Şekil 7'deki soru "dairenin çevre ve alan bağıntılarını oluşturur" (MEB, 2018) kazanımına yöneliktir. Dairenin alan bağıntısını oluşturmaya yönelik olan bu soruda, öğrencilerin çoğunluğu süreç düzeyinde davranış sergilediği görülmüştür. Örnek olarak Pelin'in bu sorunun çözümüne yönelik yaklaşımı aşağıda sunulmuştur.



Resim 7. Daire sorusu ve Pelin'in bu soruya yönelik çözümü

51P: "Buradan şuraya yarı çap çeksem 4 olur {bir dik üçgen oluşturuyor}."

52P: "Burası 30,60,90 var, burası 30, burası 60 oluyor {dik üçgenin kenarları ile açıları arasında ilişki kuruyor}."

53P: "Dairenin toplam alanı πr^2 'den 16π . Burası 60 derece $16\pi \cdot \frac{60}{360} = \frac{16\pi}{6}$ çıkıyor {60°'lik daire diliminin alanını hesaplıyor}."

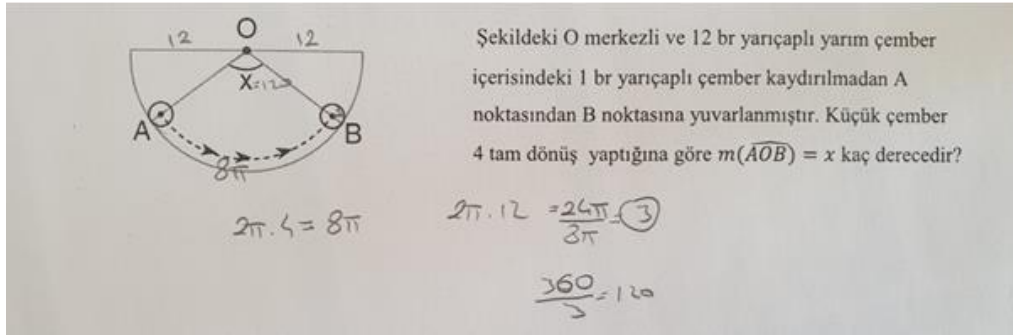
54P: "Bundan üçgenin alanine çıkaracağım $\{\frac{16\pi}{6}\}$ 'yi kastediyor}. Buda $\frac{2 \cdot 2\sqrt{3}}{2}$ 'den $2\sqrt{3}$ olur {dik üçgenin alanını hesaplıyor}."

55P: "Buda boyalı bölge oluyor {Burada $\frac{16\pi}{6} - 2\sqrt{3}$ işlemini yapıyor ve sonucu $\frac{8\pi - 6\sqrt{3}}{3}$ buluyor}."

Pelin bu soruda oran-orantı şemasını işe koşarak boyalı bölgenin alanını hesaplayabilirdi. Bunun için Pelin'in daire diliminin merkez açısı ile tam açı arasında ilişki kurması ve bu ilişkiden yola çıkarak dairenin alanı ile daire diliminin alanı arasında ilişki kurması gerekiyordu. Pelin dairenin alanı kavramıyla orantı kavramını koordineli kullanarak merkez açısı olan daire diliminin alanını bulabilir ve elde ettiği sonuçtan dik üçgenin alanını çıkartarak sonuca ulaşabilirdi. Pelin'in sorunun çözümünde üçgen, cebirsel ifadeler ve dairenin alanına yönelik bilgilerini koordine ettiği görülmektedir. Pelin'in dairenin alanını,

oran-orantı kavramına kapsülleyemediği için daire diliminin alanına yönelik formülü kullandığı görülmektedir. Dairenin alan bağıntısını oluşturmaya yönelik olan bu soruda, Pelin süreç düzeyinde davranış sergilemektedir.

Resim 8’de verilen soru “dairenin çevre ve alan bağıntılarını oluşturur” (MEB, 2018) kazanımına yöneliktir. Çemberin çevre bağıntısını oluşturmaya yönelik olan bu soruda, öğrencilerin çoğunluğu süreç düzeyinde davranış sergilediği görülmüştür. Örnek olarak Taner’in bu sorunun çözümüne yönelik yaklaşımı aşağıda sunulmuştur.



Resim 8. Daire sorusu ve Taner’in bu soruya yönelik çözümü

61T: “Yarıçapı 12’miş, buralar 12. Küçük çemberin çevresi r , 1 olduğu için 2π oluyor.”

62T: “Çarpı 4’ten çünkü 4 kez dönüş yapmış, burası 8π oluyor {AB yayını kastediyor}.”

63T: “Dairenin çevresi $2 \cdot \pi \cdot 12$ ’den 24π dir.”

64T: “ 8π ise 3’te 1’i oluyor, o zaman burası 120 oluyor.”

Öğretmen: “Nasıl bir ilişki kurdun.”

65T: “Tamamının çevresi 24π ’ymiş yani bunu 8π ’ye bölersek 3 oluyor 3’te 1’idi. O zaman açı olarakta 3’te 1’i olması lazım. Çünkü burayı görüyorsa.”

Taner’in, herhangi bir dışsal ipucuna ihtiyaç duymadan AB yayının uzunluğu ile O merkezli çemberin çevresi arasında koordinasyon sağlayabilmesi onun çemberin çevresine yönelik eylemleri yansıtabildiğinin göstergesidir. Taner oran-orantı ve çemberin çevresine yönelik önceden oluşturduğu bilgilerini kapsülden çıkartarak yeni duruma uyarlamıştır. Taner’in çemberin çevresini, oran-orantı kavramına kapsülleyebildiği görülmektedir. Çemberin çevre bağıntısını oluşturmaya yönelik olan bu soruda Taner nesne düzeyinde davranış sergilemektedir.

Tartışma, Sonuç ve Öneriler

Çalışma sonucunda çokgen kavramını bütüncül bir bakış açısıyla ele alarak etkin bir şekilde kullanmaya yönelik sorularda çoğu öğrencinin çokgen kavramını etkin bir şekilde

kullanamadığı görülmektedir. Öksüz ve Başışık (2019) 5. sınıf öğrencileri üzerinde yaptıkları çalışmanın sonunda öğrencilerin çokgenlerin klasik formunu tanımakta zorlanmadıklarını fakat klasik formunda olmayan çokgenlere yönelik kavram yanılgılarına sahip olduklarını, döndürülmüş şekilde verilen çokgenlerin özellikleri ile ilgili ve çokgenlerin köşegenlerine yönelik kavram yanılgılarına sahip olduklarını tespit etmişlerdir. Akdemir ve Narlı (2022) ortaokul öğrencileri üzerinde yaptıkları çalışmanın sonunda öğrencilerin çoğunlukla tam bir çokgen tanımını yapamadıklarını tespit etmişlerdir. Fujita ve Jones (2006) yaptıkları çalışma sonunda sınıf öğretmeni adaylarının dörtgenler arasındaki hiyerarşik ilişki konusunda yeterli anlayışa sahip olmadıklarını tespit etmişlerdir.

Bu çalışmada öğrencilerden; eşkenar dörtgenin köşegen özelliklerini tanımaları ve eşkenar dörtgenin köşegen özelliklerine yönelik bilgileriyle üçgenin alanına yönelik bilgilerini koordine ederek eşkenar dörtgenin alanını bulmaları beklenmektedir. Ayrıca yamuğun içinde üçgensel ve dikdörtgensel bölge oluşturmaları ve oluşturdukları bölgelerin alanlarından yararlanarak yamuğun alanını bulmaları, dikdörtgenin köşegen özelliklerini tanımaları ve dikdörtgenin köşegen özelliklerine yönelik bilgileriyle üçgenin alanına yönelik bilgilerini koordine ederek dikdörtgenin alanını bulmaları gerekmektedir. Bununla beraber karenin köşegen özelliklerini tanımaları ve dikdörtgenin köşegen özelliklerine yönelik bilgileriyle üçgenin alanına yönelik bilgilerini koordine ederek karenin alanını bulmaları beklenmektedir. Fakat sınırlı sayıda öğrencinin eşkenar dörtgenin alanı ile üçgenin alanı arasında, yamuğun alanı ile üçgenin alanı ve dikdörtgenin alanı arasında ilişki kurabildiği, öğrencilerin büyük çoğunluğunun eşkenar dörtgenin ve yamuğun alan formüllerini kullandıkları görülmektedir. Dikdörtgenin alanı ile üçgenin alanı arasında ve karenin alanı ile üçgenin alanı arasında ise hiçbir öğrencinin ilişki kuramadığı, bütün öğrencilerin karenin ve dikdörtgenin alan formüllerini kullandıkları görülmektedir. Bu durumun ortaya çıkmasının, bilgilerin ezberlenmesi, kavramsal öğrenmenin gerçekleşmemesi olduğu söylenebilir.

Olkun vd. (2014) yaptıkları çalışmanın sonucunda öğrencilerin standart sorularda formül kullanma eğiliminde olduklarını, fakat başka yolları olmadığında farklı çözüm yolları aradıklarını tespit etmişlerdir. Güreffe (2018) yaptığı çalışmanın sonucunda eşkenar dörtgen ve yamuğun alanının hesaplanmasında, öğrencilerin çoğunun üçgen, kare veya dikdörtgen alanını kullandıklarını ve dikdörtgene yönelik alan problemlerinde genellikle formül kullandıklarını tespit etmiştir. Baturo ve Nason (1996) ise öğretmen adayları üzerine yaptıkları

çalışma sonunda öğrencilerin çok azının üçgenler ile dikdörtgenler arasındaki ilişkiyi anlamlandırabildiklerini, öğrencilerin çoğunun üçgenin alanı ile onu çevreleyen dikdörtgenin alanı arasında ilişki kuramadığını, üçgenin alanını hesaplama formülünün bu öğrenciler için bir anlamının olmadığını ve niçin 2'ye bölünmesi gerektiğini açıklayamadıklarını tespit etmişlerdir. Geleneksel uygulamada öğretmenler temel şekillerin alan ölçümüne ilişkin formülleri öğretme eğilimindedirler ve öğretmenler formüllerin uygulanmasının etkinliği üzerinde dururlar (Huang & Witz, 2011). Fakat alan öğretiminde öğrencilere ilgili formülleri vermek ve sadece çeşitli çokgenlerin alanlarını hesaplatmak yeterli olmadığından, öğrencilerin alan kavramına yönelik anlayışları geliştirilmelidir (Manizade & Mason, 2014). Alan öğretiminde öğrenciler çeşitli parçalara ayırma yöntemleriyle tanıştırılmalı, kendi varyasyonlarını bulmaları desteklenmeli, esnek düşünme, daha fazla anlayış ve ezberlenmiş alan formüllerine daha az güvenme teşvik edilmelidir (Vincent & Stacey, 2009).

Bu çalışmada öğrencilerden dikdörtgenin içine yerleştirilebilecek kare sayısı ile dikdörtgenin alanı arasında ilişki kurmaları beklenen soruda ise hiçbir öğrencinin dikdörtgenin alanı ile karenin alanı arasında ilişki kuramadığı ve öğrencilerin hepsinin dikdörtgenin alanını veren formülü kullandıkları görülmektedir. Zacharos (2006), yaptığı çalışmada alan ölçme araçlarının kullanımı ve alanı karelere bölme konusunda eğitim alan deney grubu öğrencilerinin, geleneksel eğitim alan kontrol grubu öğrencilerine göre alanları ölçmeye yönelik sorularda farklı stratejiler kullanmada daha başarılı olduklarını, öğrencilerin dikdörtgenin alanını doğru bir şekilde hesaplamak için formül kullandıklarını fakat öğrencilerin (özellikle kontrol grubu öğrencilerinin) elde ettikleri sayısal sonucun ne anlama geldiğini bilmediklerini tespit etmiştir.

Bu çalışmada çemberde iç ve dış açıya yönelik sorularda öğrencilerden üçgende açıya yönelik bilgilerini kullanmaları beklenmektedir. Fakat çok az öğrencinin çemberin açısı ile üçgenin açısı arasında ilişki kurabildiği, öğrencilerin büyük çoğunluğunun çemberin iç ve dış açısını veren formülleri kullandıkları görülmektedir. Yay parçasının uzunluğu ile ilgili sorularda öğrencilerden oran-orantı bilgilerini kullanmaları beklenmektedir. Fakat çok az öğrencinin yay parçasının uzunluğu ile oran-orantı arasında koordinasyon sağlayabildiği, öğrencilerin büyük çoğunluğunun yay parçasının uzunluğunu veren formülü kullandıkları görülmektedir. Daire diliminin alanının hesaplanması istenen soruda öğrencilerden daire diliminin alanını hesaplamak için oran-orantı bilgisini kullanmaları beklenmektedir. Fakat

öğrencilerin hiçbirinin daire diliminin alanı ile oran-orantı arasında koordinasyon sağlayamadıkları ve daire diliminin alanını veren formülü kullandıkları görülmektedir.

Bekdemir (2012), sınıf öğretmeni adayları üzerinde çember ve daire alt öğrenme alanına yönelik yapmış olduğu çalışmanın sonunda, öğrencilerin işlem bilgisine yönelik başarı seviyelerinin, kavram bilgisine yönelik başarı seviyelerinden daha iyi olduğunu, formüllerin nasıl elde edildiğini bilmemelerine rağmen işlemsel ifadelerde kullanabildiklerini, genelleme ve soyutlama becerilerinin yetersiz olduğunu tespit etmiştir. Özsoy ve Kemankaşlı (2004) ortaöğretim öğrencileri üzerine yaptıkları çalışmada, öğrencilerin çemberin iç, dış, merkez ve çevre açı kavramları arasında bağlantı kuramadıklarını, sorularda çember içinde verilen üçgensel ve dörtgensel bölgelerde açı kavramlarına yönelik bazı özellikleri uygulamada zorlandıklarını tespit etmişlerdir.

Çalışma sonucunda öğrencilerin çembere yönelik formülleri kullanabildikleri fakat çember ve daireyi matematiğin farklı kavramlarıyla ilişkilendiremedikleri görülmektedir. Öğrenciler çember ve daire kavramlarını nesnelleştiremediklerinden dolayı farklı çözüm yolları geliştirememektedirler. Öğrenciler çemberin çevresi ile yay parçası arasında, dairenin alanı ile daire diliminin alanı arasında nasıl bir ilişki olduğunu bilmediklerinden formülleri kullanma eğiliminde oldukları söylenebilir. Bu durumun ortaya çıkmasında öğrencilerin çember ve daireye yönelik kavramsal öğrenme yerine çember ve daireye yönelik özellikleri ezberlemeleri olduğu söylenebilir. Öğrenciler çember ve daireye yönelik kavramlar üzerinde bütüncül düşünemediklerinden, bu kavramlar üzerinde ezberledikleri formüller aracılığı ile eylem gerçekleştirdiklerinden, çember ve daire kavramlarını farklı kavramlara kapsüleyememektedirler. Bu sonuçlara göre öğrencilerin çoğunluğunun geometrik kavramların bilgi oluşturmada APOS teorisine göre süreç düzeyinde oldukları söylenebilir.

Stacey ve Vincent (2009) yaptığı çalışmada ortaokul matematik dersinde dairenin alan formülünün ezberlenmesi yerine dairenin alan formülünün didaktik öğretime yönelik birtakım önerilerde bulunmaktadır. O'Dell vd. (2016) 8. sınıf öğrencileriyle yaptıkları çalışma sonunda öğrencilerin önce dairenin alan formülünü açıklayamadıklarını fakat birtakım görevlerden sonra (kare yarıçapın alanı ile dairenin alanını karşılaştırma, dairenin alanını üçgene dönüştürerek bulma) dairenin alan formülü için bir gerekçe üretebildiklerini ve bu görevlerin öğrencilerin dairenin alanını bulma konusunda daha anlamlı bir kavrayış geliştirdiğini tespit etmişlerdir. Dolayısıyla öğretimde doğrudan formül vermek yerine,

çember parçası uzunluğu ile çemberin çevresi, daire dilimi ile dairenin alanı arasındaki ilişki üzerinde durulması, çember ve daire kavramlarının daha anlamlı öğrenilmesini sağlayabilecektir. Bu şekilde öğrencilerin çember ve daire kavramlarını kapsülleyebilmeleri ve öğrencilerin APOS teorisine göre çember ve daire kavramlarını matematiksel bir nesneye dönüştürmeleri sağlanabilir.

Araştırmada 10. sınıf öğrencilerinin çokgen ve dörtgen, 11. sınıf öğrencilerinin ise çember ve daire kavramlarına ilişkin bilgi oluşturma süreçleri APOS teorisi çerçevesinde incelenmiştir. Buna istinaden araştırma sonuçları ve ilgili alanyazın incelenerek gelecek çalışmalara ışık tutması bakımından şu önerilere yer verilmiştir:

- Farklı sınıf düzeyleri ve farklı matematik ilişkin bilgi oluşturma süreçleri APOS teorisi çerçevesinde incelenebilir.
- Bu çalışmadaki elde edilen sonuçlarına göre aralarında ilişki kurulamayan çokgen, dörtgen, çember ve daireye yönelik kavramların öğretiminde geleneksel yöntemler yerine öğrencinin daha etkin katılım sağlayacağı metotlar denenebilir.

Etik Kurul Belgesi

Etik Kurul Komisyon Adı: Bursa Uludağ Üniversitesi Sosyal ve Beşeri Bilimler Araştırma ve Yayın Etiği Kurulu

Etik Kurul Belge Tarihi ve Protokol No: 27/10/2023-2023/09

Bilgilendirme

Bu çalışma ikinci yazar danışmanlığında yapılan birinci yazarın doktora tez çalışmasının bir kısmından oluşmaktadır.

Yazar Katkı Beyanı

Şafak YILDIZ: *Literatür taraması, kavramsallaştırma, uygulama, verilerin toplanması, işlenmesi, analizi, yorumlanması, inceleme-yazma, düzenleme.*

Rıdvan EZENTAŞ: *Kavramsallaştırma, metodoloji, uygulama, verilerin analizi ve yorumlanması, denetim, inceleme-yazma, düzenleme.*

Kaynaklar

- Açıl, E. (2015). *Ortaokul 3. sınıf öğrencilerin denklem kavramına yönelik soyutlama süreçlerinin incelenmesi: Apos teorisi* [Doktora tezi]. Atatürk Üniversitesi.
- Akdemir, M., & Narlı, S. (2022). Ortaokul öğrencilerinin çokgenler konusundaki algılarının incelenmesi. *Uluslararası Karamanoğlu Mehmetbey Eğitim Araştırmaları Dergisi*, 4(1), 74-92. <https://doi.org/10.47770/ukmead.1123023>
- Baturo, A., & Nason, R. (1996). Student teachers' subject matter knowledge within the domain of area measurement. *Educational Studies in Mathematics*, 31(3), 235-268.
- Bekdemir, M. (2012). Öğretmen adaylarının çember ve daire konularında kavram ve işlem bilgilerinin değerlendirilmesi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 43, 83-95.
- Borji, V., Alamolhodaei, H., & Radmehr, F. (2018). Application of the apos-ace theory to improve students' graphical understanding of derivative. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(7), 2947-2967. <https://doi.org/10.29333/ejmste/91451>
- Breidenbach, D., Dubinsky, E., Hawks, J., & Nichols, D. (1992). Development of the process conception of function. *Educational Studies in Mathematics*, 23(3), 247-285.
- Büyüköztürk, Ş., Kılıç-Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2016). *Bilimsel araştırma yöntemleri* (20. baskı). Pegem Akademi.
- Chimhande, T., Naidoo, A., & Stols, G. (2017). An analysis of grade 11 learners' levels of understanding of functions in terms of apos theory. *Africa Education Review*, 14, 1-19. <https://doi.org/10.1080/18146627.2016.1224562>
- Çetin, İ., & Dubinsky, E. (2017). Reflective abstraction in computational thinking. *Journal of Mathematical Behavior*, 47(1), 70-80. <https://doi.org/10.1016/j.jmathb.2017.06.004>
- Çepni, S. (2018). *Araştırma ve proje çalışmalarına giriş*. Celepler Matbaacılık.
- Dreyfus, T. (1991). Advanced mathematical thinking processes. In D. Tall (Eds.), *Advanced mathematical thinking* (pp. 25 - 41). Kluwer Academic Publishers.
- Dubinsky, E. (1991). Reflective abstraction in advanced mathematical thinking. In D. Tall (Eds.), *Advanced mathematical thinking* (pp. 95 - 126). Kluwer Academic Publishing.
- Dubinsky, E., & Lewin, P. (1986). Reflective abstraction and mathematics education: The genetic decomposition of induction and compactness. *The Journal of Mathematical Behavior*, 5(1), 55-92.
- Dubinsky, E., & McDonald, M. A. (2001). Apos: A constructivist theory of learning in undergraduate mathematics education research. In D. Holton (Eds.), *The teaching and learning of mathematics at university level* (pp. 273 - 280). Kluwer Academic Publishers.
- Dubinsky, E., Weller, K., McDonald, M. A., & Brown, A. (2005). Some historical issues and paradoxes regarding the concept of infinity: An apos-based analysis: Part 1. *Educational Studies in Mathematics*, 58(3), 335-359.
- Fujita, T., & Jones, K. (2006). Primary trainee teachers' understanding of basic geometrical figures in Scotland. In J. Novotná, H. Moraová, M. Krátká & N. Stehlíková (Eds.), *Proceedings 30th conference of the international group for the psychology of mathematics*

- education (Vol. 3). Prague: Charles University. <https://eric.ed.gov/?id=ED496933>'dan alınmıştır (Eric number: ED496933).
- Gürefe, N. (2018). Ortaokul öğrencilerinin alan ölçüm problemlerinde kullandıkları stratejilerin belirlenmesi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 33(2), 417-438. <https://doi.org/10.16986/HUJE.2017032703>
- Huang, H. M. E., & Witz, K. G. (2011). Developing children's conceptual understanding of area measurement: A curriculum and teaching experiment. *Learning and Instruction*, 21(1), 1-13.
- Kemp, A., & Vidakovic, D. (2023). Students' understanding and development of the definition of circle in taxicab and euclidean geometries: An apos perspective with schema interaction. *Educational Studies in Mathematics*, 112(3), 567-588. <https://doi.org/10.1007/s10649-022-10180-2>
- Manizade, A. G., & Mason, M. M. (2014). Developing the area of a trapezoid. *The Mathematics Teacher*, 107(7), 508-514.
- Milli Eğitim Bakanlığı. (2018). *Ortaöğretim matematik dersi öğretim programı*.
- O'Dell, J. R., Rupnow, T. J., Cullen, C. J., Barrett, J. E., Clements, D. H., Sarama, J., & Van Dine, D. W. (2016). Developing an understanding of children's justifications for the circle area formula. In M. B. Wood, E. E. Turner, M. Civil & J. A. Eli (Eds.), *Proceedings of the 38th annual meeting of the north american chapter of the international group for the psychology of mathematics education* (pp. 235 – 242). Tucson: The University of Arizona.
- Olkun, S., Çelebi, Ö., Fidan, E., Engin, Ö., & Gökğün, C. (2014). Birim kare ve alan formülünün Türk öğrenciler için anlamı. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 29(1), 180-195.
- Öksüz, C., & Başışık, H. (2019). 5. sınıf öğrencilerinin çokgenler ve dörtgenler konularında sahip oldukları kavram yanlışlarının belirlenmesi. *Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi*, 20, 413-430. <https://doi.org/10.17494/ogusbd.548525>
- Özsoy, N., & Kemankaşlı, N. (2004). Ortaöğretim öğrencilerinin çember konusundaki temel hataları ve kavram yanlışları. *TOJET: The Turkish Online Journal of Educational Technology*, 3(4), 140-147.
- Parraguez, M., & Oktaç, A. (2010). Construction of the vector space concept from the viewpoint of apos theory. *Linear Algebra and Its Applications*, 432(8), 2112-2124.
- Paschos, T., & Farmaki, V. (2006). The reflective abstraction in the construction of the concept of the definite integral: A case study. In J. Novotná, H. Moraová, M. Krátká & N. Stehlíková (Eds.), *Proceedings of the 30th conference of internacional group for the psychology of mathematics education* (vol. 4). Prague: Charles University.
- Pirie, S., & Kieren, T. (1989). A recursive theory of mathematical understanding. *For the Learning of Mathematics*, 9(3), 7-11.
- Reed, B. (2007). *The effects of studying the history of the concept of function on student understanding of the concept* [Doctoral dissertation, Kent State University]. ProQuest Dissertations & Theses Global.

- Salgado, H., & Trigueros, M. (2015). Teaching eigenvalues and eigenvectors using models and apos theory. *The Journal of Mathematical Behavior*, 39, 100-120. <https://doi.org/10.1016/j.jmathb.2015.06.005>
- Selden, A., & Selden, J. (1992). Research perspectives on conceptions of function: Summary and overview. In E. Dubinsky & G. Harel (Eds.), *The concept of function: Aspects of epistemology and pedagogy* (MAA notes and series 25). Mathematical Association of America.
- Stacey, K., & Vincent, J. (2009). Finding the area of a circle: Didactic explanations in school mathematics. *The Australian Mathematics Teacher*, 65(3), 6-9.
- Stewart, S. (2008). *Understanding linear algebra concepts through the embodied, symbolic and formal worlds of mathematical thinking* [Doctoral dissertation, The University of Auckland]. The University of Auckland Libraries.
- Tall, D. (1999). Reflections on apos theory in elementary and advanced mathematical thinking. In O. Zaslavsky (Eds.), *Proceedings of the 23 rd Conference of the International Group for the Psychology of Mathematics Education* (vol 1, pp. 111-118). Haifa: Israel Institute of Technology.
- Tziritas, M. (2011). *Apos theory as a framework to study the conceptual stages of related rates problems* [Master's thesis, Concordia University]. Concordia University Library.
- Vincent, J., & Stacey, K. (2009). Finding the area of a trapezium: Theme and variations. *The Australian Mathematics Teacher*, 65(2), 13-16.
- Weller, K., Arnon, I., & Dubinsky, E. (2009). Preservice teachers' understanding of the relation between a fraction or integer and its decimal expansion. *Canadian Journal of Science, Mathematics and Technology Education*, 9(1), 5-28.
- Yıldırım, A., & Şimşek, H. (2018). *Sosyal bilimlerde nitel araştırma yöntemleri*. Seçkin Yayıncılık.
- Yin, R. K. (2009). *Case study research, designs and methods*. Sage Publications.
- Zacharos, K. (2006). Prevailing educational practices for area measurement and students' failure in measuring areas. *The Journal of Mathematical Behavior*, 25(3), 224-239.

Research Article/Araştırma Makalesi

Examination of the Association of Mathematics and Art in Middle School Mathematics Textbooks

Satı Aygül İBAS¹  Melike TURAL SÖNMEZ^{* 2} 

¹ Kırıkkale University, Department of Mathematics and Science Education, Kırıkkale, Turkey, ibassatiaygul@gmail.com

² Kırıkkale University, Department of Mathematics and Science Education, Kırıkkale, Turkey, melikesonmez@kku.edu.tr


* Corresponding Author: ibassatiaygul@gmail.com

Article Info

Received: 10 July 2024

Accepted: 14 September 2024

Keywords: Mathematics and art association, middle school mathematics textbooks, textbook review, mathematics education

 10.18009/jcer.1514066

Publication Language: Turkish

Abstract

The aim of this research is to examine the association of the contents of middle school mathematics textbooks (MSMT) with art. Document review method was used in this research. The class level of the section where the MSMT mathematics-art association was determined from the documents, the relevant learning and sub-learning area, the outcome number and the associated art branch (painting, sculpture, architecture, music, literature, theater, cinema) were examined. In addition, the content of the mathematics-art association was evaluated and interpreted according to the determined criteria. The findings were presented with tables and contents taken from books by subjecting them to descriptive analysis. In the examination, it was determined that the 57 mathematics-art association contents determined by MSMT were mostly in painting and least in cinema at all class levels. As a result of the study, suggestions were made regarding the application to the curriculum and textbook writers, teachers and researchers.



To cite this article: İbas, S. A., & Tural- Sönmez, M. (2024). Ortaokul matematik ders kitaplarındaki matematik ve sanat ilişkilendirmesinin incelenmesi. *Journal of Computer and Education Research*, 12 (24), 689-717. <https://doi.org/10.18009/jcer.1514066>


Ortaokul Matematik Ders Kitaplarındaki Matematik ve Sanat İlişkilendirmesinin İncelenmesi

Makale Bilgisi

Geliş: 10 Temmuz 2024

Kabul: 14 Eylül 2024

Anahtar kelimeler: Matematik ve sanat ilişkilendirmesi, ortaokul matematik ders kitapları, ders kitabı inceleme, matematik eğitimi

 10.18009/jcer.1514066

Yayın Dili: Türkçe

Öz

Bu araştırmanın amacı ortaokul matematik ders kitaplarındaki (OMDK) içeriklerin sanatla ilişkilendirilmesinin incelenmesidir. Bu çalışmada doküman inceleme yöntemi kullanılmıştır. Dokümanlardan OMDK matematik-sanat ilişkilendirmesi tespit edilen bölümün sınıf düzeyi, ilgili öğrenme ve alt öğrenme alanı, kazanım numarası ve ilişkilendirilen sanat dalı (resim, heykel, mimari, müzik, edebiyat, tiyatro, sinema) incelenmiştir. Ayrıca matematik-sanat ilişkilendirmesinin içeriği belirlenen kriterlere göre değerlendirilerek yorumlanmıştır. Bulgular betimsel analize tabi tutularak tablolar ve kitaplardan alınan örnek içeriklerle sunulmuştur. Yapılan incelemede OMDK kapsamında tespit edilen 57 matematik-sanat ilişkilendirme içeriğinin tüm sınıf düzeylerinde en fazla resim, en az ise sinema dalında olduğu belirlenmiştir. Çalışmanın sonucunda öğretim programı ve ders kitabı yazarlarına, öğretmenlere ve araştırmacılara yönelik önerilerde bulunulmuştur.

Summary

Examination of the Association of Mathematics and Art in Middle School Mathematics Textbooks

Satı Aygül İBAS¹  Melike TURAL SÖNMEZ^{* 2} 

¹ Kırıkkale University, Department of Mathematics and Science Education, Kırıkkale, Turkey, ibassatiaygul@gmail.com

² Kırıkkale University, Department of Mathematics and Science Education, Kırıkkale, Turkey, melikesonmez@kku.edu.tr

* Corresponding Author: ibassatiaygul@gmail.com

Introduction

Drawing and calculating have always been a part of life. From the time of cave people to people living today, they have all drawn shapes and symbols to communicate. These drawings have been considered the beginning of both art and science and have been studied as basic subjects (Doyran & Yılmaz, 2021). As science investigates nature, it has been influenced by what it sees and has applied the knowledge it has gained in various branches of art. In more general terms, art has been used as the power of creation that begins with people's preoccupations with science, religion, etc. (Keser, 2009). There are different uses for the definition of art, such as these expressions (Yolcu, 2021). However, aesthetics is found in common views about art. Concepts such as beauty, aesthetics, and design that art contains are actually directly related to mathematics and geometry. The concepts that the artist pays attention to when designing his works are mathematical concepts (Atabey, 2023). The mathematics-art association is also seen in mathematics and visual arts course curriculum (Ministry of Education [MOE], 2018). For example; the value of "Aesthetics" is emphasized in both programs. Similarly, different levels of associations have been identified in the mathematics and music curriculum.

Textbooks have an important place in creating the connection between students and teachers (Katipoğlu & Katipoğlu, 2016). In this research, it is aimed to interpret the degree of suitability by examining the association of mathematics with painting, sculpture, architecture, literature, music, theater and cinema as branches of art in the secondary school mathematics textbooks (MSMT), which were prepared in accordance with the 2018 middle school mathematics course curriculum (MSMCC) and approved by the Board of Education

and Discipline (BoEaD). According to this purpose, the sub-problems of the research are as follows:

- What is the distribution of the departments identified to be associated with mathematics-art in the MSMT,
 - 1- among grade levels?
 - 2- according to book positions on the basis of grade levels?
 - 3- according to learning areas on the basis of grade levels?
 - 4- according to sub-learning areas on the basis of grade levels?
 - 5- according to their objectives codes on the basis of grade levels?
- How are the sections in which mathematics-art associations are detected in the OMDK interpreted according to the criteria of content-visual compatibility, visual appeal, and age appropriateness?

Method

For this study, the document review method, one of the qualitative data analysis methods, was applied. For this research, 2021 BOE publications MSMT were used at the fifth, sixth, seventh and eighth grade levels, approved by BoEaD in the 2022-2023 academic year. In the first stage of study, based on the literature, the departments in MSMT at each level with mathematics-art associations were matched with MSMMC (MOE_2018) objectives. The numbers of the matched objectives were determined. The codes of the learning and sub-learning areas were written from the numbers of the determined objectives. The titles of these sections in MSMT were examined and the book locations were classified according to the determined codes. In the second stage; The associated art branch with math was determined. Detailedly examination criterias were created taking into account the draft textbook review criteria (2023). Data was obtained by preparing a "Data Collection Form" that included headings such as the photograph of the section with a determined mathematics-art association, its location in the book, learning area, sub-learning area, objectives codes, art branch, examination criteria and suitability degree. The validity of the study was ensured by achieving 91.23 % agreement among the referees.

Results

Mathematics-art associations were detected in a total of 57 sections of the MSMT examined. The most connections were seen in the seventh grade MSMT ($f=22$), while the least connections were seen in the sixth grade MSMT ($f=10$). According to the branches of art, the most associations belong to painting ($f=32$) and the least to cinema ($f=2$). There is no mathematics-sculpture association ($f=0$). Based on grade levels, the most mathematics-art associations were related to the geometry and measurement learning area at the seventh grade level ($f=16$), while the least associations were related to the algebra learning area at the sixth grade level ($f=1$) and numbers and operations at the eighth grade level ($f=1$). According to the sub-learning areas of mathematics-art association, it was mostly seen in the seventh grade level.

57 sections in MSMT where mathematics-art association was detected were examined one by one for each criterion. According to the content-visual compatibility criterion of these criteria, it was interpreted as no data (4) because there was no visual in 6 sections, while the remaining sections ($f=51$) were deemed appropriate (1). When examined in terms of another criterion, emphasizing the relationship between the relevant text and art, more than half ($f=35$) were found appropriate (1), while nearly half were evaluated as needing improvement (2) due to the deficiency in the texts regarding emphasis. When examined in terms of another criterion, the attractiveness of the visual, again six sections were expressed as no data (4) because there was no visual, while very few of the remaining sections ($f=4$) were interpreted as needing improvement (2), and the remaining sections ($f=47$) were interpreted as appropriate (1). Finally, according to the criterion of age-appropriateness of the visual, the same six sections were explained as no data (4), while almost all of the remaining sections ($f=50$) were explained as appropriate (1). Only one of the introductory chapters of the seventh grade MOE book was evaluated as (2) which should be improved in terms of mathematics-architecture association.

Discussion and Conclusion

Although the most associations between art and mathematics were found in painting, only two associated departments were detected at the sixth grade level. As a result of the research conducted by Coştu (2020) with sixth grade students on associating the

mathematics course with other disciplines, they stated that the art course was the least associated course, which supports these results. The math and art associations were generally found to be in the position of the most solved questions in the textbook, while they were found to be in the least activity position. However, Bingölbali & Bingölbali (2020) stated that they thought that due to the various features of the activities, they would provide an important place in many subjects, including formative and learning and teaching approaches of textbooks in in-class applications. From this perspective, it is expected that mathematics-art associations will be more effective and more numerous in activities. It has been seen that activity-based mathematics-art association course applications motivate students and increase student success (Altunbay & Soylu, 2020; Atasay & Erdoğan, 2017; Işıtan & Doğan, 2020). For this reason, it is believed that the inclusion of such application activities in textbooks will be more efficient both in terms of guiding the teacher and enriching the course process.

When these associations are examined according to learning areas at different grade levels, the most common sections on the learning area of geometry and measurement and the learning area of numbers and operations are seen. Tural-Sönmez (2024) stated in his study that the most common sections on the learning area of information and communication technologies in MSMT are numbers and operations and geometry and measurement. In particular, the eighth grade MSMT identified sections related to geometry and measurement. These results are parallel to the results of the research.

Finally, the sections where associations were detected were interpreted by examining their suitability levels one by one according to the determined criteria. As a result, while the general content was found to be suitable according to the visual compatibility, visual appeal and age-appropriateness of the visual. According to the criterion of emphasizing the relationship of the relevant text with art, more than half of the identified sections were found appropriate, while the remaining sections were interpreted as needing improvement. It is recommended to examine the new edition textbooks together with the new curriculum in the context of mathematics and art association. It is also recommended to examine teachers' mathematics-art associations in classroom practices and reveal their opinions on these issues.

Giriş

Çizim yapmak, hesaplamak her zaman hayatın içinde olmuştur. Mağarada yaşayan insan zamanından bu günlerde yaşayan insanlara kadar hepsi iletişim kurmak için şekil ve semboller çizmişlerdir. Bu çizimler hem sanat hem de bilim için başlangıç kabul edilip temel konular olarak incelenmiştir (Doyran & Yılmaz, 2021). Bilim doğayı araştırdıkça gördüklerinden etkilenerek çeşitli sanat dallarında elde ettiği bilgileri uygulamıştır. Daha genel ifadeyle sanat; insanların bilim, din vb. meşguliyetleri ile başlayan var etme gücü olarak kullanılmıştır (Keser, 2009). Sanat tanımı için bu ifadeler gibi farklı kullanımlar vardır (Türkcan, 2020; Yolcu, 2021). Tanımlarda ortaklık olmadığı gibi sanatın sınıflandırmasında da ortak bir görüş yoktur (İlhan, 2019; Türkcan, 2020). Sanatın zaman içerisindeki farklılaşan görünüşü ve ihtivasından kaynaklı sanat sınıflandırmaları ortaya çıkmıştır (Türkcan, 2020, s. 22). Bu ifadelerden genel olarak sanatın alt sınıflandırması resim, heykel, mimari, edebiyat, müzik, tiyatro ve sinema olarak kabul görmüştür (<https://tr.wikipedia.org/wiki/Sanat>). Ancak sanatla ilgili ortak görüşlerde estetik bulunur. Sanatın ihtiva ettiği güzellik, estetik, dizayn benzeri kavramların esasında matematik ve geometri ile direkt alakası vardır. Sanatçı eserlerini dizayn ederken dikkat ettiği kavramlar, matematik kavramlarıdır (Atabey, 2023).

Literatürde yapılan araştırmada matematik-sanat ilişkilendirmesi saptanan kavramlar ve konular Tablo 1’de sunulmuştur.

Tablo 1. Matematik-sanat ilişkilendirmesi kapsamında literatür taraması sonuçları

İlgili kavramlar	Yazarlar	Açıklama
Altın Oran	Ankaralığıl, 2013 Esi, 2107 İrhan, 2013 Tekkanat, 2006 Thapa & Thapa, 2018 Akarsu, 2009 Aktan & Yağmur, 2019 Yazıcı, 2011	Matematik-sanat ilişkilendirmesinde altın oran kavramı Türk Bayrağı çizimi Ünlü ressamların tabloları
Oran- Orantı	Malkoç, 2011 Acil & Genç, 2022 Bora, 2002 Tarhan, 2020 Şeker, 2021 Oğuzhan, 2013 Gürsoy, 2018 Katmer, 2022	Minyatürk eserlerden Miniaturk Pisagor’un müzik matematik araştırmaları ve Mersenne’nin müziği geliştirmesi Tiyatro’da düzenler Cami tipi projelerde ölçü-oran ilişkisi Camera Obscura gelişimi ve görüntü vermesi

Perspektif	Erdoğan, ve diğ. 2019	Perspektifin tanımı, sanat eserlerindeki ve eğitim sistemindeki yeri
Dönüşüm Geometrisi	Bulut ve diğ.2016 Toptaş, 2023 Yazıcı, 2011 Yılmaz, 2022	7. Sınıf 4 farklı matematik ders kitabının dönüşüm deometrisine göre resim dersi ile ilişkilendirilmesi Lorenzo Bazilikası'nda mimari Dönme, öteleme, yansıma ile ilgili çalışmalar ve başta Escher olmak üzere birçok sanatçının eserleri kullanılarak daha iyi bir eğitim olacağı Bu eserler kullanılarak dönüşüm geometrisi ve çokgenler konularının daha iyi öğrenileceği
Çokgenler	Atasay & Erdoğan, 2017 Bütow, 2021	Dersin giriş kısmında mandala kullanarak dönüşüm geometrisi ve çokgenlerin daha etkili öğretileceği Ünlü sanatçıların eserlerinde geometrik şekiller içeren çalışmalar
Polihedronlar (Çok yüzlüler)	Atabey, 2023 İrhan, 2013	Çok yüzlü tanımı, çeşitleri ve örnekler
Koordinat sistemi	Aydoğdu, 2022 Beytekin, 2015	Heykel sanatında Mısır Kanonu'nun gelişimi La havre kentinin ızgara plana yerleşimi
Fibonacci sayıları	Ayran & Aydın, 2017 İrhan, 2013	Fibonacci sayılarının tarihi "Fibonacci Rabbit Genarator" adlı Alison Gray'in heykel çalışması
Kesirler	Atli, 2007 Ayata, 2020 Işıtan & Doğan, 2020	Müzikal aralık ve kesir ilişkisi Nota- kesir ilişkilendirmesi ders uygulaması
Denklemler	Bayrı, 2019	Nota eşitlik üzerinden ders uygulaması
Fonksiyon	Bora, 2002	Müziksel seslerin fonksiyonu
Edebiyat-Matematik İlişkilendirmesi	Ayvaz, 2010 Doğan & Yazıcı, 2022 Eryiğit, 2024 Karagözoğlu, 2024 Güneş, 2020 Kaplan, 2021	Edebi eserlerde matematik vurgusu ve kullanımı Şiirlerdeki matematik vurgusu ve kullanımı Tekerlemelerdeki matematik vurgusu ve kullanımı

Matematik-sanat ilişkilendirmesi matematik ve görsel sanatlar dersi öğretim programlarında (GSDÖP, 2018) da görülmektedir. Örneğin; Ortaokul Matematik Dersi Öğretim Programı'nın (OMDÖP, 2018) genel amaçlarından 12. maddesi "Öğrenci; matematiğin sanat ve estetikle ilişkisini fark edebilecektir." olarak ifade edilmiştir (Ortaokul Matematik Dersi Öğretim Programı [OMDÖP], 2018). GSDÖP (2018), program uygulanırken önem arz eden hususlarla ilgili olarak maddeler belirtilmiştir. Bu programın ilgili bölümünde görsel sanatlar dersinin kazanımlarının, programdaki diğer derslerle (Matematik, Türkçe vb.) ilişkilendirmesi ifade edilmiştir (GSDÖP, 2018). Her iki programda da "Estetik" değeri üzerinde durulmuştur.

Aynı şekilde matematik ve müzik dersi öğretim programlarında farklı seviyelerde ilişkilendirmeler saptanmıştır. Örneğin; “Mü.5.B.2. Öğrendiği seslerin uzunluk ve kısalık özelliklerini ayırt eder.” kazanımı bulunmaktadır (Müzik Dersi Öğretim Programı, 2018).

Ders kitapları, öğrenci ile öğretmen arasındaki bağlantıyı oluşturan önemli bir yere sahiptir (Katipoğlu & Katipoğlu, 2016). Eğitim öğretim yılı sürecinde ders kitaplarının bu önemli yerinden kaynaklı nitelikli bir yapısının olması mecburi olmuştur (Şahin & Başgöl, 2019). Bu bağlamda ders kitabının içeriği ilişkilendirme açısından donanımlı olmalıdır. Literatür tarandığında matematik ile farklı alanlardaki ilişkilendirmelerin ders kitabı incelenmesine rastlanmıştır (Bingölbali & Özdiğer, 2022; Bulut ve diğ., 2016; Sönmez & Topcal, 2022; Tural-Sönmez, 2024) Fakat matematik-sanat ilişkilendirilmesi üzerine ders kitabı incelemesine rastlanmamıştır. Bu araştırmada matematik biliminin sanat dalları olarak resim, heykel, mimari, edebiyat, müzik, tiyatro ve sinema ile ilişkilendirmesi çerçevesinde ortaokul matematik ders kitaplarındaki ilişkilendirmesi incelenerek uygunluk derecesi yorumlanması amaçlanmaktadır. Bu amaca göre araştırmanın alt problemleri 2018 yılı OMDÖP göre hazırlanmış olan ve Talim Terbiye Kurulu (TTK) tarafından okutulması onay verilen OMDK’nda matematik-sanat ilişkilendirilmesi tespit edilen bölümlerin incelenmesi şu şekildedir:

- Sınıf seviyelerine dağılımı nasıldır?
- Sınıf seviyeleri bazında kitap bölümlerine göre dağılımı nasıldır?
- Sınıf seviyeleri bazında öğrenme alanlarına göre dağılımı nasıldır?
- Sınıf seviyeleri bazında alt öğrenme alanlarına göre dağılımı nasıldır?
- Sınıf seviyeleri bazında kazanım koduna göre dağılımı nasıldır?
- İçerik görsel uyumu, ilgili metnin belirlenen sanat ile ilişkisinin vurgusu, görselin dikkat çekiciliği, görselin yaşa uygunluğu kriterlerine göre incelenmesi ve yorumlanması nasıldır?

2024 yılında öğretim programı değişimine gidilmiştir. 2024-2025 yıllarında beşinci sınıf seviyesinde, yeni program uygulanacakken; önümüzdeki yıllarda diğer sınıf seviyelerinde yeni programa kademeli olarak geçilecektir. Bu araştırma 2018 OMDÖP göre hazırlanmış olan TTK tarafından okutulması onay verilen OMDK’nda bulunan matematik-sanat ilişkilendirmesinin ortaya çıkarılması açısından önemlidir. Bu çalışma ile birlikte konudaki

gelişim alanlarının belirlenmesi kitap yazarlarına, öğretmenlere ve araştırmacılara faydalı olacaktır.

Yöntem

Araştırmanın Modeli

Matematik eğitimi literatür taraması, 2018 yılı OMDÖP göre hazırlanmış olan ve TTK tarafından onaylanmış 2021 yılı basımlı OMDK ve 2018 yılı OMDÖP'nin incelenmesi yapılan bu çalışma için nitel veri analiz metotlarından doküman inceleme metodu uygulanmıştır. Bu metot; çalışmadaki veri grubu için seçilen çeşitli evrakların (birincil veya ikincil kaynaklar) ulaşılması, tetkik edilmesi, sorgulanması ve analiz edilmesi olarak ifade edilebilir (Özkan, 2019).

Veri Kaynağı

Bu araştırma için TTK onaylı 2022-2023 eğitim öğretim yılında kullanılan OMDK kullanılmıştır. Bazı devlet okullarında okutulan kitaplardan her sınıf seviyesi için rastgele bir tane seçilmiştir. Ayrıca bu kitaplardaki ilişkilendirme tespit edilen bölümler OMDÖP (Milli Eğitim Bakanlığı [MEB], 2018) göre öğrenme ve alt öğrenme alanları ile kazanım numaraları belirlenmiştir. Bu amaçla kullanılan matematik ders kitaplarının (MDK) künyesi Tablo 2'de verilmiştir.

Tablo 2. Veri kaynağı olarak kullanılan matematik ders kitapları

Kitap Künyesi	1. Kitap	2. Kitap	3. Kitap	4. kitap
Yayın evi	MEB yayınları	MEB yayınları	MEB yayınları	MEB yayınları
Yayın yılı	2021	2021	2021	2021
Sınıf seviyesi	5. sınıf	6. sınıf	7. sınıf	8. sınıf

Veri Analizi

İlk aşamada literatür baz alınarak her seviyedeki OMDK'nda yer alan matematik-sanat ilişkilendirmesi belirlenen bölümler OMDÖP (MEB_2018) kazanımlarıyla eşleştirilmiştir. Eşleştirilen kazanımların numaraları belirlenmiştir. Belirlenen kazanımların numaralarından öğrenme ve alt öğrenme alanlarının kodları yazılmıştır. Bu bölümlerin OMDK'ndaki başlıkları incelenerek Tablo 3'teki şekilde belirlenen kodlara göre kitap bölümleri sınıflandırılmıştır.

Tablo 3. OMDK'ndaki başlıkların kitap bölümüne göre sınıflandırılması

Kitap bölümü	Giriş	Etkinlik	Çözümlü sorular	Çözümü öğrencilere bırakılan sorular
--------------	-------	----------	-----------------	--------------------------------------

Kitaptaki başlıklar	-Konu anlatımı -Giriş -Hazır mıyız? -Hatırlayalım -Neden öğrenmeliyiz?	-Oyun zamanı -Bunu deneyelim -Matematik oyunları -Etkinlik -Biraz da eğlenelim	-Birlikte yapalım -Birlikte öğrenelim -Birlikte çözelim	-Araştırınız düşününüz -Sıra sizde -Ünite değerlendirme -Tartışmalar -Konu Değerlendirme -Çözüm Sende
---------------------	--	--	---	--

Matematik-sanat ilişkilendirmesi olan bu bölümler ikinci aşamada; ilişkilendirilen sanat dalı belirlenmiştir. Bu sanat dallarını incelemek için kriterler oluşturulmuştur. Bu kriterler için TTK Taslak Ders Kitabı ve Eğitim Araçları ile Bunlara Ait Elektronik İçeriklerin İncelenmesinde Değerlendirmeye Esas Olacak Kriterler ve Açıklamaları (2023) kitabı maddeleri incelenerek araştırmadaki bölümleri inceleme kriterleri tespit edilmiştir. Bu kitaptaki “2.1.3. Metin ile görsel uyumlu olmalıdır.” maddesi göz önüne alınarak “içerik görsel uyumu” kriteri birinci olarak seçilmiştir. İkinci olarak “3.1.4. İçerik, konu alanının özelliğine uygun olarak bütünsel bir yapıda verilmelidir.” maddesinin alt maddesi olan “İçerik kendi içerisinde ve disiplinler arası boyutta ilişkilendirilebilir nitelikte olmalıdır.” alt maddesine göre “ilgili metnin belirlenen sanat ile ilişkisinin vurgusu” kriteri oluşturulmuştur. “3.4.1. İçerik kazanımın gerçekleşmesini ve öğrenmeyi destekleyecek, anlamayı kolaylaştıracak görsellerle desteklenmelidir.” maddesinin “İçerik öğrenmeyi destekleyecek sayıda, amaca hizmet eder nitelikte ve metinle bütünlük oluşturacak çeşitlilikte görsellerle zenginleştirilmelidir” alt maddesinden “görselin dikkat çekiciliği” kriteri hazırlanmıştır. Son olarak “3.1.5. İçerik ilgili yaş ve sınıf seviyesine uygun olmalıdır.” maddesine dayanarak “görselin yaşa uygunluğu” kriteri yazılmıştır. Yazılan bu kriterlere göre matematik ve sanat ilişkilendirmesi tespit edilen bölümlerin niteliğinin uygunluk derecesi uygun (1), geliştirilmeli (2), uygun değil (3) ve veri yok (4) şeklinde kategorize edilmiştir. Bu doğrultuda tespit edilen bölümler analiz edilirken betimsel analize tabi tutulmuş ve frekans analizi yapılmıştır.

Şekil 1’de verilen analiz çerçevesine göre her bir uzman tespit edilen bölümler için incelemede bulunmuştur.

ANALİZ ÇERÇEVESİ


Ortaokul Matematik Ders Kitabı'ndan İlişkilendirilen Bölüm						
Kitaptaki konumu						
Giriş	Etkinlik	Çözümlü sorular	Çözümü öğrencilere bırakılan sorular			
2) Öğrenme alanı		3) Alt öğrenme alanı				
Sayılar ve İşlemler		Doğal Sayılar Kesirler Ondalık Gösterim Çarpanlar ve Katlar Tam Sayılar Rasyonel Sayılar Oran Üslü İfadeler Cebir Veri İşleme	Doğal Sayılarla İşlemler Kesirlerle İşlemler Yüzdeler Kümeler Tam Sayılarla İşlemler Rasyonel Sayılarla İşlemler Oran ve Orantı Kareköklü İfadeler Geometride Ölçme Olasılık			
Cebir		Cebirsel İfadeler Doğrusal Denklemler Eşitsizlikler	Eşitlik ve Denklem Cebirsel İfadeler ve Özdeşlikler			
Geometri ve ölçme		Temel Geometrik Kavramlar ve Çizimler Üçgen ve Dörtgenler Uzunluk ve Zaman Ölçme Alan Ölçme Açılar Çember Sıvı Ölçme Çokgenler Cisimlerin Farklı Yönlerden Görünümleri Veri Toplama ve Değerlendirme	Üçgenler Geometrik Cisimler Doğrular ve Açılar Çember ve Daire Dönüşüm Geometrisi Eşlik ve Benzerlik	Veri Analizi		
Veri işleme						
Olasılık		Basit Olayların Olma Olasılığı				
4) Kazanım Kodu						
Matematik Dersi Öğretim Programı, 2018, s51-76						
5) Sanat dalı						
Resim	Heykel	Mimari	Edebiyat	Müzik	Tiyatro	Sinema
6) İnceleme Kriterleri		Uygun	Geliştirilmeli	Uygun Değil	Veri yok	
- İçerik görsel uyumu		(1)	(2)	(3)	(4)	
- İlgili metnin sanatla ilişkisinin vurgulanması						
- Görselin dikkat çekiciliği						
- Görselin yaşa uygunluğu						

Şekil 1. Analiz çerçevesi

Deneyimli üç matematik ve iki görsel sanatlar öğretmeninin analiz çerçevesine göre görüşleri alınmıştır. Matematik-sanat ilişkilendirmesi yapılan bölümlerin uzmanlar tarafından yapılan görüşlerine göre uzlaşıya varılarak her bir bölüm tekrardan görüşülmüştür.



Tablo 4'te uzlaşı açıklamaları ile OMDK'deki ilişkilendirme olan bölümlerin ortak karar sonuçlarına örnekler verilmiştir.

Tablo 4. Araştırmanın Veri Analizi Çerçevesine Ait İnceleme Örneği

Kitapta ilişkilendirilen bölümler	Uzmanlar	Kodlar
<p>Örüntüler</p> <p>Matematik Her Yerde</p> <p>Tarihi binalarda, kilim desenlerinde, kaldırım taşlarında ve çinlerde genellikle geometrik şekiller belli düzende ve sayıda kullanılır. Özellikle tarihi eserlerde bu şekillerin varlığı açıkça görülmektedir.</p> <p>Evinizde kullandığınız halı ya da kilim desenlerinde dikkatinizi çeken geometrik şekiller nelerdir?</p>  <p>(MEB 5. Sınıf MDK., 2021, s. 22)</p>	Uzman 1	Giriş
		Sayılar ve İşlemler
		Doğal Sayılar
		5.1.1.3
		Resim
		1 1 1 1
	Uzman 2	Giriş
		Sayılar ve İşlemler
		Doğal Sayılar
		5.1.1.3
		Resim
		1 1 1 1
	Uzman 3	Giriş
		Sayılar ve İşlemler
		Doğal Sayılar
		5.1.1.3
		Resim
		1 1 1 1
	Uzman 4	Giriş
		Sayılar ve İşlemler
	Doğal Sayılar	
	5.1.1.3	
	Resim	
	1 1 1 1	
Uzman 5	Giriş	
	Sayılar ve İşlemler	
	Doğal Sayılar	
	5.1.1.3	
	Resim	
	1 1 1 2	
UZLAŞI: Görselin yaşa uygunluğu maddesi dışında inceleme sonuçlarında ortaklık görülmüştür. Bu noktada beşinci sınıf öğrencilerinin karşılaştığı bir desen olduğu için yaşlarına uygun kararına varılmıştır.	KARAR	Giriş
		Sayılar ve İşlemler
		Doğal Sayılar
		5.1.1.3
		Resim
		1 1 1 1

Sonuç olarak matematik-sanat ilişkilendirmesi belirlenen bölümün fotoğrafı, kitaptaki konumu, öğrenme alanı, alt öğrenme alanı, kazanım kodları, sanat dalı, inceleme kriteri ve uygunluk derecesi gibi başlıklar bulunduran “Veri Toplama Formu” hazırlanmıştır. Oluşturulan veri formundan bir örnek Tablo 5’te verilmiştir.

Tablo 5. Altıncı sınıf MDK'nda belirlenen kısma göre matematik-sanat ilişkilendirmesi incelenmesi

Kitaptaki bölümü	Öğrenme Alanları	Alt Öğrenme Alanları	Kazanım Kodu	Sanat Dalı	İnceleme Kriteri	Uygunluk derecesi
<p>Birlikte Öğrenelim</p> <p>Kümelerin farklı gösterim yöntemleri vardır. Bunlar venn şeması yöntemi, liste yöntemi ve ortak özellik yöntemi olmak üzere 3 tanedir. Aşağıda verilen çalgıları farklı gösterim yöntemleri ile inceleyelim.</p>  <p>Venn şeması yöntemi ile gösterelim.</p> <p>Elemanlar kapalı bir eğri içine alınarak ve her eleman bir nokta ile belirtilerek aşağıdaki gibi gösterilebilir.</p>  <p>Liste yöntemi ile gösterelim.</p> <p>Kümeyi oluşturan elemanlar küme parantezi içinde virgüllerle ayrılarak gösterilebilir.</p> <p>V = {davul, perküsyon, bateri, ksilofon, trampet} T = {viyolonsel, elektrogitar, ut, cümbüş, arp}</p> <p>Ortak özellik yöntemi ile gösterelim.</p> <p>Kümeyi oluşturan elemanların ortak özelliği varsa ve ortak özellikler bu kümeyi belirtmek için yeterli ise, küme elemanlarının ortak özelliği küme parantezi içine yazılır.</p> <p>V = {Vurmalı çalgılar} T = {Telli çalgılar}</p> <p>(MEB 6. Sınıf MDK., 2021, s. 45)</p>						
Çözümlü sorular	Sayılar ve İşlemler	Kümeler	6.1.3.1	Müzik	İçerik görsel uyumu	1
					İlgili metnin sanatla ilişkisinin vurgulanması	2
					Görselin dikkat çekiciliği	1
					Görselin yaşa uygunluğu	1

Güvenirlilik ve Geçerlilik

Araştırmanın güvenilirliği için araştırma soruları çerçevesinde 18 yıllık deneyimli üç matematik öğretmeni, iki görsel sanatlar öğretmeni olmak üzere beş uzmandan tek tek OMDK incelenerek matematik-sanat ilişkisi olduğu düşünüldükleri bölümleri tespit etmeleri istenmiştir. Miles-Huberman modeline göre başlangıç aşamasında nitel veriler araştırmanın analizi için düzenlenmeli, incelenmesi için uygun şekli almalıdır (Baltacı, 2017). Bu noktada uzmanlarla yapılan görüşmelerde matematik-sanat ilişkilendirmesi bulunduğu düşünülen bölümler sebepleriyle tartışılmıştır. Tartışmaya göre verilerde ortak görüş sağlanmıştır. Ortak fikirde buluşulamayan veriler azaltılmıştır. Miles ve Huberman'ın (1994) tavsiye ettiği kodlayıcı güvenirlilik yüzde hesabı için [Güvenirlilik = Görüş Birliği / (Görüş Birliği + Görüş

Ayrılığı)] formülü ile hesap yapılmıştır. Sonuç olarak bireysel ve toplu görüşmelerden yola çıkarak “görüş birliği” ve “görüş ayrılığı” olan bölümlerin sayısı tespit edilerek kodlayıcı güvenilirlik yüzdesi % 91,23 olarak hesaplanmıştır. Uzmanların ortak görüşleriyle kabul gören bölümlerden ana çerçeve oluşturulmuştur. Bu düzenlemeyle belirlenen bölümler, veri formundaki kriterlerin uygunluk derecesine göre bulgular toplanmıştır. Sonrasında bir devlet üniversitesinde matematiksel ilişkilendirme üzerine araştırmaları olan bir öğretim üyesiyle son kez irdelenerek veriler son halini almış ve veri formu doldurulmuştur.

Bulgular

Araştırmanın bulgular kısmında, OMDK’de tespit edilen veriler sanat dallarına göre araştırmanın alt problemleri bağlamında incelenmiştir.

Matematik-Sanat İlişkilendirilmesi Tespit Edilen Bölümlerin Sınıf Seviyelerine Dağılımının İncelenmesi

OMDK’de matematik-sanat ilişkilendirilmesi bulguları sınıf seviyelerine göre incelenmiş ve Tablo 6’da veriler sunulmuştur.

Tablo 6. OMDK’de matematik-sanat ilişkilendirmesi tespit edilen bölümlerin sınıf seviyelerine göre dağılımı

Sınıf seviyesi	Resim f	Heykel f	Mimari f	Edebiyat f	Müzik f	Tiyatro f	Sinema f	Toplam f
5. sınıf	5	0	0	2	1	1	2	11
6. sınıf	2	0	4	1	2	1	0	10
7. sınıf	16	0	4	2	0	0	0	22
8. sınıf	9	0	1	3	0	1	0	14
Toplam	32	0	9	8	3	3	2	57

İncelenen OMDK’nın toplam 57 bölümde matematik-sanat ilişkilendirmesi saptanmıştır. En çok yedinci sınıf MDK (f=22) ilişkilendirme görülürken en az ilişkilendirme altıncı sınıf MDK (f=10) görülmüştür. Sanat dallarına göre en fazla ilişkilendirme resim (f=32), en az sinema (f=2) dalına aittir. Matematik-heykel ilişkilendirmesi (f=0) hiçbir sınıfta yer almamaktadır.

Matematik-Sanat İlişkilendirilmesi Tespit Edilen İçeriğin Kitabın Bölümlerine Göre İncelenmesi

OMDK’de matematik-sanat ilişkilendirilmesi bulguları sınıf seviyelerin bazında kitap bölümlerine göre incelenmiş ve Tablo 7’de veriler sunulmuştur.

Tablo 7. OMDK’de matematik-sanat ilişkilendirmesi tespit edilen bölümlerin sınıf seviyeleri bazında kitap bölümlerine göre dağılımı

Sınıf seviyesi	Kitaptaki bölümü	Resim f	Heykel f	Mimari f	Edebiyat f	Müzik f	Tiyatro f	Sinema f	Toplam f
5. Sınıf MEB kitabı	Giriş	3	0	0	0	0	1	0	4
	Etkinlik	0			0	0	0	0	0
	Çözümlü sorular	1			1	1	0	1	4
	Çözümü öğrencilere bırakılmış sorular	1			1	0	0	1	3
6. Sınıf MEB kitabı	Giriş	0	0	0	0	0	0	0	0
	Etkinlik	1		1	1	1	0		4
	Çözümlü sorular	1		3	0	1	1		6
	Çözümü öğrencilere bırakılmış sorular	0		0	0	0	0		0
7. Sınıf MEB kitabı	Giriş	5	0	2	1	0	0	0	8
	Etkinlik	3		0	1				4
	Çözümlü sorular	4		2	0				6
	Çözümü öğrencilere bırakılmış sorular	4		0	0				4
8. Sınıf MEB kitabı	Giriş	4	0	1	0	0	0	0	5
	Etkinlik	0		0	0		0		0
	Çözümlü sorular	3		0	0		0		3
	Çözümü öğrencilere bırakılmış sorular	2		0	3		1		6
Toplam		32	0	9	8	3	3	2	57

İncelenen OMDK’nda sınıf seviyelerine göre en çok yedinci sınıf MEB kitabı giriş bölümünde (f=8) görülmüştür. Beşinci sınıf MEB kitabı etkinlik, altıncı sınıf MEB kitabı giriş ve çözümü öğrencilere bırakılan sorular ile sekizinci sınıf MEB kitabı etkinlik bölümlerinde (f=0) ilişkilendirme yoktur.

OMDK’de matematik-sanat ilişkilendirmesinin sınıf seviyeleri bazında kitap bölümlerine göre incelenmiş ve Tablo 8’de inceleme örnekleri ve açıklamaları sunulmuştur.

Tablo 8. OMDK’de matematik-sanat ilişkilendirmesinin sınıf seviyeleri bazında kitap bölümüne göre inceleme örnekleri

Belirlenen bölüm	Açıklama
<p>Doğal Sayılarla Bölme İşlemi</p> <p>Tiyatro Yaşanmış, yaşanması mümkün olayların veya insan yaşamının çeşitli yönlerinin sahnede canlandırılarak oynanmasına yönelik eserlere tiyatro denir. Tiyatro, bütün sanatları kullanıp bunları uyumlu bir biçime dönüştüren bir sanattır. Bir tiyatro yapınının, kendine özgü kuralları ve nitelikleri vardır. Özünde hareket vardır. Sözü görünüşe, düşünceyi eyleme dönüştürür. Günümüzde tiyatro 19. yüzyıl öncesi kadar ilgi görmemesine rağmen, tiyatrolarda sergilenen eser sayısı giderek artmaktadır. 2014-2015 sezonunda Türkiye genelindeki tiyatro salonlarında 6825 eser sergilenmiştir.</p> <p>Hiç tiyatro oyunu izlediniz mi? Ülkemizde 2014-2015 sezonunda gösterilen eser sayısına göre, 81 ilin her birinde yaklaşık kaç eser sergilenmiş olabilir?</p> <p>(MEB 5. Sınıf MDK., 2021, s. 58)</p> 	<p>Giriş “Konu anlatımı” kısmı kitap bölümünde “Giriş” kısmında yer almıştır.</p>
<p>Fibonacci dizisi</p> <p>Doğanın kanunlarını matematiksel bir şekilde açıklamaya çalışan, matematiğin sınırlarını Avrupa’ya tanıtan, en meşhur dizilerden bir tanesine adını veren ünlü matematikçi Fibonacci’dir. Kendi adını verdiği Fibonacci dizisinin ilk iki terimi 1 ve 1’den oluşmaktadır.</p> <p>1-1-2-3-5-8-13-21-34-...</p>  <p>Fibonacci dizisinin her yerde olduğunu biliyor muydunuz?</p> <p>Dizinin kuralı şöyledir: Önceki iki terimi toplayarak yeni terim oluşturun ve bu şekilde sayıların hızla arttığını göreceksiniz.</p>  <p>Ayçiçeğinin merkezinden dışarıya doğru sağdan sola ve soldan sağa doğru taneler sayıldığında çıkan sayılar Fibonacci dizisinin ardışık terimleridir.</p>  <p>Çam kozalağındaki taneler kozalağın altındaki sabit bir noktadan kozalağın tepesindeki başka bir sabit noktaya doğru spiraller (eğriler) oluşturarak çıkarlar. İşte bu taneler soldan sağa ve sağdan sola sayıldığında çıkan sayılar, Fibonacci dizisinin ardışık terimleridir.</p> <p>(MEB 6. Sınıf MDK., 2021, s. 51)</p> <p>Birlikte Çözelim 6</p> <p>Türkiye’nin vitrini olan Miniatürk’te mimari eserler $\frac{1}{25}$ oranında küçültülmüştür. Buna göre yaklaşık 1550 m uzunluğundaki 15 Temmuz Şehitler Köprüsü’nün Miniatürk’teki maket uzunluğunun kaç metre olduğunu bulalım.</p> <p>Çözüm:</p> <p>Bir eserin $\frac{1}{25}$ oranında küçültülmesi, her 25 biriminin 1 birimle temsil edilmesidir. Bu durumda bütün eserlerin maket uzunluğunun gerçek uzunluğuna oranı $\frac{1}{25}$ olur.</p> $\frac{\text{Köprü'nün Miniatürk'teki maketinin uzunluğu}}{\text{Köprü'nün gerçek uzunluğu}} = \frac{x}{1550} = \frac{1}{25}$ $\frac{x}{1550} = \frac{1}{25}$ $\frac{x}{1550} = \frac{62}{1550}$ $x = 62$ <p>15 Temmuz Şehitler Köprüsü’nün Miniatürk’teki maketinin uzunluğu 62 m’dir.</p> <p>Birlikte Çözelim 7</p> <p>$\frac{1}{100000}$ ölçekli bir haritada iki şehir arası 3 cm olarak ölçülmüştür. Bu iki şehir arasındaki gerçek uzaklığın kaç kilometre olduğunu bulalım.</p> <p>(MEB 7. Sınıf MDK., 2021, s. 147)</p>	<p>Etkinlik “Bunları biliyor musunuz?” kısmı kitap bölümünde “Etkinlik” başlığı altında kategorize edilmiştir.</p>
<p>MINIATÜRK</p> <p>İstanbul’da 02 Mayıs 2003 tarihinde ziyarete açılan Miniatürk, “Büyük Ülkenin Küçük Bir Modeli” sloganıyla Türkiye’nin vitrini olmuştur.</p> <p>Antik Çağ’dan Roma’ya, Bizans’a, Selçuklu’ya, Osmanlı’ya değin bu topraklarda hüküm süren medeniyetlerden kalan 132 mimari eserin 1/25 oranında küçültülmüş minyatür modelleri Miniatürk’te sergilenmektedir.</p>	<p>Çözümlü sorular</p> <p>Kitaptaki “Birlikte çözelim” kısmı kitap bölümü olarak “Çözümlü sorular” başlığı altında toplanmıştır.</p>

24. * Sinekli Bakkal * Osmancık
 * Beyaz Gemi * Ateşten Gömlek
 * Dertli Dolap

Yağmur, arkadaşı Esra'ya doğum günü hediyesi olarak yukarıdaki kitap listesinde bulunan kitapların içinden birini seçecektir. Yağmur'un "Ateşten Gömlek" romanını hediye etme olasılığı aşağıdakilerden hangisidir?

- A) $\frac{1}{3}$ B) $\frac{1}{4}$ C) $\frac{1}{5}$ D) $\frac{1}{6}$

Çözümü öğrencilere bırakılmış sorular Kitaptaki "Ünite değerlendirme soruları" bu başlıkta toplanmıştır.

(MEB 8. Sınıf DK., 2021, syf 106)

Matematik-Sanat İlişkilendirilmesi Tespit Edilen Bölümlerin Öğrenme Alanlarına Göre Dağılımının İncelenmesi

OMDK'de matematik-sanat ilişkilendirilmesi bulguları sınıf seviyelerin bazında öğrenme alanlarına göre incelenmiş ve Tablo 9'da veriler sunulmuştur.

Tablo 9. OMDK'de matematik-sanat ilişkilendirmesi tespit edilen bölümlerin sınıf seviyeleri bazında öğrenme alanlarına göre dağılımı

Sınıf seviyesi	Öğrenme Alanı	Resim f	Heykel f	Mimari f	Edebiyat f	Müzik f	Tiyatro f	Sinema f	Top f
5. Sınıf MEB kitabı	Sayılar ve İşlemler	3			1	1	1	0	6
	Geometri ve Ölçme	2	0	0	0	0	0	1	3
	Veri Analizi	0			1	0	0	1	2
6. Sınıf MEB kitabı	Sayılar ve İşlemler	1		2	0	2	0		5
	Cebir	0	0	0	1	0	0	0	1
	Geometri ve Ölçme	1		2	0	0	1		4
7. Sınıf MEB kitabı	Sayılar ve İşlemler	1		2	0				3
	Cebir	2	0	0	1	0	0	0	3
	Geometri ve Ölçme	13		2	1				16
8. Sınıf MEB kitabı	Sayılar ve İşlemler	1		0	0		0		1
	Cebir	0	0	0	1		1		2
	Geometri ve Ölçme	8	0	1	0	0	0	0	9
	Olasılık	0		0	2		0		2
Toplam		32	0	0	9	8	3	2	57

OMDK'ında sınıf seviyeleri bazında en çok matematik-sanat ilişkilendirmesi yedinci sınıf seviyesinde *geometri ve ölçme* öğrenme alanıyla (f=16) ilgiliyken en az ilişkilendirme altıncı sınıf seviyesinde *cebir* öğrenme alanı (f=1) ve sekizinci sınıf seviyesi *sayılar ve işlemler*(f=1) öğrenme alanı üzerinedir. Beşinci sınıf MEB kitabı hariç diğer kitaplarda *veri analizi* (f=0) öğrenme alanında matematik sanat ilişkilendirmesi olan içerik bulunmamaktadır. OMDK'ndaki matematik-sanat ilişkilendirmesi olan bölümlerden öğrenme alanlarına göre yapılan inceleme örneği Tablo 12'de yer almaktadır.

Matematik-Sanat İlişkilendirilmesi Tespit Edilen Bölümlerin Alt Öğrenme Alanlarına Göre İncelenmesi

OMDK'de matematik-sanat ilişkilendirilmesi bulguları sınıf seviyelerin bazında alt öğrenme alanlarına göre incelenmiş ve Tablo 10'da veriler sunulmuştur.

Tablo 10. OMDK'de matematik-sanat ilişkilendirmesi tespit edilen bölümlerin sınıf seviyeleri bazında alt öğrenme alanlarına göre dağılımı

Sınıf seviyesi	Alt öğrenme alanı	Resim f	Heykel f	Mimari f	Edebiyat f	Müzik f	Tiyatro f	Sinema f	Top f
5. Sınıf MEB kitabı	Doğal sayılar	2			0	0	0	0	2
	Doğal sayılar ve işlemler	0			0	0	1	0	1
	Kesirler	1			0	0	0	0	1
	Kesirlerle işlemler	0			0	1	0	0	1
	Yüzdeler	0	0	0	1	0	0	0	1
	Temel Geometrik Kavramlar ve Çizimler	1			0	0	0	1	2
	Üçgenler ve Dörtgenler	1			0	0	0	0	1
	Veri toplama ve değerlendirme	0			1	0	0	1	2
6. Sınıf MEB kitabı	Doğal sayılar ve İşlemler	1		1	0	0	0		2
	Kümeler	0		0	0	1	0		1
	Kesirlerle işlemler	0		0	0	1	0		1
	Oran	0	0	1	0	0	0	0	1
	Cebirsel ifadeler	0		0	1	0	0		1
	Açılar	0		1	0	0	1		2
	Alan ölçme	1		1	0	0	0		2
7. Sınıf MEB kitabı	Cebirsel ifadeler	1		0	1				2
	Eşitlik ve denklem	1		0	0				1
	Oran ve Orantı	1		2	0				3
	Doğrular ve Açılar	0	0	1	1	0	0	0	2
	Çokgenler	1		1	0				2
	Cisimlerin farklı yönlerden görünümü	12		0	0				12
8. Sınıf MEB kitabı	Kareköklü ifadeler	1		0	0		0		1
	Basit olayların olma olasılığı	0		0	2		0		2
	Cebirsel ifadeler ve Özdeşlik	0	0	0	0	0	1	0	1
	Eşitsizlikler	0		0	1		0		1
	Üçgenler	0		1	0		0		1
	Dönüşüm geometrisi	8		0	0		0		8
	Toplam	32	0	9	8	3	3	2	57

OMDK incelendiğinde matematik-sanat ilişkilendirmesi alt öğrenme alanlarına göre en çok yedinci sınıf seviyesinde cisimlerin farklı yönlerden görünümüleri (f=12) alt öğrenme alanında görülmüştür. Bu veriyi takiben sekizinci sınıf MEB kitabı dönüşüm geometrisi (f=8)

alt öğrenme alanında fazlaca veri tespit edilmiştir. OMDK'de matematik-sanat ilişkilendirmesi tespit edilen bölümlerden alt öğrenme alanlarına göre inceleme örneği Tablo 12'dedir.

Matematik-Sanat İlişkilendirilmesi Tespit Edilen Bölümlerin Sınıf Seviyeleri Bazında Kazanım Numaralarına Göre İncelenmesi

OMDK'de matematik-sanat ilişkilendirilmesi bulguları sınıf seviyeleri bazında kazanım kodlarına göre incelenmiş ve Tablo 11'de veriler sunulmuştur.




Tablo 11. OMDK'de matematik-sanat ilişkilendirmesi tespit edilen bölümlerin sınıf seviyeleri kazanım kodlarına göre dağılımı

Sınıf seviyesi	Kazanım numarası	Resim f	Heykel f	Mimari f	Edebiyat f	Müzik f	Tiyatro f	Sinema f	Top f
5. Sınıf MEB kitabı	5.1.1.3	2			0	0	0	0	2
	5.1.2.5	0			0	0	1	0	1
	5.1.3.6	1			0	0	0	0	1
	5.1.6.3	0			1	0	0	0	1
	5.1.4.2	0	0	0	0	1	0	0	1
	5.2.1.1	1			0	0	0	0	1
	5.2.1.2	0			0	0	0	1	1
	5.2.2.1	1			0	0	0	0	1
	5.3.1.1	0			1	0	0	1	2
6. Sınıf MEB kitabı	6.1.1.4	1		1	0	0	0		2
	6.1.3.1	0		0	0	1	0		1
	6.1.5.1	0		0	0	1	0		1
	6.1.7.1	0		1	0	0	0		1
	6.2.1.1	0	0	0	1	0	0	0	1
	6.3.1.1	0		0	0	0	1		1
	6.3.1.3	0		1	0	0	0		1
	6.3.2.3	1		0	0	0	0		1
	6.3.2.4	0		1	0	0	0		1
7. Sınıf MEB kitabı	7.1.4.1.	1		0	0				1
	7.1.4.2	0		1	0				1
	7.1.4.3	0		1	0				1
	7.2.1.3	1		0	1				2
	7.2.2.1	1		0	0				1
	7.3.1.1	0	0	1	0	0	0	0	1
	7.3.1.2	0		0	1				1
	7.3.2.1	0		1	0				1
	7.3.2.3	1		0	0				1
	7.3.4.1	7		0	0				7
7.3.4.2	5		0	0				5	
8. Sınıf MEB	8.1.3.8	1		0	0		0	0	1
	8.2.1.2	0	0	0	0	0	1	0	1

kitabı	8.2.3.3	0	0	1	0	1			
	8.3.1.1	0	1	0	0	1			
	8.3.2.1	1	0	0	0	1			
	8.3.2.2	3	0	0	0	3			
	8.3.2.3	4	0	0	0	4			
	8.5.1.5	0	0	2	0	2			
TOPLAM		32	0	9	8	3	3	2	57

OMDK'ındaki matematik-sanat ilişkilendirmesi en çok yedinci sınıf MEB kitabında 7.3.4.1 (f=7) numaralı kazanımdır. Yapılan incelemelerde Tablo 12'de belirtildiği gibi farklı sınıf seviyelerinde çeşit çeşit kazanım kodu görülmüştür. Görülen bu ilişkilendirmelerden kazanım koduna göre inceleme örneği Tablo 12'de verilmiştir.

Tablo 12. OMDK'de matematik-sanat ilişkilendirmesinin sınıf seviyeleri bazında kazanım numaralarına göre inceleme örneği

Belirlenen bölüm	Açıklama
<p>2) Arkadaşlarınızın kitap okuma alışkanlıklarını belirlemek için araştırma soruları oluşturunuz.</p> <p>(MEB 5. Sınıf DK., 2021, syf 253)</p>	<p>5.3.1.1 (5) 5. Sınıf (3) Veri analizi öğrenme alanı (1) Veri toplama ve değerlendirme alt öğrenme alanı (1) 1. kazanım</p>
<p>Birlikte Yapalım 10</p> <p>Yandaki müzik aletlerini ve verilen kesirleri kullanarak kesirlerle toplama ve çıkarma işlemi gerektiren bir problem kuralım ve çözelim.</p> <p>Kullanılacak kesirler: $\frac{5}{20}$, $\frac{2}{4}$</p>  <p>Gitar Keman Piyano</p> <p>(MEB 6. Sınıf MDK., 2021, s. 45)</p>	<p>6.1.3.1 (6) 6. Sınıf (1) Sayılar ve işlemler öğrenme alanı (3) Çokgenler alt öğrenme alanı (1) 1. kazanım</p>
 <p>22.09.1983 tarihinde kabul edilen 2893 Sayılı Bayrak Kanunu'nda Türk bayrağının şekli, yapımı ve korunması ile ilgili esas ve usuller belirtilmiştir. Buna göre Türk bayrağı, kısa kenar uzun kenarına oranı 2:3 olan dikdörtgendir.</p> <p>Dünyada neredeyse tüm bayraklar dikdörtgen şeklindedir. Ancak bazı ülkelerin bayrakları dikdörtgen şeklinde değildir. Örneğin İsviçre bayrağı kare şeklindedir. Nepal bayrağının kendine has bir şekli vardır. Genellikle bayraklar 2:3 oranında çizilirken Belçika bayrağında bu oran 13:15'tir ve yine de dikdörtgendir.</p>  <p>İsviçre Bayrağı Nepal Bayrağı Belçika Bayrağı</p> <p>(MEB 7. Sınıf DK., 2021, syf 208)</p>	<p>7.3.2.3 (7) 7. Sınıf (3) Geometri ve ölçme öğrenme alanı (3) Kümeler alt öğrenme alanı (1) 1. kazanım</p>

a) Bir tiyatro salonunda (3a - 1) tane sıra ve her sırada da (2a - 5) tane koltuk olduğuna göre bu sinema salonunda kaç tane koltuk vardır?



8.2.1.2
(8) 8. Sınıf
(2) Cebir öğrenme alanı
(1) Cebirsel ifadeler ve özdeşlik alt öğrenme alanı
(2) 2. kazanım

(MEB 8. Sınıf MDK., 2021, s. 93)

Matematik-Sanat İlişkilendirmesi Tespit Edilen Bölümlerin İçeriklerinin Bazı Kriterlere Göre İncelenmesi

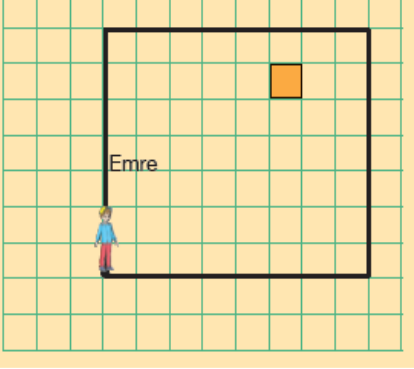

OMDK'de matematik-sanat ilişkilendirilmesi bulguları sınıf seviyelerin bazında her bir kriter için tek tek incelenerek uygunluk derecesine göre frekans değerleri Tablo 13'teki verilerle sunulmuştur.

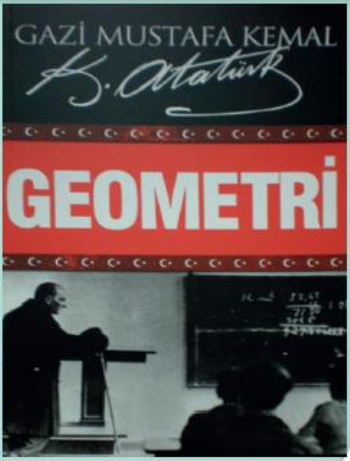
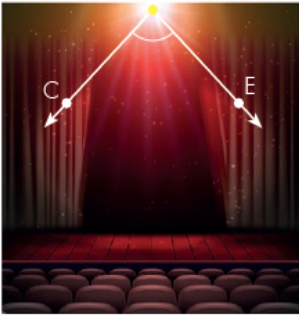
Tablo 13. OMDK'de matematik-sanat ilişkilendirmesi tespit edilen bölümlerin sınıf seviyeleri bazında inceleme kriterlerinin uygunluk derecesine göre dağılımı

Sınıf seviyesi	İçerik-Görsel Uyumu				İlgili metnin sanatla ilişkisinin vurgulanması				Görselin dikkat çekiciliği				Görselin yaşa uygunluğu			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
5. Sınıf MDK	8	-	-	3	7	4	-	-	7	1	-	3	8	-	-	3
6. Sınıf MDK	10	-	-	-	10	-	-	-	10	-	-	-	10	-	-	-
7. Sınıf MDK	22	-	-	-	9	13	-	-	21	1	-	-	21	1	-	-
8. Sınıf MDK	11	-	-	3	9	5	-	-	9	2	-	3	11	-	-	3
TOPLAM	51	0	0	6	35	22	0	0	47	4	0	6	50	1	0	6

OMDK 'ndaki matematik-sanat ilişkilendirmesi saptanan 57 bölüm her bir kriter için tek tek incelenmiştir. Bu kriterlerden içerik-görsel uyumu kriterine göre 6 bölümde görsel olmadığı için veri yok (4) olarak yorumlanırken geriye kalan bölümler (f=51) uygun (1) görülmüştür. Bir diğer kriter olan ilgili metnin sanatla ilişkisinin vurgulanması açısından incelendiğinde yarısından çoğu (f=35) uygun (1) bulunurken, yarısına yakını vurgulanması konusunda metinlerde eksiklik olduğundan geliştirilmeli (2) olarak değerlendirilmiştir. Bir diğer kriter olan görselin dikkat çekiciliğine göre incelendiğinde yine altı bölümde görsel olmadığı için veri yok (4) olarak ifade edilirken kalan bölümlerin çok azı (f=4) geliştirilmeli (2), kalan bölümler (f=47) ise uygun (1) olarak yorumlanmıştır. Son olarak görselin yaşa uygunluğu kriterine göre yine aynı altı bölüm veri yok (4) olarak açıklanırken kalan bölümlerin neredeyse hepsi (f=50) uygun (1) olarak açıklanmıştır. Sadece yedinci sınıf MEB kitabının giriş konumunda bulunan bölümlerden bir tanesi matematik-mimari ilişkilendirmesi açısından geliştirilmeli (2) olarak değerlendirilmiştir. Bu değerlendirmelerden örnekler Tablo 14'te yer almaktadır.

Tablo 14. OMDK’de yer alan matematik-sanat ilişkilendirmesi tespit edilen bölümlerin kriterlere göre incelenip yorumlanması örnekleri

Belirlenen bölüm ile uygunluk kriteri, derecesi, yorumu	<p>6) Yandaki kareli kâğıtta bir sinema salonunun oturma planı gösterilmiştir. Salonun girişinde bulunan Emre’ye turuncu ile gösterilen yerini nasıl tarif edersiniz?</p> 		<p>(MEB 5. Sınıf MDK., 2021, syf 204)</p>	
	İçerik görsel uyumu -1-	İlgili metnin sanatla ilişkisinin vurgulanması -2-	Görselin dikkat çekiciliği -2-	Görselin yaşa uygunluğu -1-
Belirlenen bölüm ile uygunluk kriteri, derecesi, yorumu	Sinema salonun oturma planı hakkında verilen içerikle verilen görsel uyumludur.	Sinema salonu oturma planı anlatılan metin için kullanılan görsel, tam olarak sinema salonunu yansıtmadığı için geliştirilmesi gerekmektedir.	Kullanılan görselin sinema mı, tarla mı tam olarak .ne olduğu anlaşılmadığı için görselin dikkat çekiciliği artırılmalıdır.	Verilen görsel beşinci sınıf öğrencisi için uygundur.
	<p>— Birlikte Öğrenelim</p> <p>1272 yılında Kırşehir’de yapımı tamamlanan Anadolu Selçuklu Dönemi eseri olan Cacabey Medresesi, o dönemde astronomi araştırmalarının yapıldığı gökbilim merkezidir. Mimarisinde kullanılan kabartmalar dünyanın şeklini, küreler ise Güneş ve Ay’ı simgelemektedir. Füzeye benzeyen sütunlar ve bugün minare olarak kullanılan gözlem kulesi dikkat çekicidir. Ayrıca bilim adamlarının 2005 yılında dünyaya duyurduğu Güneş sisteminin 10. gezegeninin izleri yaklaşık 750 yıl önce medresedeki sütunlarda yerini almıştır. Cacabey Medresesi’ni görmek isteyen bir grup öğrenci İstanbul’dan Kırşehir’e araçla yola çıkmış, 300 dakikada 450 km yol aldıktan sonra mola vermiştir. Moladan sonra aynı hızla devam eden bu aracın gideceği yere ulaşması için 180 km yolu kalmıştır. Buna göre aracın İstanbul-Kırşehir arasındaki mesafeyi kaç saatte tamamladığını bulalım.</p> 		<p>(MEB 6. Sınıf MDK., 2021, s. 25)</p>	
İçerik görsel uyumu -1-	İlgili metnin sanatla ilişkisinin vurgulanması -1-	Görselin dikkat çekiciliği -1-	Görselin yaşa uygunluğu -1-	
Belirlenen bölüm ile uygunluk kriteri, derecesi, yorumu	Cacabey Medresesi ile ilgili açıklamalar ve fotoğraf görseli birbiriyle uyumludur.	Anadolu Selçuklu Dönemi eseri olan Cacabey Medresesi ile ilgili metinde sanatsal ifadeler yer verildiği için bu kriter uygundur.	Cacabey Medresesinin fotoğrafı öğrencinin meraklanmasını sağlayacak şekilde verilmiştir.	Altıncı sınıf seviyesi için uygun bir görsel kullanılmıştır.

Belirlenen bölüm ile uygunluk kriteri, derecesi, yorumu	<h3 style="text-align: center;">Paralel İki Doğrunun Bir Kesenle Yaptığı Açılar</h3> <p>Türkiye Cumhuriyeti'nin kurucusu Mustafa Kemal Atatürk, Türk milletine her alanda yenilik ve çağdaşlığın yolunu açarken bilimsel anlamda da oldukça faydalı çalışmalara imza atmıştır. Atatürk'ün 1936-1937 yılları arasında yazdığı 44 sayfalık "Geometri" kitabı sayesinde bugün geometri terimleri daha kolay ve anlaşılır şekilde yazılıp okunmaktadır.</p> <p>Atatürk tarafından matematik ve geometri alanlarında değiştirilen bazı Osmanlıca açı terimlerinin Türkçe karşılıkları aşağıdaki tabloda verilmiştir.</p> <p>Tablo: Geometri Terimlerinin Türkçe Karşılıkları</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #f4a460;">Osmanlıca Terimler</th> <th style="background-color: #f4a460;">Atatürk'ün Önerdiği Terimler</th> </tr> </thead> <tbody> <tr> <td>zâviye</td> <td>Açı</td> </tr> <tr> <td>re'sen mütekebil zâviyeler</td> <td>Ters açılar</td> </tr> <tr> <td>zâviyei hadde</td> <td>Dar açı</td> </tr> <tr> <td>zâviyetan'ı mütabâdiletân-ı dâhiletan</td> <td>İç ters açılar</td> </tr> <tr> <td>zâviyetan-ı mütevâfikatân</td> <td>Yöndeş açılar</td> </tr> </tbody> </table>  <p>(MEB 7. Sınıf MDK., 2021, s. 194)</p>				Osmanlıca Terimler	Atatürk'ün Önerdiği Terimler	zâviye	Açı	re'sen mütekebil zâviyeler	Ters açılar	zâviyei hadde	Dar açı	zâviyetan'ı mütabâdiletân-ı dâhiletan	İç ters açılar	zâviyetan-ı mütevâfikatân	Yöndeş açılar
Osmanlıca Terimler	Atatürk'ün Önerdiği Terimler															
zâviye	Açı															
re'sen mütekebil zâviyeler	Ters açılar															
zâviyei hadde	Dar açı															
zâviyetan'ı mütabâdiletân-ı dâhiletan	İç ters açılar															
zâviyetan-ı mütevâfikatân	Yöndeş açılar															
	İçerik görsel uyumu -1-	İlgili metnin sanatla ilişkisinin vurgulanması -1-	Görselin dikkat çekiciliği -1-	Görselin yaşa uygunluğu -1-												
	Geometri kitabı ile ilgili içerik ile geometri kitabı görseli uyumludur.	İlgili metinde Atatürk tarafından değiştirilen kavramlar ifade edilerek edebiyat sanatına vurgu yapılmıştır.	Geometri kitabının kapağı görseli dikkat çekicidir.	Yedinci sınıf öğrencileri için uygun bir görseldir.												
Belirlenen bölüm ile uygunluk kriteri, derecesi, yorumu	<h3 style="text-align: center;">Birlikte Öğrenelim</h3> <p>Bir tiyatro sahnesinde sahneyi aydınlatmak için kullanılan spot ışığının oluşturduğu iki ışın aşağıda verilmiştir. Buna göre oluşan açığı belirleyelim, sembolle gösterelim.</p>  <p>İlk olarak spot ışığının oluşturduğu açıklığı belirtmek için kullanılan çizgilerin üzerindeki noktaları harflendirelim. [DC ve DE'nin bir araya gelerek oluşturduğu açığı inceleyelim.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #f4a460;">Sembolle Gösterimi</th> <th style="background-color: #f4a460;">Okunuşu</th> </tr> </thead> <tbody> <tr> <td>\widehat{CDE}</td> <td>CDE açısı</td> </tr> <tr> <td>\widehat{EDC}</td> <td>EDC açısı</td> </tr> <tr> <td>\widehat{D}</td> <td>D açısı</td> </tr> </tbody> </table> <p>(MEB 6. Sınıf MDK., 2021, s. 159)</p>				Sembolle Gösterimi	Okunuşu	\widehat{CDE}	CDE açısı	\widehat{EDC}	EDC açısı	\widehat{D}	D açısı				
Sembolle Gösterimi	Okunuşu															
\widehat{CDE}	CDE açısı															
\widehat{EDC}	EDC açısı															
\widehat{D}	D açısı															
	İçerik görsel uyumu -1-	İlgili metnin sanatla ilişkisinin vurgulanması -1-	Görselin dikkat çekiciliği -1-	Görselin yaşa uygunluğu -1-												
	Verilen metin ile görsel uyumludur	Verilen metinde tiyatro sahnesinin elemanları ile matematik ilişkilendirilerek vurgu yapılmıştır.	Kullanılan görsel ayrıntılı ve net olduğu için dikkat çekicidir.	Altıncı sınıf öğrencisinin yaşına uygundur.												

Tartışma, Sonuç ve Öneriler

OMDK matematik-sanat ilişkilendirmesi incelenmesi amaçlanan bu çalışmada toplamda 57 bölüm tespit edilmiştir. Bu bölümlerin sınıf seviyeleri bazında ilişkilendirilen sanat dalı, kitaptaki bölümleri ile MDÖP göre öğrenme ve alt öğrenme alanı ile kazanım kodu incelenmiştir. Son olarak da ilişkilendirilen sanat dalı ile belirlenen kriterlere göre uygunluk derecesi ile yorumu yapılarak bulgular kısmı tamamlanmıştır.

OMDK'nda matematik-sanat ilişkilendirmesi tespit edilen bölümler en çok yedinci sınıf seviyesinde (f=22), en az ise altıncı sınıf seviyesinde (f=10) karşılaşılmıştır. Sanat dallarına göre incelendiğinde ise en fazla resim (f=32), en az ise sinema (f=2) sanatı ile ilgili ilişkilendirilmiş bölüm tespit edilmiştir. En fazla resim ile matematik ilişkilendirmesi olmasına rağmen altıncı sınıf seviyesinde sadece iki tane ilişkilendirilmiş bölüm saptanmıştır. Coştu (2020) matematik dersinin diğer disiplinlerle ilişkilendirmesi üzerine altıncı sınıf öğrencileri ile yaptığı araştırma sonucunda en az ilişkilendirilen ders olarak resim dersini söylemeleri bu sonuçları destekler niteliktedir. Çünkü öğrenciler ve öğretmenler için ders kitabının önemli bir eğitim materyali olduğuna inanılmaktadır. Ünal (2023) OMDK'ü ilişkilendirme becerisini açısından incelemiş ve diğer disiplinlerle olan ilişkilendirmede yetersiz olduğunu saptamıştır. Ayrıca ders kitaplarının sınıfta en çok yararlanılan materyal olmasına rağmen çeşitli disiplinlerle ilişkilendirme için yeteri kadar önemsenmediği ve çeşitli ilişkilendirmeler ile işlenen derslerin öğrencilerin başarılarını arttırmamasından dolayı ders kitaplarında bu tarz ilişkilendirmelere daha çok yer verilmesi gerektiğini belirtmiştir (Ünal, 2023). Matematik-heykel ilişkilendirmesine ait OMDK'de bölüm (f=0) yer almaması Ünal (2023) çalışmasında belirttiği gibi ilişkilendirmenin ders kitaplarında önem verilmediği düşüncesini desteklemektedir. Oysaki Morando ve Spreafico (2023) araştırmasında ilişkilendirmeyle yapılan matematik eğitiminin öğrenciye keyif verirken öğretmenin süreci benimsemesi adına değişik bir yöntem olduğunu ifade etmiştir. Bu amaçla Milano'da bulunan Emili Tadini eserlerinden ilham alınan bir atölyede matematik-sanat ilişkilendirmesi ihtiva eden heykel ve tablolar temel alınarak ders uygulanmıştır. İlköğretim öğrencilerine uygulanan bu derste üç boyutlu heykeller temel alınıp hazırlanan gökdelenler oyunu oynanmasıyla ders bitirilmiştir. Söz konusu çalışmadan esinlenerek OMDK'de bunun gibi ünlü heykeltıraşlar hakkında bilgilendirilme yapıldıktan sonra *Oran-Orantı* öğrenme alanıyla ilgili çözümlü sorular yazılabilir.

OMDK'de yer alan matematik-sanat ilişkilendirmesinin farklı sınıf seviyesinde kitaptaki bölümlerine baz alınarak yapılan incelemelerde yedinci sınıf MEB kitabının giriş bölümünde (f=8) en fazla ilişkilendirme görülmüştür. Genel olarak ilişkilendirmeler ders kitabının en çok çözümlü sorular (f=19) bölümünde görülürken, en az etkinlik (f=8) bölümünde tespit edilmiştir. Oysaki Bingölbali ve Bingölbali (2020) etkinliklerin çeşitli özelliklerinden kaynaklı sınıf içi uygulamalarda biçimlendirici ve ders kitaplarının öğrenim, öğretim yaklaşımları olmak üzere çok fazla konuda önemli bir yer sağlayacağını düşündüklerini belirtmişlerdir. Bu bakış açısıyla etkinliklerde matematik-sanat ilişkilendirmelerinin daha etkili ve daha fazla sayıda olması beklenmektedir. Literatür incelendiğinde etkinlik temelli matematik-sanat ilişkilendirmeli ders uygulamaları çalışmalarının öğrencileri motive ettiği ve öğrenci başarısını arttırdığı görülmüştür (Altunbay & Soylu, 2020; Atasay & Erdoğan, 2017; Işıtan & Doğan, 2020). Bu sebeple bu tarz uygulama etkinliklerinin ders kitaplarında da yer alması hem öğretmene yol gösterici olması açısından hem de ders işlemini zenginleştirmesinden daha verimli olacağına inanılmaktadır.

Bu ilişkilendirmeler farklı sınıf seviyelerinde öğrenme alanlarına göre incelendiğinde en çok yedinci sınıf *geometri ve ölçme* (f=19) öğrenme alanı ile ilgili olduğu görülmüştür. Bu veriyi takiben sekizinci sınıf MDK'nda da *geometri ve ölçme* (f=9) öğrenme alanıyla ilgili bölümler tespit edilmiştir. Genel olarak öğrenme alanı bazında en çok *geometri ve ölçme* (f=32) öğrenme alanı ve sayılar ve işlemler (f=15) öğrenme alanı üzerine bölümler görülmüştür. Tural-Sönmez (2024) çalışmasında OMDK'nda bilişim ve iletişim teknolojilerinin öğrenme alanı bazında en çok sayılar ve işlemler ile geometri ve ölçme öğrenme alanlarıyla ilgili bölüm olduğunu belirtmiştir. Özellikle sekizinci sınıf MDK *geometri ve ölçme* öğrenme alanı ile ilgili bölümler tespit etmiştir. Bu sonuçlar, araştırmanın sonuçlarına paralellik göstermektedir. OMDK'nda en az ilişkilendirme beşinci sınıf MEB kitabında (f=2) *veri analizi* ve sekizinci sınıf MEB kitabında *olasılık* öğrenme alanında bulunmakta ve diğer sınıf seviyelerinde bu öğrenme alanları bulunmamaktadır. Alt öğrenme alanlarına göre sınıf bazında çeşitli ilişkilendirmeler yer almaktadır. Bunun sebebi olarak *geometri ve ölçme* ile *sayılar ve işlemler* öğrenme alanlarının OMDÖP ve incelenen OMDK her sınıf seviyesinde yer alırken diğer öğrenme alanları hem OMDÖP'nda hem de OMDK'nda çok az yerde geçmesi olarak da görülebilir. Yedinci sınıf MEB kitabında cisimlerin farklı yönlerden görünümü alt öğrenme alanı ile ilgili çok fazla (f=12) ilişkilendirilmiş bölüm belirlenmiştir. Bu değerlere

bağlı olarak “7.3.4.1” (f=7) ile “7.3.4.2” (f=5) kazanım kodlu matematik sanat ilişkilendirmesi olan bölümler en fazla sayıda yer almıştır.

Son olarak ilişkilendirme tespit edilen bölümler belirlenen kriterlere göre uygunluk dereceleri tek tek incelenerek yorumlanmıştır. Sonuç olarak geneli içerik görsel uyumu, görselin dikkat çekiciliği ve görselin yaşa uygunluğu kriterine göre uygun bulunurken, yine bu kazanımlarla ilgili altı bölümde görsel olmadığı için veri yok olarak değerlendirilmiştir. İlgili metnin sanatla ilişkisinin vurgulanması kriterine göre tespit edilen bölümlerin yarısından fazlası uygun bulunurken kalan bölümler geliştirilmeli olarak yorumlanmıştır. TTK Taslak Ders Kitabı ve Eğitim Araçları ile Bunlara Ait Elektronik İçeriklerin İncelenmesinde Değerlendirmeye Esas Olacak Kriterler ve Açıklamaları (2023) kitabının “3.1.4. İçerik, konu alanının özelliğine uygun olarak bütünsel bir yapıda verilmelidir.” maddesine göre ilgili bölümlerin matematik-sanat ilişkilendirmesi noktasında daha etkili metinlerden oluşması gerekmektedir. Bununla birlikte bu kitapta yer alan maddelere matematik-sanat ilişkilendirmesi kriterine göre inceleme sonuçları uyumluluk göstermektedir.

Sonuç olarak tartışma sonuç kısmında verilen maddeler yazılacak yeni bir kitap için yol gösterici olabilir. Ayrıca matematiği diğer disiplinlerle ilişkilendirerek derslerini zenginleştirmek isteyen öğretmenlere kaynak olabilir. Aynı zamanda matematiğe karşı olan ön yargıları azaltmak ve matematiğin her zaman ve her yerde var olduğunu göstermek isteyenlere ışık tutabilir. Yeni müfredatla birlikte matematik derslerinin zenginleştirilmesi ve farklılaştırılması noktasında öğretmenlere ve kitap yazarlarına kaynak olabilir. Bu bağlamda yeni müfredat ile birlikte yeni basım ders kitaplarının matematik-sanat ilişkilendirmesi bağlamında incelenmesi önerilir. Ders içi uygulamalarında öğretmenlerin matematik sanat ilişkilendirmelerinin incelenmesi ve bu konulardaki görüşlerinin ortaya çıkarılması da tavsiye edilir.

Bilgilendirme

Bu çalışma, birinci yazarın ikinci yazar danışmanlığında hazırladığı yüksek lisans tezinden üretilmiştir.

Yazar Katkı Beyanı

Satı Aygül İBAS: Literatür taraması, kavramsallaştırma, metodoloji, veri toplama formunun hazırlanması ve geliştirilmesi, verilerin toplanması, işlenmesi, analizi, yorumlanması, denetim, inceleme-yazma ve düzenleme.

Melike TURAL SÖNMEZ: Kavramsallaştırma, metodoloji, veri toplama formunun geliştirilmesi, verilerin toplanması, işlenmesi, analizi, yorumlanması, denetim, düzenleme.

Kaynaklar

- Acil, A., & Genç, S. (2022). Pisagor ve Marin Mersenne'in monchord'larına müzik ile matematik bağlamında bir bakış. *İstanbul Esenyurt Üniversitesi İşletme ve Yönetim Bilimleri Fakültesi Sosyal Bilimler Araştırmaları Dergisi*, 2(2), 191-200.
- Akarsu, V. (2009). Türk bayrağı ve altın oran ilişkisi. *Erciyes Üniversitesi Fen Bilimleri Enstitüsü Fen Bilimleri Dergisi*, 25(1), 437-448.
- Aktan, G., & Yağmur, B. E. (2019). Altın Oran bağıntısının Leonardo da Vinci'nin eserleri üzerinden incelenmesi. *Uluslararası Bilimsel Araştırmalar Kongresi Sosyal bilimler tam metin bildiri kitabı*, 147-158.
- Altunbay, M., & Soylu, Ş. (2020). Çocuk edebiyatının disiplinler arası öğrenmeye etkisi: Hikaye ile matematik öğrenimi ve bir kitap incelemesi. *Uluslararası Türkoloji Araştırmaları ve İncelemeleri Dergisi*, 5(1), 16-24.
- Ankaralığıl, N. (2013). Fotoğraf ve sinemada kompozisyon: Altın Oran ve Fibonacci spirali bağlamında Spielberg filmleri üzerine görsel çözümleme. *Erciyes İletişim Dergisi*, 3(1).
- Atabey, S. (2023). Matematik ve sanat. *Görünüm*, (14), 61-80.
- Atasay, M., & Erdoğan, A. (2017). Matematik ile sanatın ilişkilendirilmesi: Mandala desenlerinin simetri öğretiminde kullanımı. *Journal of Instructional Technologies & Teacher Education*, 6(2), 58-77.
- Atli, S. (2007). *Matematiksel-mantıksal yetenek ile ritimsel yetenek arasındaki ilişkiler* [Yayımlanmamış yüksek lisans tezi]. Gazi Üniversitesi Eğitim Bilimleri Enstitüsü.
- Ayata, E. (2020). Tarihten günümüze müzik ve matematik ilişkisi. *Pearson journal*, 5(9), 62-73.
- Aydoğdu, E. (2022). *Antik Dönem'de matematik bilgisinin mozaik ve heykel sanatına yansımaları* (Doctoral dissertation, Dokuz Eylül Üniversitesi (Turkey)).
- Ayran, A., & Aydın, N. (2017). Matematik ve doğa. *Journal of Awareness*, 2(3S), 509-514.
- Ayvaz, A. (2010). *Dördüncü sınıf matematik dersi bölme işlemi alt öğrenme alanının edebi ürünlerle işlenmesinin öğrenci başarısı ve tutumuna etkisi*. (Yayımlanmamış yüksek lisans tezi). Sakarya Üniversitesi, Sakarya.
- Bayri, S. (2019). 5-9 yaş aralığındaki çocukların müzik ve matematik ile ilişkileri. *Disiplinlerarası yaklaşımda uluslararası matematik ve müzik kongresi özet ve tam metin bildiri kitabı*, 378-386. Marmara Üniversitesi, İstanbul, Türkiye, 21-22 Haziran.
- Beytekin, S. (2015). *Cazın piyano üzerinden matematiksel analiz ile fraktal geometri ile ilişkisinin analizi*. (Yayımlanmamış yüksek lisans tezi). İstanbul Teknik Üniversitesi, İstanbul.
- Bingölbali, E., & Bingölbali, F. (2020). Çok doğru cevaplı ve çok çözüm metotlu etkinliklerin ortaokul matematik ders kitaplarındaki yeri. *International Journal of Educational Studies in Mathematics*, 7(4), 214-235.

- Bingölbali, E., & Öz diner, M. (2022). İlkokul ve ortaokul matematik ders kitabı etkinliklerinin gerçek hayatla ilişkilendirme açısından incelenmesi. *Afyon Kocatepe Üniversitesi Sosyal Bilimler Dergisi*, 24(1), 45-65.
- Bora, U. (2002). Bilim ve sanatın kesiştiği temel bir nokta: Matematik ve müzik ilişkisi. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 15(1), 53-68.
- Bulut, S., Boz-Yaman, B., & Yavuz, F. D. (2016). 7. sınıf matematik ders kitaplarında dönüşüm geometrisi işlenişinin öğretim programları açısından değerlendirilmesi. *Ilkogretim Online*, 15(4), 1164-1190.
- Bütow, N. Ö. (2021). Allyson Grey resimlerinde geometrik şekiller. *İdil Sanat ve Dil Dergisi*, 10(79), 463-477.
- Coştu, S. (2020). Matematik derslerinde ilişkilendirmenin önemi hakkında 6. sınıf öğrencileri ne söylüyor, ne düşünüyor?. *Eğitim Bilim ve Araştırma Dergisi*, 1(2), 40-63.
- Doğan, A., & Yazıcı, B. (2022). Matematik ile edebileşen eserler. *Sivas Cumhuriyet Üniversitesi Eğitim Bilimleri Enstitüsü Dergisi*, 1(2), 108-119.
- Doyran, E. Y., & Yılmaz, B. (2021). Sanat ve bilim bağlamında İlker Yardımcı'nın heykellerine düşünsel yaklaşımlar. *Uluslararası Disiplinlerarası ve Kültürlerarası Sanat*, 6(12), 89-112.
- Erdoğan, A., Denizli, Z. A., & Çoban, F. N. (2019). Niçin bazı kavramlar matematik dersi öğretim programlarında tutunamıyor? Perspektif çizimler örneği. *Ilkogretim Online*, 18(4), 1858-1874.
- Esi, A. (2017). Matematik ve sanat. *Journal of Awareness (JoA)*, 2(Special), 515-522.
- Güneş, F. (2020). Çocuk tekerlemeleri. *The Journal of Limitless Education and Research*, 5(1), 1-21.
- Gürsoy, E. (2018). Cami tip projelerinde ölçü-oran ilişkisi. *Türk Dünyası Araştırmaları*, 118(232), 211-228.
- Işıtan, S., & Doğan, M. (2020). Matematik müzik ilişkisi: Notalardan kesirlere. *Araştırma Temelli Etkinlik Dergisi*, 10(2), 100-111.
- İlhan, A. Ç. (2019). Türkiye'de sanat ve sanat eğitimi alanında yapılan son değişiklikler. *Ankara Üniversitesi Güzel Sanatlar Fakültesi Dergisi*, 1(1), 9-22.
- İrhan, A. (2013). *Matematik ve geometrinin heykel sanatına etkisi*. (Yayınlanmamış Yüksek Lisans Tezi). Anadolu Üniversitesi, Eskişehir.
- Kaplan, Z. (2021). Oyun tekerlemelerinin işlevsel özellikleri. *Karabük Türkoloji Dergisi*, 3(3), 67-84.
- Karagözoğlu, B. (2024). Büyük Selçuklu Dönemi'nin ünlü astronomu Ömer Hayyâm ve astronomi çalışmalarının rubâilerine yansımaları. *Akademik Tarih Ve Düşünce Dergisi*, 10(6), 2512-2525. <https://doi.org/10.46868/atdd.2023.635>.
- Katipoğlu, M., & Katipoğlu, S. N. (2016). Matematik öğretmenlerinin öğrenci ders kitabı hakkındaki görüşleri. *Uluslararası Eğitim Bilim ve Teknoloji Dergisi*, 2(3), 156-165.
- Katmer, G. (2022). Teknolojik bir aygıt olarak kameranın keşfi ve sinemanın doğuş döneminin incelemesi. *Medeniyet Sanat Dergisi*, 8(2), 229-252.
- Keser, N. (2009). *Sanat Sözlüğü*. Ütopya Yayınları.
- Malkoç, E. (2011). Türkiye'nin ilk minyatür parkı: Miniaturk. *Adnan Menderes Üniversitesi Ziraat Fakültesi Dergisi*, 8 (1), 1-8.
- Morando, P., & Spreafico, M. L. (2023). Math inhabits the museum. In *EDULEARN23 Proceedings* (pp. 2074-2081). IATED.
- MEB (2018). *Görsel sanatlar dersi öğretim programı* (İlkokul ve Ortaokul 1, 2, 3, 4, 5, 6, 7 ve 8. Sınıflar), Ankara.

- MEB (2018). *Matematik dersi öğretim programı* (İlkokul ve Ortaokul 1, 2, 3, 4, 5, 6, 7 ve 8. Sınıflar), Ankara.
- MEB (2018). *Müzik dersi öğretim programı* (İlkokul ve Ortaokul 1, 2, 3, 4, 5, 6, 7 ve 8. Sınıflar), Ankara.
- MEB Talim Terbiye Kurulu (2023). *Taslak ders kitabı ve eğitim araçları ile bunlara ait elektronik içeriklerin incelenmesinde değerlendirmeye esas olacak kriterler ve açıklamaları*, Ankara.
- Oğuzhan, N. (2013). *Tiyatro salonlarında sahne aydınlatması ile salon ve sahne biçiminin ilişkisi*. (Yayınlanmamış yüksek lisans tezi). İstanbul Teknik Üniversitesi, İstanbul.
- Özkan, UB (2019). *Eğitim bilimleri araştırmaları için kapsamlı inceleme yöntemi*. Pegem Akademi.
- Sönmez, M. T. ve Topcal, B. (2022). Ortaokul matematik ders kitaplarındaki finansal okuryazarlık ilişkilendirme içeriklerinin sınıf düzeyine göre analizi. *Kırşehir Eğitim Fakültesi Dergisi*, 23 (3), 2596-2630.
- Şahin, Ö., & Başgül, M. (2019). Türkiye’de matematik ders kitaplarına yönelik yapılan araştırmalardaki eğilimler. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi*, 13(1), 328-358.
- Şeker, N. Ç. (2021). Akustik performansı etkileyen geometrik tasarım parametreleri ve farklı plan tipi örnekleri. *Bilge International Journal of Science and Technology Research*, 5(1), 42-54.
- Tarhan, D. E. (2020). Pythagoras felsefesinde müzik ve matematik ilişkisi üzerine. *Felsefi Düşün-Akademik Felsefe Dergisi*, (15), 203-224.
- Tekkanat, N. (2006). *Altın oran’ın kaynakları ve sanat’a yansımaları*. (Yayınlanmamış yüksek lisans tezi). Akdeniz Üniversitesi, Antalya.
- Thapa, G. B., & Thapa, R. (2018). The relation of golden ratio, mathematics and aesthetics. *Journal of the Institute of Engineering*, 14(1), 188-199.
- Toptaş, R. (2023). Erken rönesans dönemi mimarlarından Filippo Brunelleschi’nin (1376-1446) eserlerinde matematiksel oranlar ve perspektif. *Dicle Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, (32), 1042-1062.
- Tural-Sönmez, M. (2024). Ortaokul matematik dersi öğretim programının ve ders kitaplarının bilgi ve iletişim teknolojileri kullanımına yönlendirme açısından incelenmesi. *Yaşadıkça Eğitim*, 38(2), 284-306.
- Türkcan, B. (2020). *Sanat*. S. Tuna & A.O. Alakuş (Ed). Görsel sanatlar eğitimi (s.1-24). Nobel Yayıncılık: Ankara.
- Ünal, H. K. (2023). *Ortaokul matematik ders kitaplarının ilişkilendirme becerisi açısından incelenmesi*. (Yayınlanmamış yüksek lisans tezi). Pamukkale Üniversitesi, Denizli.
- Yazıcı, Y. E. (2011). Matematikten sanata yansımalar: MC Escher. *Sanat ve Tasarım Dergisi*, 1(8), 59-75.
- Yılmaz, D. (2022). Sanatla ilişkilendirilmiş matematik: İlkokul 4. sınıf öğrencilerinin uygulamaları. *Cukurova University Faculty of Education Journal*, 51(1), 590-633.
- Yolcu, E. (2021). *Sanat eğitimi kuralları ve yöntemleri*. (4. Baskı). Pegem Akademi.

Research Article/Araştırma Makalesi

Studies on Blended Learning in Turkey: A Document Review

Aysel ARSLAN^{1*}  Hilal ÇETİN² 

¹ Sivas Cumhuriyet University, Sivas, Turkey, arslanaysel.58@gmail.com

² Sivas Cumhuriyet University, Sivas, Turkey, hll_cetiinn@hotmail.com


* Corresponding Author: arslanaysel.58@gmail.com

Article Info

Received: 18 July 2024

Accepted: 21 September 2024

Keywords: Blended learning, hybrid, graduate, document review

 10.18009/jcer.1518675

Publication Language: Turkish

Abstract

This study aims to determine the general trends of postgraduate theses in the field of blended learning in Turkey. Postgraduate theses published between 2007-2023 were scanned and 99 theses were identified and included in the study. Document review, which is among the qualitative research methods, was used to obtain the research data. The identified postgraduate theses were examined in accordance with the descriptive analysis technique, percentage and frequency analyzes were made and tabulated. When the findings are examined; It was determined that the most theses on blended learning were written in 2023, there were 64 theses at the master's level and 35 theses at the doctoral level, 93 of these theses were defined as blended learning and 6 of them were defined as hybrid learning. It was found that the number of theses conducted at Gazi University ($f = 21$) was higher than other universities, secondary school students ($f = 25$) were the most preferred sample type, 67 studies were conducted using mixed methods, the most preferred measurement tool as a data collection tool was scale ($f = 50$), and the most preferred data analysis method was t-test.



To cite this article: Arslan, A. & Çetin, H. (2024). Türkiye’de harmanlanmış öğrenme alanında yapılan çalışmalar: Bir doküman incelemesi. *Journal of Computer and Education Research*, 12 (24), 718-737 <https://doi.org/10.18009/jcer.1518675>

Türkiye’de Harmanlanmış Öğrenme Alanında Yapılan Çalışmalar: Bir Doküman İncelemesi

Makale Bilgisi

Geliş: 18 Temmuz 2024

Kabul: 21 Eylül 2024

Anahtar kelimeler: Harmanlanmış öğrenme, hibrit, lisansüstü, doküman incelemesi

 10.18009/jcer.1518675

Yayın Dili: Türkçe

Öz

Bu çalışmada Türkiye’de harmanlanmış öğrenme alanında yapılan lisansüstü tez çalışmalarının genel eğilimlerini belirlemek amaçlanmıştır. Araştırma 2007-2023 yılları arasında yayımlanmış lisansüstü tezler taranmış ve tespit edilen 99 tez çalışmaya dahil edilmiştir. Araştırma verilerinin elde edilmesi için nitel araştırma yöntemleri arasında yer alan doküman incelemesi kullanılmıştır. Belirlenen lisansüstü tezler betimsel analiz tekniğine uygun olarak incelenmiş, yüzde ve frekans analizleri yapılarak tablolaştırılmıştır. Elde edilen bulgulara bakıldığında; harmanlanmış öğrenmeyle ilgili en fazla tezin 2023 yılında yazıldığı, yüksek lisans düzeyinde 64 doktora düzeyinde 35 tez olduğu, bu tezlerin 93 tanesinin harmanlanmış öğrenme, 6 tanesinin hibrit öğrenme olarak tanımlandığı saptanmıştır. Gazi Üniversitesi’nde yapılan tez sayısının ($f = 21$) diğer üniversitelerden fazla olduğu, örneklem türü olarak en fazla ortaokul öğrencilerinin ($f = 25$) tercih edildiği, 67 çalışmanın karma yöntemle yapıldığı, veri toplama aracı olarak en fazla tercih edilen ölçme aracının ölçek ($f = 50$), en fazla tercih edilen veri analiz yönteminin t testi olduğu sonuçlarına ulaşılmıştır.

Summary

Studies on Blended Learning in Turkey: A Document Review

Aysel ARSLAN ^{1*}  Hilal ÇETİN ² 

¹ Sivas Cumhuriyet University, Sivas, Turkey, arslanaysel.58@gmail.com

² Sivas Cumhuriyet University, Sivas, Turkey, hll_cetiinn@hotmail.com

* Corresponding Author: arslanaysel.58@gmail.com

Introduction

The changes brought about by technology are felt intensely in education, just as in every other area of life. With the diversification of ways to access information and the adaptation of technology to education, technology-supported teaching models and methods have found their place in educational life. Moreover, multiple learning environments such as web-based learning, e-learning, computer-assisted learning, blended learning, hybrid learning, and mobile learning have emerged for learners. Among these learning environments, blended learning is defined as a learning model that utilizes multiple methods together to achieve learning, encompassing both distance education and face-to-face education. It is developed based on taking the advantageous aspects of web-supported learning and face-to-face learning while avoiding their disadvantages. The aim of blended learning is to provide a learning environment that combines face-to-face classroom education with online learning, utilizing the most advantageous aspects of both to achieve higher quality teaching. It is stated that a blended learning environment should be created with six purposes in mind: educational environment enrichment, access to information, interpersonal interaction, cost-effectiveness, personal development of the student, and ease of revision. When looking at the models of blended learning, it is observed that they are presented in three models: skill-focused application model, attitude/behavior-focused model, and ability-focused model.

In the literature, the number of master's and doctoral theses prepared on blended learning has increased in recent years. Studies on blended learning reveal that this method is also preferred by researchers. Reflecting all studies as a whole with a new update provides comprehensive information to researchers interested in this subject. Additionally, there are differences in the criteria used in the conducted research. Based on these stated reasons, this

study aims to reveal the descriptive characteristics of master's and doctoral thesis studies conducted in the field of blended learning. The first study determined dates back to 2007, and studies from this date until the end of 2023 have been included in the research scope (2007-2023). The answer to the following question is sought:

- ✓ How do graduate theses on blended learning distribute according to year, thesis type, learning model name, sample group, university, methods and techniques, data collection tools, and data analysis methods?

Method

Research Model

In line with the research objective, document analysis, which is one of the qualitative data collection methods, was used in this study.

Research Material

The material for this research consists of graduate theses registered and accessible at the National Thesis Center. It was found that the oldest accessible graduate thesis dates back to 2007. From this date up to and including 2023, the total number of identified theses is 99. Of these 99 theses, 35 are doctoral and 64 are master's level.

Data Collection and Analysis

The graduate theses were chronologically ordered and subjected to document analysis. Using descriptive analysis, the year of completion, type of thesis, sample group studied, distribution of the universities where the theses were prepared, research methods utilized, data collection tools employed, and analysis methods and techniques applied were determined. The findings identified through descriptive analysis were recorded in Excel, and percentage and frequency analysis were applied.

Results, Discussion and Conclusion sults

It is observed that out of the theses written between 2007-2023, 64 are at the master's level and 35 are at the doctoral level, with 93 theses published under the name of blended learning and 6 under the name of hybrid learning. The broader scope of blended learning encompassing hybrid learning, and the preference for the term "blended learning" in the

literature, despite being used interchangeably, is thought to result in a higher number of theses written under the name of blended learning. Middle school students were the most commonly used sample type, followed by university students. It is noted that graduate theses on blended learning were prepared at 41 different universities. Gazi University had the highest number of theses, followed by Fırat University and Bahçeşehir University. In studies using the blended learning model, it was found that mixed methods were more frequently preferred. From the perspective of data collection tools, 22 different techniques were used. The most frequently used data collection tool was scales.

Based on the findings of this research, the following recommendations are deemed appropriate for educational stakeholders wishing to conduct research in this area:

- ✓ It is observed that studies on blended learning have intensified in recent years. The reasons for this and the findings obtained from these studies can be examined together. Particularly, qualitative research providing in-depth information is thought to provide significant data in this area.
- ✓ This study was conducted under the broad heading of blended learning. A more comprehensive document analysis study can be conducted by including topics such as flexible learning, flipped learning, and virtual-supported learning, which fall within the scope of blended learning.
- ✓ It is observed that mixed methods are predominantly preferred. A metasynthesis study can be conducted by collectively considering the qualitative data in these studies. Additionally, meta-analysis research can be conducted in quantitative studies that prefer frequently used variables such as academic achievement.

Giriş

Teknolojinin getirdiği değişim yaşamın her alanında olduğu gibi eğitimde de yoğun olarak hissedilmektedir. Eğitimin gittikçe dijital tabanlı bir yapıya doğru yöneldiği görülmektedir. Özellikle yeni neslin dijital ortam ve araçları etkin olarak kullanması bu süreci hızlandırmaktadır. Bilgisayarlar, internet, akıllı tahtalar gibi teknolojik aletler bilgiye erişimi kolaylaştırırken bireylere interaktif bir öğrenme yaşantısı sunmaktadır. İnternetin yaygın olarak kullanılmasıyla birlikte yaşamımızın bir parçası haline gelen dijital kitaplar, sosyal medya, sanal kütüphaneler, web sayfaları bilgiye erişimi kolaylaştırmıştır (Taşkıran, 2017). Bilgiye ulaşma yollarının çeşitlenip teknolojinin eğitime adaptasyonu sonucunda teknoloji destekli öğretim model ve yöntemleri eğitim hayatında kendine yer bulmuştur. 1990'ların başında e-öğrenme kavramıyla başlayan bu süreç zaman içinde geleneksel öğretimi desteklemenin çok ötesine geçerek yeni bir öğretim modeli ortaya konulmasını beraberinde getirmiştir (Can, 2022). Öğrenenler için web tabanlı öğrenme, e-öğrenme, bilgisayar destekli öğrenme, harmanlanmış öğrenme, hibrit öğrenme, mobil öğrenme gibi çoklu öğrenme ortamları ortaya çıkmıştır (Vallée ve diğ., 2020). Teknolojik gelişmeler ve öğrenme yöntemlerindeki değişimler geleneksel sınıf ortamının ötesine geçmeyi sağlamıştır. Teknoloji destekli zengin öğrenme ortamları öğrencilere esneklik, bireyselleşme, zaman ve mekân bağımsızlığı imkânı sunmuştur (Bulut, 2023).

Sınıf içi ve internet tabanlı eğitim modellerinin kendilerine özgü olumlu ve olumsuz yanlarının giderilmesi amacıyla bu iki eğitim modelinin birleştirilmesi temelinde yeni arayışlar ortaya çıkmıştır (Graham, 2006). Bu arayışların sonucunda sınıf içi ve internet tabanlı öğrenmenin kesişimi üzerinden harmanlanmış öğrenme olarak tanımlanan model geliştirilmiştir (Graham ve diğ., 2013). Alan yazınında hibrit öğrenme olarak da adlandırılan harmanlanmış öğrenme ile ilgili olarak öğrenmenin gerçekleştirilmesi için birden fazla yolun birlikte kullanılması (Rossett, 2002), uzaktan eğitimi ve yüz yüze eğitimi kapsayan bir öğrenme modeli (Nyika & Modise, 2022; Zagouras ve diğ., 2022), web destekli öğrenme ile yüz-yüze öğrenmenin avantajlı yanlarının alınması ve dezavantajlı yanlarının ise alınmaması temelinde geliştirilen model (Osguthorpe & Graham, 2003) şeklinde tanımlamaların yapıldığı görülmektedir. Harmanlanmış öğrenmede yüz yüze sınıf eğitimiyle çevrimiçi öğrenmeyi birleştirerek her ikisinin en avantajlı yanlarının kullanıldığı bir öğrenme

ortamının sağlanması ve dolayısıyla daha nitelikli bir öğretimin gerçekleşmesi amaçlanmaktadır (Harriman, 2004; Yıldırım, 2023).

Harmanlanmış öğrenme eğitim süreçlerinde eğitimin niteliğinin artırılması, internet ortamlarıyla yüz yüze eğitimin birleştirilmesi, zaman ve emek maliyetinin azaltılması vb. amaçlar çerçevesinde geliştirilmiştir. Walne'ye (2012) göre harmanlanmış öğrenme, eğitim ve içerikte internet ve uzaktan eğitimle eğitimi kişiselleştirme imkânı sunmakta, böylece eğitimde iyileşme sağlanmakta, kullanım maliyetini düşürebilmektedir. Bu öğrenme yönteminde sınıf dışında oluşturulan sanal sınıflarda tekrar sunumları, videolar, notlar, ödevler paylaşılıp, okuldaki ders süresinin öğrencilerin bireyselleşmesine fırsat verecek şekilde daha verimli geçmesi, dersteki etkinliklere daha fazla zaman ayrılması sağlanabilir (Akgündüz, 2019). Ayrıca Graham (2006) eğitimcilerin, düşük maliyet, sosyal etkileşim, pedagojik zenginlik, kişisel faaliyeti artırma ve yenilemede kolaylık sağlaması açısından harmanlanmış öğrenmeyi seçtiklerini ifade etmiştir. Harmanlanmış öğrenmede öğrenciler çevrimiçi süreçte sadece öğretmenleriyle değil birbirleriyle de dijital olarak bağ kurmaktadır (Can, 2022; Graham ve diğ., 2013). Graham ve arkadaşları (2003) eğitimcilerin harmanlanmış öğrenmeyi seçmelerine sebep olarak geliştirilmiş pedagoji, artan erişim ve esnekliği ve ucuz maliyeti göstermiştir. Colins (2003) harmanlanmış öğrenmenin eğitim sürecinde yüz yüze eğitim ve web destekli eğitimin avantajlarını birleştirdiği için öğrencilerin öğrenmeye yönelik daha çok ilgilerinin arttığını söylemektedir. Akgündüz'e (2019) göre ise modelin avantajları, kendi kendine öğrenme, internet kaynaklarını kullanabilme, kendi hızında bireysel öğrenme, etkili iletişim, farklı öğrenme stilleri, sanal sınıf uygulamaları, ders süresini etkili ve verimli kullanmadır.

Harmanlanmış öğrenmenin dezavantajlarına baktığımızda ise yazılım ve donanım eksikliği durumunda öğrenmenin gerçekleştirilememesi en önemli sorun olarak karşımıza çıkmaktadır (Nyika & Modise, 2022; Vaughan, 2007). Özellikle internet ağının yetersiz olduğu yerleşim alanları, internete erişim için gerekli araç-gerece öğrencinin sahip olamaması, öğretmenin veya öğrencinin dijital teknolojiyi kullanma konusundaki yetersizliği de öğrenme süreçlerini olumsuz etkileyen faktörler arasında yer almaktadır. Poon (2012) harmanlanmış öğrenmenin beklenen sonuçları verememesinde başlıca etkenlerin öğrencilerin gerçekçi olmayan beklentileri, öğrencinin izole olmuş hissetmesi, teknolojik sorunlar, teknolojik beceri gerektiren etkinliklerin yapılamaması olduğunu söylemektedir.

Tekdemir (2022) de yazılım ve donanım yetersizliği, internete erişimde sıkıntılar yaşanması, zaman yönetiminde oluşacak yetersizlikler, teknoloji kullanımındaki güçlükler, geleneksel yöntemdeki ders içeriklerinin harmanlanmış öğrenmeye uyarlanmasında ihtiyaç duyulan uzun zaman gibi sorunlar yaşandığını belirtmektedir. Bu sorunların süreç içerisinde giderilmesiyle harmanlanmış öğrenmenin öğretim ortamlarında kullanılması yaygınlaşmaktadır (Graham, 2006). Osguthorpe ve Graham (2003), eğitimcilerin harmanlanmış eğitim ortamını altı amaç doğrultusunda oluşturması gerektiğini belirtmiştir. Bu altı amaç eğitsel ortam zenginliği, bilgiye erişim, kişiler arası etkileşim, maliyet etkinliği, öğrencinin kişisel gelişimi ve revizyon kolaylığı olarak ifade edilmiştir.

Harmanlanmış öğrenmenin kapsamının geniş olması sınıflandırmaların yapılarak farklı model başlıkları altında incelenmesine zemin oluşturmuştur. Harmanlanmış öğrenmenin modellerine baktığımızda ise Valiathan'ın (2002) beceri odaklı uygulama modeli, tutum/davranış odaklı model ve yetenek odaklı model olmak üzere üç modelde sunduğu karşımıza çıkmaktadır. Beceri odaklı uygulama modelinde amaç beceri geliştirmektir. Bu modelde öğrenen yüz yüze sınıf ortamındaki dersten sonra animasyonlar, web tabanlı kurslar gibi içeriklerle kendi öğrenmelerini devam ettirebilir. Tutum/davranış odaklı modelde öğrencilerin tutumlarını geliştirme amacıyla kullanılmaktadır. Yüz yüze eğitime ek olarak rol tabanlı davranışları uygulama fırsatı sunan işbirlikçi öğrenme ortamları sunulabileceği ifade edilmektedir. Son olarak yetenek odaklı modele bakıldığında ise öğrenciye yaparak yaşayarak öğrenebileceği ortamlar sunulmaktadır hızlı karar verme yeteneğinin gelişiminin amaçlandığı görülmektedir. Öğrenmeler uzman danışmanlığında devam etmektedir. Çevrim içi forumlar, sohbet ağları kullanılarak canlı uzman desteği alınabilmektedir (Yıldırım, 2023).

Christensen ve arkadaşları (2013) model sınıflandırmalarını rotasyon modeli, esnek model, seçimli model ve zenginleştirilmiş sanal model olarak dört ana başlık altında toplamıştır. Rotasyon modeli; Öğrenme ortamlarında bulunan öğrencilerden en az biri e öğrenme yaşantısı gerçekleştiriyorsa model rotasyon modeli olarak adlandırılmaktadır. Öğretim tekniklerinde yer alan istasyon tekniğine benzemektedir. Etkinlikler sınıfça yapılabildiği gibi küçük bir grupla istasyonlar oluşturularak da yapılabilir (Can, 2022; Yıldırım, 2023). Rotasyon modeli de kendi içinde istasyon rotasyonu, laboratuvar rotasyonu, ters yüz sınıf ve bireysel rotasyon olmak üzere dört başlığa ayrılmıştır. Bunlardan ilki olan

istasyon rotasyonunda öğrenmelerden en az biri çevrim içidir. Öğretmenin önceden hazırlanmış çizelgeye göre istasyonlar değiştirilmektedir. İkinci sıradaki laboratuvar rotasyonu modelinde öğrenciler öğretmen duyurularına göre istasyonlar arası değişiklik yapmaktadır. Fakat bu modelde farklı olarak istasyonlardan biri yüz yüze diğerlerinin çevrim içi olmaktadır. Üçüncüsü olan ters yüz edilmiş sınıfta öğrenci öğrenmelerini evde ya da herhangi bir web ortamında gerçekleştirmektedir. Sınıfa geldiğinde ise pekiştirici uygulama ve alıştırmalara yer verilmektedir. Sonuncusu olan bireysel rotasyonda öğrenen her öğrenme sonucunda bireysel gelişimine uygun olan başka bir istasyona yönlendirilmektedir. Bu sayede öğrenen öğrenmelerini en üst düzeyde kişileştirme imkânı bulmaktadır (Tonbuloğlu & Tonbuloğlu, 2021).

Esnek modelde rotasyon modelden farklı olarak öğrenenler öğrenmelerini çevrim içi yöntemlerle gerçekleştirir ancak gerekli olduğu zamanlarda yüz yüze yöntemleri kullanılır. Bu modelde öğrenen kendi ihtiyaçlarına göre öğrenme yaşantısını düzenlerken öğretmen de ihtiyaçlar doğrultusunda yüz yüze etkinliklerle öğrencinin öğrenmesini desteklemektedir (Horn & Staker, 2017). Rotasyon ve esnek modelden farklı olarak seçimli modelde öğrenen bu modelde neyi tamamen çevrim içi olarak alacağını, ödevlerini ne zaman yapacaklarını, yüz yüze alacakları derslerin zamanını belirleyerek öğrenme yaşantısını tamamen kendisi düzenleyebilmektedir (Cleveland-Innes & Wilton, 2018). Bakıldığında yüz yüze eğitimin bu modelde yer almadığı görülmektedir. Bu bağlamda öğrenen kendi için en uygun olan zaman ve mekân esnekliğini yakalamış olmaktadır. (Gülbahar ve diğ., 2020). Zenginleştirilmiş sanal modele bakıldığında öğrenenlerin yüz yüze aldıkları eğitimden sonra çevrim içi olarak öğrenmelerini gerçekleştirmeye devam edebildikleri görülmektedir. Fakat her gün yüz yüze eğitim alma zorunlulukları bulunmamaktadır (Yıldırım, 2023). Görüldüğü gibi günümüzde öğrencinin öğrenme ihtiyacı kendi tercihleri doğrultusunda gerçekleştirebileceği farklı modeller bulunmaktadır. Bu modellerin sınıf, erişilebilirlik, öğrenci ihtiyacı, dersin içeriği vb. özellikler dikkate alınmalı ve eğitim süreçlerinde hangisinin daha verimli olacağına karar verilerek uygulamaya geçilmelidir.

Alan yazınında harmanlanmış öğrenme üzerine hazırlanan yüksek lisans ve doktora tezlerinin sayısının son yıllarda artış gösterdiği görülmektedir. Özellikle harmanlanmış öğrenmeye yönelik olarak yapılan çalışmalar bu yöntemin araştırmacılar tarafından da tercih edildiğini ortaya koymaktadır. Hebecci ve Usta (2015) tarafından yapılan çalışmada

harmanlanmış öğrenme ile ilgili 2005-2014 yılları arasında yapılan çalışmaların bir bütün olarak incelendiği görülmektedir. Sontay ve Karamustafaoğlu (2022) harmanlanmış öğrenme ile ilgili yapılmış 2007-2021 yılları arasındaki tez, makale ve bildirilerin toplu olarak incelendiği bir araştırma yapmıştır. Dikmen ve diğerleri (2018) tarafından da harmanlanmış öğrenme üzerine yapılan çalışmaların incelendiği bir araştırma yürütülmüştür. Usta (2007), Ceylan (2015) harmanlanmış öğrenme ortamının öğrencilerin akademik başarısına, Akgündüz (2013) tutum ve motivasyonlarına, Balaman ve Tüysüz (2011) fen dersindeki başarılarına etkisini inceleyen çalışmalar yapmıştır. Lisansüstü olarak yapılan çalışmaların olarak son üç yılda yoğunlaşması önemlidir. Hebecci ve Usta (2015) 44, Sontay ve Karamustafaoğlu (2022) 69 lisansüstü çalışmaya ulaşılmışken yapılan bu çalışmada 99 çalışmaya ulaşılmıştır. Bu bağlamda yaklaşık üçte bir oranında bir bilgi birikiminin ortaya konulduğu görülmektedir. Yapılan tüm çalışmaların yeni bir güncellemeyle bir bütün olarak yansıtılması bu konuyla ilgilenen araştırmacılara derli toplu bir bilgi sunmaktadır. Ayrıca yapılan araştırmalarda kullanılan kriterlerde farklılıklar bulunmaktadır. Harmanlanmış Öğrenme konusunda Çalışma yapmak isteyen araştırmacıların hali hazırda yapılmış çalışmaların önemli noktalarını görmeleri ve kendi çalışmalarını planlamaları için ilgili alanda yapılan çalışmaları bir bütün halinde inceleyebilecekleri bu tür çalışmalar önem arz etmektedir. Harmanlanmış öğrenmenin de gittikçe yaygınlaşan bir oranda araştırılmaya başladığı göz önüne alındığında bu çalışmanın alan yazını destekleyeceği görülmektedir. İfade edilen gerekçelerden yola çıkılarak gerçekleştirilen bu çalışmayla harmanlanmış öğrenme alanında yapılan yüksek lisans ve doktora tez çalışmalarının tanımlayıcı özelliklerinin ortaya konulması amaçlanmaktadır. Belirlen ilk çalışma 2007 yılına ait olup bu tarihten itibaren 2023 yılı sonuna kadar olan çalışmalar araştırma kapsamına alınmış (2007-2023) ve aşağıda yer alan sorunun yanıtı aranmıştır.

- ✓ Harmanlanmış öğrenmeyi konu alan lisansüstü tezler yıl, tez türü, öğrenme modeli adı, örneklem grubu, üniversite, yöntem ve teknik, veri toplama araçları ve veri analiz yöntemlerine göre nasıl bir dağılım göstermektedir?

Yöntem

Araştırmanın Modeli

Bu çalışmada araştırma amacı doğrultusunda nitel veri toplama yöntemleri arasında yer alan doküman incelemesi kullanılmıştır. Doküman incelemesi basılı materyallerin, resimlerin, filmlerin, simgelerin, kısa videoların, sözlü sembollerin araştırmanın amacı doğrultusunda incelenip değerlendirilmesi için yapılan işlemlerdir (Armstrong, 2021). Ayrıca Karasar'a (2023) göre doküman incelemesi belli bir amaç doğrultusunda kaynakları bulup okuma, not alarak değerlendirme işlemlerini kapsamaktadır. Araştırmacı elde ettiği verileri araştırma sonrasında bir bütün olarak ele alarak değerlendirmede bulunmaktadır.

Araştırma Materyali

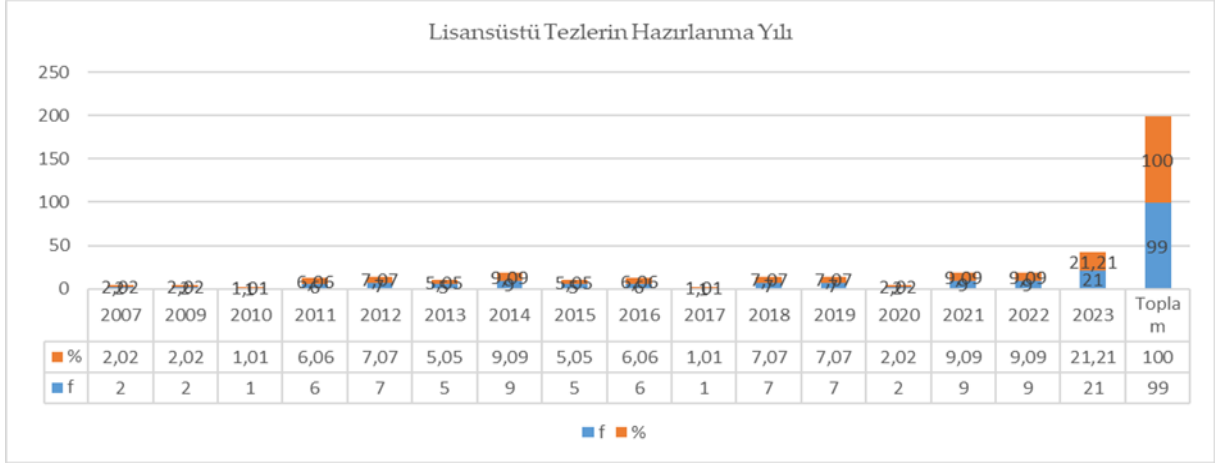
Bu araştırmanın materyalini Ulusal Tez Merkezi'nde (UTM) kayıtlı ve erişime açık olan lisansüstü düzeyde yapılmış tezler oluşturmaktadır. UTM'de "harmanlanmış Öğrenme" ve "hibrit Öğrenme" anahtar kelimeleri kullanılarak detaylı bir tarama yapılmıştır. Erişilebilen en eski lisansüstü tezin 2007 yılına ait olduğu saptanmıştır. Bu tarihten itibaren 2023 yılı da dâhil olmak üzere belirlenen tezlerin toplam sayısının 99 olduğu görülmüştür. 99 tezin 35 tanesi doktora 64 tanesi yüksek lisans düzeyinde hazırlanmıştır.

Verilerin Toplanması ve Analizi

UTM sitesinde yapılan lisansüstü tez taramasında harmanlanmış öğrenme, hibrit öğrenme anahtar kelimeleri kullanılmış ve 99 tez tespit edilmiştir. Bu tezler bilgisayar ortamına pdf olarak indirilerek kodlanmıştır. Örneğin "2008-YL" kodlamasındaki 2008 tezin yayınlandığı yılı YL ifadesi ise yüksek lisans tezi olduğunu göstermektedir. Burada amaç gerektiğinde ilgili teze erişimin kolaylaştırılmasıdır. Lisansüstü tezler yıl itibarıyla sıralanarak içerikleri doküman incelemesine tabi tutulmuştur. Betimsel analiz kullanılarak tezlerin hangi yıl yapıldığı, tezin türü, hangi örneklem grubuyla çalışıldığı, tezlerin hazırlandığı üniversitelerin dağılımı, hangi araştırma yöntemlerinden yararlandığı, kullanılan veri toplama araçları ve uygulanan analiz yöntem ve tekniklerinin neler olduğu saptanmıştır. Betimsel analiz sonucunda tespit edilen bulgular Excel programına kaydedilerek yüzde ve frekans analizi uygulanmıştır. Bu bulguların anlaşılabilirliğinin sağlanması ve bulguların bir bütün olarak görülmesi amacıyla yine Excel programında grafikler hazırlanmış ve her bir şeklin altına açıklamaları verilmiştir.

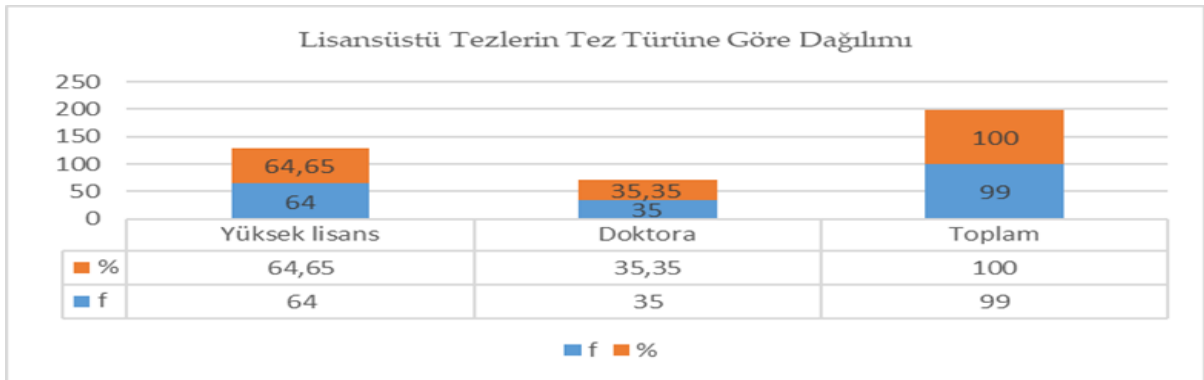
Bulgular

Araştırmanın bu bölümünde harmanlanmış öğrenme modeli çerçevesinde araştırma soruları kullanılarak incelenen lisansüstü tezlere ilişkin bulgular yer almaktadır. Lisansüstü tezlerin yıl bazında dağılımının yer aldığı Grafik 1 aşağıda sunulmuştur.



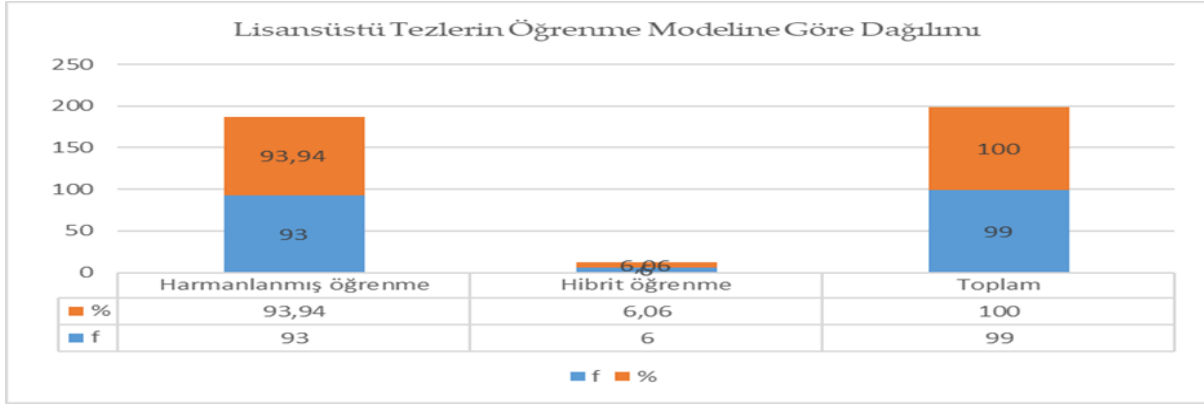
Grafik1. Lisansüstü tezlerin hazırlanma yılı

Grafik 1’de yer alan bulgular incelendiğinde 2007-2023 yılları arasında harmanlanmış öğrenme alanında 99 lisansüstü tezin hazırlandığı görülmektedir. Hazırlanan tezlerin en çok 2023 (f=21) yılına, en az ise 2010 ve 2017 (f=1) yıllarına ait olduğu görülmektedir. 2020 yılına kadar hazırlanan tez sayısında düzenli bir seviyenin olmadığı ancak 2021 yılından itibaren bunun artış eğiliminde olduğu belirlenmiştir. Lisansüstü tezlerin tez türü açısından yapılan incelemesine ilişkin bulgular Grafik 2’de sunulmuştur.



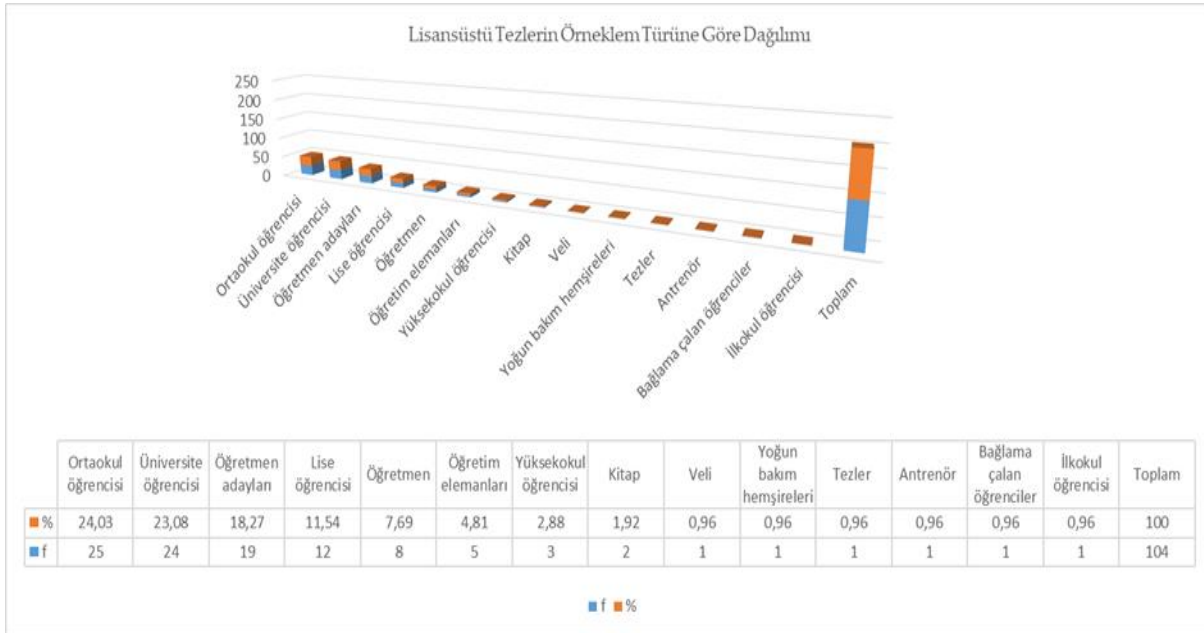
Grafik 2. Lisansüstü tezlerin tez türüne göre dağılımı

Grafik 2 incelendiğinde; hazırlanan 99 tezin 64’ünün (%64.65) yüksek lisans 35’inin (%35.35) doktora düzeyinde olduğu tespit edilmiştir. Lisansüstü tezlerin harmanlanmış öğrenme modeline göre dağılımının analizini içeren Grafik 3 aşağıda yer almaktadır.



Grafik 3. Lisansüstü tezlerin öğrenme modeli adına göre dağılımı

Grafik 3'teki bulgulara bakıldığında harmanlanmış öğrenme ve hibrit öğrenme modeli ifadelerinden biri tercih edilerek hazırlanan lisansüstü tezlerden 93'ünün harmanlanmış öğrenme (%93.94), 6'sının (%6.6) ise hibrit öğrenme adıyla yapıldığı görülmektedir. Grafik 4'te hazırlanan lisansüstü tezlerin örneklem grubu açısından incelenmesi yer almaktadır.



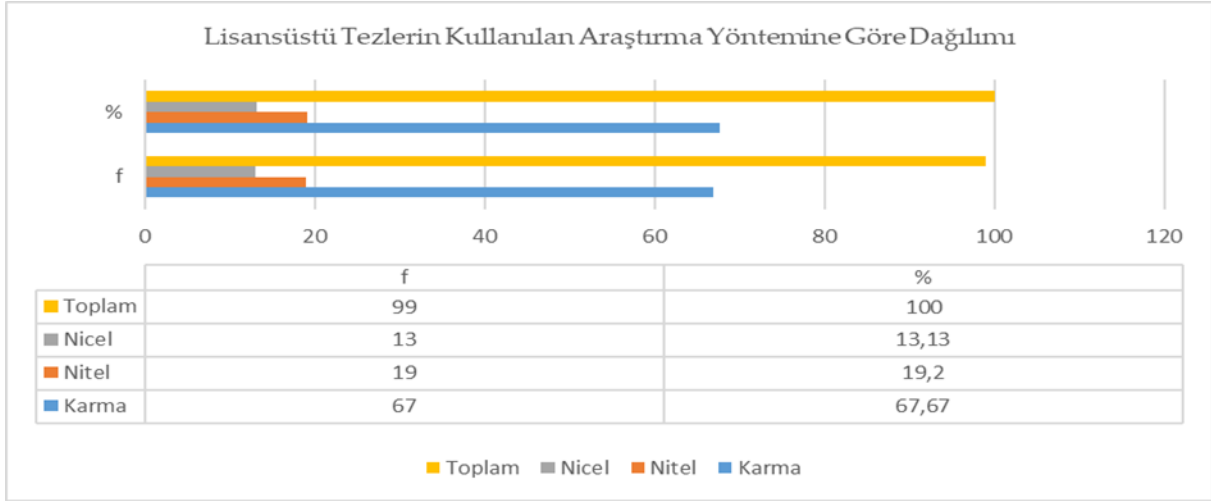
Grafik 4. Lisansüstü tezlerin örneklem türüne göre dağılımı

Grafik 4 incelendiğinde harmanlanmış öğrenme alanında yazılan tezlerde 14 farklı örneklem grubuyla çalışıldığı görülmektedir. Tezlerde en fazla çalışılan örneklem türü ortaokul öğrencileri (f=25) olurken onu üniversite öğrencileri (f=24) takip etmiştir. En az çalışılan örneklem türleri ise ilkokul öğrencileri, veliler, yoğun bakım hemşireleri, tezler, antrenör ve bağlama çalan öğrenciler (f=1) olmuştur. Aşağıda yer alan Tablo 1'de lisansüstü tezlerin yapıldıkları üniversitelere göre dağılımı yer almaktadır.

Tablo 1. Lisansüstü tezlerin yapıldıkları üniversitelere göre dağılımı

Üniversite adı	<i>f</i>	%
Gazi Üniversitesi	21	21.21
Anadolu Üniversitesi	7	7.07
Fırat Üniversitesi	6	6.06
Bahçeşehir Üniversitesi	5	5.05
Ege Üniversitesi	4	4.04
Pamukkale Üniversitesi		
Atatürk Üniversitesi; Dicle Üniversitesi; Manisa Celal Bayar Üniversitesi	3	3.03
Marmara Üniversitesi; Adnan Menderes Üniversitesi; Amasya Üniversitesi; Hacettepe Üniversitesi; İstanbul Aydın Üniversitesi; Gaziantep Üniversitesi; Selçuk Üniversitesi; Hatay Mustafa Kemal Üniversitesi; Bursa Uludağ Üniversitesi; Çağ Üniversitesi; Uşak Üniversitesi	2	2.02
Erzincan Binali Yıldırım Üniversitesi; Sivas Cumhuriyet Üniversitesi; Karabük Üniversitesi; İnönü Üniversitesi; Çanakkale Onsekiz Mart Üniversitesi; Sakarya Üniversitesi; Necmettin Erbakan Üniversitesi; Nevşehir Hacı Bektaş Veli Üniversitesi; Çukurova Üniversitesi; Mersin Üniversitesi; Muğla Sıtkı Koçman Üniversitesi; Dokuz Eylül Üniversitesi; Akdeniz Üniversitesi; Ankara Üniversitesi; Kocaeli Üniversitesi; Erciyes Üniversitesi; Kilis 7 Aralık Üniversitesi; Ahi Evran Üniversitesi; Van Yüzüncü Yıl Üniversitesi; Ufuk Üniversitesi; Ağrı İbrahim Çeçen Üniversitesi	1	1.01
Toplam	99	100.00

Tablo 1'deki bulgular analiz edildiğine 2007-2023 yıllarını kapsayan süreç içerisinde harmanlanmış öğrenme modeli kullanılarak hazırlanan lisansüstü tezlerin toplamda 41 farklı üniversiteye ait olduğu görülmektedir. Üniversitesinde diğer üniversitelere kıyasla en fazla tezin hazırlandığı saptanmıştır ($f = 21$). Gazi Üniversitesini Anadolu ($f = 7$), Fırat ($f = 6$) ve Bahçeşehir ($f = 5$) Üniversitelerinin takip ettiği görülmektedir. Grafik 5'te hazırlanan lisansüstü tezlerde kullanılan araştırma türü incelenmiştir.



Grafik 5. Lisansüstü tezlerin kullanılan araştırma yöntemine göre dağılımı

Grafik 5'te yer alan bulgulara göre harmanlanmış öğrenme temelinde hazırlanan lisansüstü tezlerde en fazla tercih edilen araştırma yönteminin karma yöntem olduğu tespit edilmiştir (f=67). Karma yöntem, sırasıyla nitel (f=19) ve nicel (f=13) araştırma yöntemleri takip etmektedir. Lisansüstü tezlerde tercih edilen veri toplama araçlarının dağılım bilgileri Tablo 2'de sunulmaktadır.

Tablo 2. Lisansüstü tezlerin kullanılan veri toplama araçlarına göre dağılımı

Veri toplama araçları	f	%
Ölçek	50	20.83
Akademik başarı testi	46	19.17
Yarı yapılandırılmış görüşme formu	39	16.25
Anket	30	12.5
Görüşme	25	10.42
Gözlem formu	9	3.75
Değerlendirme formu	8	3.33
Video kayıtları	6	2.5
Öğrenci günlükleri	5	2.08
Kişisel bilgi formu	4	1.67
Doküman incelemesi; Araştırmacı günlüğü	3	1.25
Öğretmen günlüğü; Kontrol listeleri	2	0.83
Öğrenci ürün dosyası; Literatür taraması; Beceri testleri; Çalışma Yaprakları; Toplantılar; Kazanım testi; Araştırmacı notları; Açık uçlu anket	1	0.42
Toplam	240	100.00

Tablo 2’de yer alan bulgular incelendiğinde 2007-2023 yılları arasında harmanlanmış öğrenme alanında yazılan tezlerde 22 farklı veri toplama aracından faydalandığı görülmektedir. En fazla kullanılan ölçme aracı ölçekler (f=50) olurken onu akademik başarı testleri (f=46), yarı yapılandırılmış görüşme formları (f=39) ve anketler (f=30) izlemiştir. Tablo 3’te lisansüstü tezlerde elde edilen verilerin analizin kullanılan yöntemlerin dağılımına yer verilmiştir.

Tablo 3. Lisansüstü tezlerde kullanılan veri analiz yöntemlerinin dağılımı

Veri analiz yöntemleri	f	%
t testi	54	20.61
İçerik analizi	47	17.94
Anova	23	8.78
Betimsel analiz	20	0.76
Aritmetik ortalama; Standart sapma	17	6.49
Frekans; Mann Whitney U testi	13	4.96
Ancova	12	4.58
Pearson-product moment; Kolmogorov		
Smirnov; Wilcoxon işaretli sıralar testi	8	3.05
Cronbach alfa	5	1.91
Shapiro – Wilk	4	1.53
Faktör analizi; Kruskal Wallis H testi	2	0.76
Levene testi; Friedman testi; Scheffe testi;		
LSD testi; X ² (Kay-Kare); Kuder-Richardson;		
Kaiser Meyer Olkin; Durbin Watson; Meta	1	0.38
sentez		
Toplam	262	100.00

Tablo 3’te yer alan bulgulara bakıldığında harmanlanmış öğrenme modeli kullanılarak yazılan tezlerde 25 farklı veri analiz yönteminin kullanıldığı görülmektedir. En çok tercih edilen analiz yöntemlerinin sırasıyla t testi (f=54), içerik analizi (f=47) ve Anova testi (f=23) ve betimsel analizdir (f=20).

Tartışma, Sonuç ve Öneriler

Bu bölümde araştırma sorularına uygun elde edilen bulgular alan yazın taramasıyla birlikte ele alınmıştır. Araştırmacılar, doküman incelemesi yöntemiyle alan yazında yapılan çalışmaları yıllara göre dağılımını, kullanılan örneklem, yöntem, veri toplama araçları, analiz yöntemleri gibi etkenler çerçevesinde incelemiştir. Bu çalışmada 2007-2023 yılları arasında yapılan çalışmalar amaçlar doğrultusunda incelenmiştir. 2007-2023 yılları arasında

harmanlanmış öğrenme alanında 106 tezin yazıldığı fakat bu tezlerden 99 tanesinin çalışma kapsamına alındığı görülmektedir. 2020 yılından sonra alanda yazılan tezlerin sayısının arttığı görülmektedir. Son yıllarda harmanlanmış öğrenme modelinin daha fazla kullanılıyor olması yapılan çalışmaların sayısının artmasına sebep olduğu düşünülmektedir. Hebebcı ve Usta (2015) yaptıkları çalışmada 2005-2014 yılları arasında harmanlanmış öğrenmeye yönelik olarak hazırlanan lisansüstü çalışmaları taramışlar 44 adet çalışma saptamışlardır. Sontay ve Karamustafaoğlu (2022) tarafından yapılan araştırmada ise 2007-2021 yılları arasında 69 adet lisansüstü tezin hazırlandı belirlenmiştir.

Çalışmada elde edilen bulgularda 2007-2023 yılları arasında yazılan tezlerin 64 tanesinin yüksek lisans 35 tanesinin doktora düzeyinde olduğu, 93 tezin harmanlanmış öğrenme, 6 tezin ise hibrit öğrenme adıyla yayınlandığı görülmektedir. Burada doktora düzeyinde yapılan çalışmaların sayısının oran olarak yaklaşık üçte birlik kısmını oluşturması önemlidir. Bu oran bu yöntemlerin alan yazınında önemli olarak görüldüğünü ortaya koymaktadır. Harmanlanmış öğrenmenin hibrit öğrenmeyi de kapsayacak şekilde daha geniş kapsamlı olmasının, birbirinin yerine kullanılan ifadeler olmasına karşın alan yazınında daha harmanlanmış öğrenme ifadesinin tercih edilmesinin harmanlanmış öğrenme adıyla sayıca daha fazla tez yazılmasını beraberinde getirdiği düşünülmektedir. Ortaokul öğrencileri en çok kullanılan örneklem türü olurken bunu üniversite öğrencileri takip etmiştir. Kolay ulaşılabilir olması ve öğrenim seviyesinin harmanlanmış modeline uygun olması dolayısıyla ortaokul öğrencilerinin daha çok tercih edildiği düşünülmektedir. Ayrıca antrenörlerin, yoğun bakım hemşirelerinin ve bağlama çalan öğrencilerin örneklem olarak tercih edilmesi harmanlanmış öğrenmenin farklı alanlarda da kullanıldığını göstermektedir. Hebebcı ve Usta (2015) 27 yüksek lisans ve 17 doktora çalışmasına ulaşmışlardır. Örneklem grubu olarak en yüksek sayıda lisans grubu olmak üzere beş farklı grup tespit etmişlerdir. Sontay ve Karamustafaoğlu'nun (2022) yaptıkları çalışma bulgularına bakıldığında 38 yüksek lisans ve 31 doktora çalışmasına ulaştıkları, çalışılan örneklem grubu olarak da lisans öğrencilerinin daha fazla tercih edildiği görülmektedir.

Harmanlanmış öğrenme ile ilgili olarak 41 farklı üniversitede lisansüstü tezlerin hazırlandığı görülmektedir. En fazla tezin Gazi Üniversitesinde yapıldığı ve onu Fırat ve Bahçeşehir üniversitelerinin takip ettiği belirlenmiştir. Gazi Üniversitesinde diğer üniversitelere kıyasla dikkat çekecek kadar fazla çalışmanın olması harmanlanmış

öğrenmenin bu üniversitede dikkate alındığını göstermektedir. Öncü nitelikte olduğu ifade edilebilir. Harmanlanmış öğrenme modeli temelinde tezlerin yazılması ülke çapında son yıllarda ilgi çeken ve merak edilen konu olduğunu göstermektedir. Ancak birçok üniversitede ilgi çeken bir konu olmakla birlikte üzerinde yeteri kadar çalışılmadığı tespit edilmiştir. Son yıllarda nispeten görülen ivmeyle bu sayının artacağı yönünde bir görüş oluşmaktadır. 21 üniversitede birer tane 11 üniversitede ise ikişer tane tez çalışması yapılmıştır. Hebecci ve Usta (2015) çalışmalarında 20 farklı üniversitede harmanlanmış öğrenme kullanılarak lisansüstü tezlerin hazırladığını ve en fazla tezin bu çalışmayla uyumlu olarak Gazi Üniversitesinde tarafından yapıldığını belirlemiştir. Elde edilen bir diğer sonuç ise 12 üniversitede sadece birer çalışma yapılmış olmasıdır.

Harmanlanmış öğrenme yöntemlerinin tercih edildiği araştırmalarda kullanılan araştırma yöntemlerine bakıldığında nitel, nicel ve karma yöntemlerle çalışmaların verilerinin elde edildiği görülmektedir. Ele alınan konuyu daha derinlemesine ve farklı boyutlardan ele almak için karma yöntemin daha çok kullanıldığı düşünülmektedir. Veri toplama araçları açısından bakıldığında ise 22 farklı veri toplama tekniğinin kullanıldığı görülmektedir. En fazla kullanılan veri toplama aracının ise ölçekler olduğu belirtilmiştir. Akademik başarı testleri, yarı yapılandırılmış görüşme formları da sık tercih edilen veri toplama araçlarından olduğu saptanmıştır. Hebecci ve Usta'nın (2015) araştırmasında karma yöntemin en çok tercih edilen araştırma yöntemi olduğu ve 19 farklı veri toplama tekniğinin kullanıldığını saptamıştır. Veri toplama araçları içinde en çok tercih edilenin ise görüşme formu olduğu sonucuna ulaşılmıştır. Sontay ve Karamustafaoğlu (2022) gerçekleştirdikleri lisansüstü tez, makale ve bildirimleri toplu olarak inceleyen çalışmasında nicel araştırma yönteminin daha çok araştırmacı tarafından tercih edildiğini ortaya konulmuştur. Ayrıca araştırma verilerinin elde edilmesinde 12 farklı yöntemin tercih edildiği ve bunlar arasında yarı deneysel desenin daha çok kullanıldığı sonucu elde edilmiştir. Yapılan bir başka çalışmada harmanlanmış öğrenme ile ilgili yapılan çalışmaların büyük çoğunluğunda karma desenin tercih edildiği vurgulanmıştır (Dikmen ve diğ., 2018). Yapılan bu çalışmada elde edilen sonuçlar çerçevesinde aşağıdaki önerilerin bu konuda araştırma yapmak isteyen eğitim paydaşlarına getirilmesi uygun bulunmuştur.

Harmanlanmış öğrenme ile ilgili yapılan çalışmaların son yıllarda yoğunluk gösterdiği görülmektedir. Bunun nedenleri ve bu çalışmalarda elde edilen bulgular birlikte

ele alınarak incelenebilir. Özellikle derinlemesine bilgi erişimini sağlayan nitel araştırmaların bu konuda önemli veri sağlayacağı düşünülmektedir.

Bu çalışmada yüksek lisans tezleri incelenmiştir. Tezlerle birlikte makalelerin de birlikte ele alınacağı çalışmalar yapılabilir.

Harmanlanmış öğrenmenin ağırlıklı olarak Gazi Üniversitesi başta olmak üzere birkaç üniversitede daha fazla çalışıldığı görülmektedir. Bunun nedenleri araştırılarak daha yaygın olarak çalışılması yönünde destekler sağlanmalıdır. Çünkü eğitimin gittikçe dijitale kaydığı günümüzde bu yöndeki çalışmalar mevcut durumu ortaya koyarak sürecin netleşmesine katkı sağlayacaktır.

Ağırlıklı olarak karma yöntemin tercih edildiği görülmektedir. Bu çalışmaların nitel kısmındaki verilerin birlikte ele alınarak bir metasentez çalışması yapılabileceği düşünülmektedir. Ayrıca nicel yöntemi tercih eden çalışmalarda da akademik başarı gibi yoğun tercih edilen değişkenlerle meta analiz araştırması yapılabilir.

Harmanlanmış öğrenmenin Gazi Üniversitesi ağırlıklı olmakla birlikte 41 farklı üniversitede lisansüstü düzeyde tercih edildiği görülmektedir. Bu sayıya bakılarak Türkiye genelinde tercih edilen bir model olarak görülmesine karşın 21 üniversitede sadece birer tane çalışma yapılmış olması düşündürücüdür. Daha yaygın olarak kullanılmasını desteleyecek faktörlerin belirlenmesi ve varsa engelleyen etkenlerin ortaya konularak giderilmesi yönünde adımlar atılabilir. Burada MEB'in de önemli sorumluluğu olduğu düşünülmektedir. Çünkü yaşadığımız Covid 19 pandemi sürecinde online tabanlı öğretim kullanılmıştır. Ancak yüz yüze ve online eğitimin olumlu yanlarını birleştiren harmanlanmış öğrenme üzerine MEB'in yapılan çalışmaları desteklemesi beklenmektedir. Zira eğitim süreci çok hızlı bir şekilde bu yöne doğru evrilmektedir.

Bilgilendirme

Bu çalışmada insan veya hayvan deneklerinden veri toplanmamıştır. Bu nedenle çalışma, etik kurul onayı gerektiren çalışmalar kapsamında yer almadığından etik kurul onayı alınmamıştır.

Yazar Katkı Beyanı

Aysel ARSLAN: Kavramsallaştırma, literatür incelemesi, metodoloji, veri analizi ve yazma

Hilal ÇETİN: Literatür incelemesi, Uygulama, veri analizi

Kaynaklar

- Akgündüz, D. (2013). *Fen eğitiminde harmanlanmış öğrenme ve sosyal medya destekli öğrenmenin öğrencilerin başarı, motivasyon, tutum ve kendi kendine öğrenme becerilerine etkisi* (Yayınlanmamış doktora tezi). Marmara Üniversitesi, İstanbul.
- Akgündüz, D. (2019). Araştıran okulda teknoloji entegrasyonu (Ed. M. Yavuz). *Araştıran okul* içinde. Eğitim Yayınevi.
- Armstrong, C. (2021). Key methods used in qualitative document analysis. OSF Preprints, 1(9). <http://doi.org/10.2139/ssrn.3996213>
- Balaman, F. (2010). *Hibrit öğrenme modelinin öğrencilerin fen ve teknoloji dersindeki başarılarına, tutumlarına ve motivasyonlarına etkisinin incelenmesi* (Yayınlanmamış yüksek lisans tezi). Mustafa Kemal Üniversitesi, Hatay.
- Balaman, F., & Tüysüz, C. (2011). Harmanlanmış öğrenme modelinin 7. sınıf öğrencilerinin fen ve teknoloji dersindeki başarılarına, tutumlarına ve motivasyonlarına etkisinin incelenmesi. *Batı Anadolu Eğitim Bilimleri Dergisi*, 2(4), 75-90.
- Blended Learning (2020). *Blended learning models*. <https://www.blendedlearning.org/models>
- Bulut, T. (2023). *Fen bilimleri öğretmenlerinin harmanlanmış öğrenmeye yönelik hazır bulunuşluklarının incelenmesi* (Yayınlanmamış yüksek lisans tezi). Erzincan Binali Yıldırım Üniversitesi, Erzincan.
- Can, H. C. (2022). *Beden eğitimi öğretmeni yetiştirmede harmanlanmış öğrenmenin 21. Yüzyıl becerilerine ve akademik başarıya etkisi: Bir karma yöntem araştırması* (Yayınlanmamış doktora tezi). Gazi Üniversitesi, Ankara.
- Ceylan, V. K. (2015). *Harmanlanmış öğrenme yönteminin akademik başarıya etkisi* (Yayınlanmamış yüksek lisans tezi). Adnan Menderes Üniversitesi, Aydın.
- Christensen, C. M., Horn, M. B., & Staker, H. (2013). *Is K-12 blended learning disruptive? An introduction to the theory of hybrids*. Clayton Christensen Institute for Disruptive Innovation. <https://eric.ed.gov/?id=ed566878>
- Cleveland-Innes, M., & Wilton, D. (2018). *Guide to blended learning*. Burnaby, Canada: Commonwealth of Learning. <http://oasis.col.org/handle/11599/3095>
- Dikmen, C. H., Ocağ, M. A., & Efe, A. A. (2018, Eylül). Harmanlanmış öğrenme ile ilgili Türkiye’de yapılmış tezlerin incelenmesi. 6. *Uluslararası Öğretim Teknolojileri ve Öğretmen Eğitimi Sempozyumu*, 12-14 Eylül, Edirne.
- Erdoğan, M. (2023). *Fen bilimleri dersi madde döngüleri ve çevre sorunları konusunun öğretiminde kullanılan hibrit öğrenme uygulamalarının bazı değişkenler üzerindeki etkisinin incelenmesi* (Yayınlanmamış yüksek lisans tezi). Kilis 7 Aralık Üniversitesi, Kilis.
- Graham, C. R. (2006). Blended learning systems. In *the handbook of blended learning: Global perspectives, local designs* (pp. 3-21). Jossey-Bass.
- Graham, C., Allen, S., & Ure, D. (2003) *Blended learning environments: A review of the research literature*. Brigham Young University.
- Graham, C. R., Woodfield, W., & Harrison, J. B. (2013). A framework for institutional adoption and implementation of blended learning in higher education. *The Internet and Higher Education*, 18, 4-14. <https://doi.org/10.1016/j.iheduc.2012.09.003>
- Gülbahar, Y., Kalelioğlu, F., & Afacan Adanır, G. (2020). *Harmanlanmış öğrenme*. Pegem Akademi.
- Harriman, G. (2004). What is blended learning. *E-learning Resources*, 21-38.

- Hebebcı, M. T., & Usta, E. (2015). Türkiye’de harmanlanmış öğrenme eğilimleri: Bir literatür çalışması. *Adıyaman Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 19, 195-219. <https://doi.org/10.14520/adyusbd.23061>
- Horn, M. B., & Staker, H. (2017). *Blended: Using disruptive innovation to improve schools*. John Wiley & Sons.
- Karasar, N. (2023). *Bilimsel araştırma yöntemi* (38. Basım). Nobel Yayıncılık.
- Nyika, R., & Modise, M.A. (2022). Experiences and challenges of adapting to online learning during covid -19 induced lockdown: The case of gweru urban tertiary students in Zimbabwe. *International e-Journal of Educational Studies*, 6 (12), 272-281. <https://doi.org/10.31458/iejes.1164927>
- Osguthorpe, R. T., & Graham, C. R. (2003). Blended learning environments: Definitions and directions. *Quarterly Review of Distance Education*, 4(3), 227-33.
- Poon, J. (2012). Use of blended learning to enhance the student learning experience and engagement in property education. *Property Management*, 30(2), 129-156. <https://doi.org/10.1108/02637471211213398>
- Rossett, A. (2002). *The ASTD e-learning handbook: Best practices, strategies, and case studies for an emerging field*. McGraw-Hill Trade. <https://www.voced.edu.au/content/ngv:10164>
- Sontay, G., & Karamustafaoğlu, O. (2022). Harmanlanmış öğrenme modeli üzerine yayınlanan ulusal araştırmaların incelenmesi. *Ulusal Eğitim Akademisi Dergisi*, 6(2), 145-155. <https://doi.org/10.32960/uead.1119698>
- Taşkıran, A. (2017). Dijital çağda yükseköğretim. *Açık Öğretim Uygulamaları ve Araştırmaları Dergisi*, 3(1), 96-109.
- Tekdemir, M. (2022). *Ortaokul öğrencilerinin fen eğitiminde hibrit öğrenme modeline ilişkin görüşleri* (Yayınlanmamış yüksek lisans tezi). Van Yüzüncü Yıl Üniversitesi, Van.
- Tonbuloğlu, İ., & Tonbuloğlu, B. (2021). *Eğitimde dijital dönüşüm harmanlanmış öğrenme* (Teknik rapor). Yıldız Teknik Üniversitesi, İstanbul.
- Usta, E. (2007). Harmanlanmış öğrenme ve çevrimiçi öğrenme ortamlarının akademik başarı ve doyuma etkisi. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, 9(2), 1-15.
- Vallée, A., Blacher, J., Cariou, A., & Sorbets, E. (2020). Blended learning compared to traditional learning in medical education: Systematic review and meta-analysis. *Journal of Medical Internet Research*, 22(8), e16504. <https://www.jmir.org/2020/8/e16504>
- Valiathan, P. (2002). Blended learning models. *Learning Circuits*, 3(8), 50-59.
- Vaughan, N. (2007). Perspectives on blended learning in higher education. *International Journal on E-Learning*, 6(1), 81-94. <https://www.learntechlib.org/p/6310/>
- Walne, M. B. (2012). *Emerging blended-learning models and school profiles* (Greater Houston Community Foundation, Ed.). Community Foundation.
- Yıldırım, H. F. (2023). *Madde ve değişim ünitesinde harmanlanmış öğrenme modelinin öğrencilerin akademik başarıları ve fene yönelik motivasyonlarına etkisi* (Yayınlanmamış yüksek lisans tezi). Sivas Cumhuriyet Üniversitesi, Sivas.
- Zagouras, C., Egarchou, D., Skiniotis, P., & Fountana, M. (2022). Face to face or blended learning? A case study: Teacher training in the pedagogical use of ICT. *Education and Information Technologies*, 27(9), 12939-12967. <https://doi.org/10.1007/s10639-022-11144-y>

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article

Understanding Stance of English Language Teachers' Cooperation with Parents and School Administrators in Classroom Management

İsmail Fırat ALTAY¹  Tarık YÜTÜK^{2,*} 

¹ Hacettepe University, Ankara, Turkey ifaltay@hacettepe.edu.tr

² National Defence University, İstanbul, Turkey tarik.yutuk@gmail.com


* Corresponding Author: tarik.yutuk@gmail.com

Article Info

Received: 21 July 2024

Accepted: 16 September 2024

Keywords: Classroom management, L2 classrooms, parent support, school administration support

 10.18009/jcer.1519825

Publication Language: English

Abstract

Classroom Management (CM) possesses a key role in teaching in L2 classroom settings. So, it is fair to suggest that there is an increasing volume of research in addition to the research conducted in the mainstream CM studies. However, to our knowledge, the lack of research about cooperation among the insider and outsider stakeholders of L2 CM is still felt. Within this respect, the objective of this study is to explore how pre-service (PSTs) and in-service English language teachers (ISTs) view parent- and school administration-support in CM. Therefore, a semi-structured interview is utilised to delve into PSTs' and ISTs' stance towards cooperation with parents and school administration. Then, data yielded from the interview are analysed through content analysis. Thus, the outcomes have revealed some convergences and divergences between PSTs' and ISTs' views. Overall, some pedagogical implications are suggested to improve ISTs' and PSTs' classroom practices in tandem with L2 teaching pedagogy.



To cite this article: Altay, İ. F. & Yütük, T. (2024). Understanding stance of English language teachers' cooperation with parents and school administrators in classroom management. *Journal of Computer and Education Research*, 12 (24), 738-753. <https://doi.org/10.18009/jcer.1519825>

Introduction

In teaching a foreign language, teachers are supposed to hold a variety of roles such as guide, director, trainer, and evaluator as well as their primary role, teacher (Gultom & Saun, 2016). In order for L2 teachers to efficiently carry out these roles, efficient ways of managing classroom become more prerequisite (Marzano & Marzano, 2003). In so doing, many L2 teacher have long reported to witness disruptive behaviours and teachers' attempts to take these behaviours under control may result in time loss at the expense of academic facilities. Therefore, certain effective classroom management (CM) strategies are needed to foster students' appropriate and desirable behaviours and decrease teachers' stress burn-out and stress (Oliver et al., 2011). In this vein, the role and nature of CM are probed into so as to attain a clearer vision.

The field of CM, despite limited, but increasing number of studies in L2 teaching and learning settings (e.g. Klattenberg, 2021; Yütük, 2018), is one of the significant domains deserving and witnessing investigation (Sakui, 2007) and is regarded as an indispensable tool in educational inventory of teachers (Marzano & Marzano, 2003). As well as fostering academic progress of students, as Doyle (1986) and Postholm (2013) have already suggested, CM can be an effective instrument for pupils' moral and social development. In tandem with the long-lasting research, the academic and social development of pupils through meticulous use of CM is positioned at the language teacher's agenda (e.g. Wright, 2005). In this background, the role of CM has been focal point in teaching English (e.g. Zein, 2018), Japanese (e.g. Horwitz, 2005), Spanish (e.g. De Fina, 1997), and French (e.g. Emeh & Agbor, 2005). Yet, the available studies in L2 CM are still scarce (Macías, 2018). So, in order to attain a better understanding and to get more comprehensive overview, the next section is reserved for CM in foreign language settings, CM from students' and teachers' perspectives, respectively.

The notion of students' disruptive or undesirable behaviours and the way teachers overcome these behaviours might show variance and necessitate the utilisation of more in-depth studies when compared to mainstream education. Some L2 teachers have reported some of these behaviours such as unwillingness to participate, staying idle during the courses, and sometimes even not attending the course itself (Debreli & Ishanova, 2019). As one of the significant stakeholder of L2 classroom, teachers are regarded as one of the key actors in managing classroom order and maintaining learning atmosphere.

To begin with, grasping CM skills possesses a significant role in preserving teachers' job satisfaction (van Tartwijk & Hammerness, 2011). Therefore, Sariçoban (2005) has underscored the need for L2 teachers' being equipped with management skills in addition to language teaching skills. Additionally, Sánchez-Solarte (2019) notifies a remarkable role for L2 teachers: decision-makers. To illustrate, teachers' decision-making processes may require dynamic and fluctuating course of action in that even a smoothly- and perfectly-planned course might bear disruption moments and they necessitate teachers' instantly- and carefully-programmed actions. Even if these behaviours do not occur in their classrooms, they need to stay alert to take an appropriate action. Similarly, while making their decisions, L2 teachers should organise classroom settings in a way that it should be a facilitator and conducive L2 teaching and learning process (Zein, 2018). In this vein, they can arrange

students' seating arrangement. To exemplify, teachers should be able to convert the formation of their classrooms among traditional, horseshoe (u-shaped), and team formation, accordingly (Gultom & Saun, 2016).

Similarly, teachers' ability in organising classroom and student behaviours seem to be critically correlated to positive learning outcomes. (Thangarajathi & Joel, 2010). In so doing, teachers have a wide spectrum of inventories managing their classroom with for the sake of this ultimate aim. First, teachers can, at the very beginning, set clear and attainable expectations and expect students to tune their behaviours, accordingly (Marzano & Marzano, 2003; Reinke et al., 2013). Second, Malmgren et al., (2005) mention that they can take charge all procedures and manage the classroom by themselves. Third, they can use the stage in an effective way and may refrain from being stick to a point for a long time (Brown, 2001). Moreover, teachers can be vigilant (Kunter et al., 2007), can scan the unfolding of students activities (Balli, 2011), and they can make use of eye-contact (Cangelosi, 1988) and intonation (Barraja-Rohan & Pritchard, 1997) to keep students in the 'classroom atmosphere'. Besides, Grim (2010) has noted teachers' use of L2 in handling students' noise, misbehaviour, etc. So, one can understand that L2 teachers possess a vital role in managing, directing and handling student behaviours.

Moreover, some studies have focused on the potential discrepancies between experienced and less experienced teachers in terms of their CM skills and procedures. Relatedly, Daloğlu (2002) has found that inexperienced teachers tend to make use of more detailed written plans while their more experienced counterparts prefer drawing on mentally designed an outline. Also, this study has uncovered that less experienced teachers seem to be challenged in motivating their students and experience difficulty in encouraging them to participate in the classroom activities. However, more experienced teachers have been reported to be more competent in making use of pair- and group-work in organising classroom setting. On the other hand, Ünal and Ünal (2012) have posited that experienced teachers tend to take the control of the classroom whereas the beginning teachers prefer being less interventionist, otherwise called as less teacher control. Moreover, these less experienced teachers are open to interactionism and collaboration; however, they appear to be authority by themselves in the course of time (Ünal & Ünal, 2012)

Students, one of the most important stakeholders in L2 classrooms, have also a vital role in the management and design of classroom settings. In this regard, Willis (1996)

suggests L2 teachers to delegate some responsibility to students and they will accordingly attune to tasks assigned to them. Also, Hoff and DuPaul (1998) have suggested teachers to foster the agent role of learners and encourage them to take initiatives. Similarly, Balli (2011) points out that students are logical and rational beings and they can be steered to be in charge of their behaviours. Therefore, teachers need to explain the underlying reasons behind the classroom rules and procedures, then students will consequently customise their behaviours in tandem with the requirements of the classroom environment (Stoughton, 2007). Correlatively, Kerdikoshvili (2012) heralds that student-centred CM procedures have increasingly gained robust grounds in foreign language teaching setting, but further adds that further progression is still needed.

Furthermore, the recent mainstream research paradigm has highly emphasised the importance of cooperation and collaboration between the stakeholders inside and outside the classroom. To this end, as noted by Back et al. (2016), the ecological approach in CM underscores the role of cooperation among staff relations and posits that positive school climate culminates in the increase in students' academic success. Similarly, Lojdová (2020) mentions the cooperation between in-service and pre-service teachers as a valuable component of a school and classroom climate. Also, some studies notify the contribution of parent support in that parent involvement can contribute to the quality of CM (Cheng & Chen, 2018) and teachers can resort to parent support in dealing with problematic behaviours (Savas, 2012) since parents are knowledgeable about the interests, learning styles, etc. and they have a significant impact on their children (Walker & Hoover-Dempsey, 2013). Similarly, in her MA thesis, Keskin (2019) has found out that there exists a medium positive correlation between young learners' English language learning and parental effect. To put it differently, parent support and effect seem to play a significant role in students' academical and behavioural conducts. Nonetheless, there seems to exist some terra incognita in understanding the role of parent and school administration support. Therefore, this study sets out to probe into in-service and pre-service English language teachers' reflection on parent and school administration support in CM. In this vein, the research questions below are the main reference points in this paper:

- 1) How do pre-service and in-service English language teachers vary in terms of parent support?
- 2) How do pre-service and in-service English language teachers vary in relation to addressing school administration?

With these questions in mind, it is aimed to account for the paucity of research about the way CM of in-service and pre-service English language teachers in relation to parent and school administration support. Relatedly, the following section will uncover the methodology to be utilised in order to shed light upon the aforementioned questions.

Method

The methodological issues are, in detail, presented according to the research design, participants, procedures, instrument(s), and analyses sections, respectively. By this way, it may become plausible to comprehensively describe the background underlying the study before initiating analytical phases to comprehend the stance of English language teachers' cooperation with parents and school administrators in CM.

Research Design

The current study is equipped with a diagnostic characteristic in a way that it sets out to take a concise overview of pre-service and in-service English language teachers' reflections regarding the parent and school administration support in order to answer the aforementioned research questions. To this end, qualitative research methodology has been adopted. To specify, upon granting ethical clearance and consent, a semi-structured interview is conducted with pre-service and in-service English language teachers since interviews enable the researchers to probe into the corners which may not be readily observed or measured with other research tools (Wellington, 2015) . In so doing, it is aimed to understand the pre-service and in-service English language teachers' reflections about (1) parent- and (2) school administration-support.

Participants

The semi-structured interviews are carried out with 5 pre-service and 2 in-service teachers in a high school in Türkiye within this frame. First, the pre-service English language teachers are senior students in an English Language Teaching Department in a state university and conduct their practicum in their last year before graduation. Moreover, they are graduates of different high schools across the country, therefore they have probably witnessed a lot of disruptive behaviours in their education paths although they have not had much opportunity to teach previously. Additionally, there is a similar gender distribution

when compared to other ELT contexts and this gender trend tends to exist in the prospective years within the profession of English language teaching. So, it is possible to assert that this research sample seems to ideally represent the ELT contexts in Türkiye. Accordingly, the external validity could be reached and the research outcomes might be viable for generalisation into different context as suggested by Seedhouse (2004) for qualitative studies.

As the second group of the study, the in-service English language teachers have already been teaching about for 15 years in a variety of schools across the country. Thereby, it is possible to put forward that these teachers are quite experienced in their careers. Furthermore, they supervise internship students from English Language Teaching departments and share their reflections and experiences with them. To put it differently, this sample can constitute a functional group in generalising research outcomes to other contexts because they have had the chance to be enrolled in various institutions and might have possibly encountered with a wide range of disruptive behaviours in the course of time.

Overall, it can be posited that the participants are selected by utilising convenience sampling, through which the informants have been recruited in line with some criteria such as being easily accessible, or willingness to participate as noted by Dörnyei (2007). Moreover, their convenience in the ELT field is another priority. That's to say, there is a clear-cut distinction in relation to service year between these groups and this could possibly facilitate our job while relating the findings to the notion of experience. In doing so, the internal validity could be ensured, too.

Procedures

The interviews are conducted with 7 participants (5 pre-service and 2 in-service English language teachers). This process lasts around 3 weeks and the data obtained from the interviews have been analysed at the end of the data collection process so as to refrain from researcher bias. In other words, the data have not been analysed after interviewing with each participants for fear that responses may have impact on the flow of the whole process. Rather, 7 recordings are transcribed and analysed altogether. That's to say, by analysing the data at the very end of the sessions, it is aimed not to lead or intervene into the participants' responses. In so doing, more reliable and valid findings could be attained.

Instrument(s)

A semi-structured interview was adopted since Dörnyei (2007) underlines its flexibility in that it gives the interviewee the chance to elaborate on the subject to be investigated. It can be further postulated that as a part of the qualitative research paradigm, this type of interview has a potential to bear openness and creativity by letting the participants lean on details as suggested by Strauss and Corbin (1998). To this end, the interview was carried out with 5 pre-service and 2 in-service English language teachers. Thus, questions were fabricated in a way that they could allow the participants to go deeper into the details of the topic by staying on the main line of the study at the same time. Also, it is important to note that the questions addressed to the both groups were not identical. Rather, according to the group they are in, the participants were asked questions bearing slight differences by based on their status, career, teaching experience, etc.

Analysis

These interviews enable the participants to refer to the views and experiences regarding these two domains (i.e. (1) parent- and (2) school administration-support). Then, the interview sessions are recorded, digitised, and transcribed into the textual form. Given that qualitative research paradigm is functional in comprehending human condition in variety of situations (Bengtsson, 2016) is taken into account, it appears to be more plausible to utilise of content analysis to probe into the details emerging in the interview sessions. Similarly, as posited by Harwood and Garry (2003), the content analysis assists researchers in terms of the reduction of phenomena into defined categories in order to better scrutinise and interpret them. It is also important to note that according to Schreier (2012), the content analysis embraces a systematic method since all relevant material is taken into consideration and this is a significant factor in enhancing the trustworthiness of the content analysis as reported by Elo et al. (2014). What's more, Dörnyei (2007) warns that researchers do not set out a set of predetermined categories, rather these categories emerge as the data are being analysed. In this vein, categorical units are constituted by referring to emergent themes through reading and re-reading. Later, these units are coded and tabulated. Following these steps, the participants' responses are appointed into these formed categories. Deviant responses are also noted. Thus, it is aimed to avoid any data being excluded as irrelevant a

priori. Finally, it is targeted to focus on the fine-grained details from the reflections of prospective and practicum English language teachers.

Finding

This study possesses a diagnostic nature and the analyses will be conducted in accordance with the semi-structured interview. In this frame, the qualifications of data analyses have been showcased in Table 1 in accordance with the research questions and data collection tools.

Table 1. General overview of data collection and data analysis

Research Questions	Instruments	Number of participants	Properties of participants	Data collection method	Data analysis
1) How pre-service and in-service English language teachers vary in terms of parent support?	Semi-structured interview	7	Pre-service and In-service English Language Teachers	Qualitative	Content Analysis
2) How do pre-service and in-service English language teachers vary in relation to addressing school administration?	Semi-structured interview	7	Pre-service and In-service English Language Teachers	Qualitative	Content Analysis

1st Research Question

The study, initially, focuses on pre-service (PST) and in-service English language teachers' (IST, in short) stance towards parent support in CM. In this respect, a semi-structured interview is carried out and the reflections posited by the participants are, respectively, (a) coded, (b) tabulated, and (c) categorised. For each group, all responses are summarised and the best representative ones are showcased in Table 2.

Table 2. Prospective and practicum English language teachers' reflections about parent support

Participant	Subcategories	Outcome
PST 1	<i>Stance/Behaviour</i>	- <i>Parent support as a crucial tool especially in teaching to young learners</i>
PST 4	<i>Stance/Behaviour</i>	- <i>The necessity for language teachers resort to students' mothers in dealing with disruptive behaviours</i>

IST 1	<i>Stance/Behaviour</i>	- <i>Trying to solve the problems on one's own</i> - <i>Then, resorting to parent support</i>
IST 2	<i>Stance/Behaviour</i>	- <i>Resorting to parent support can be necessary if all techniques seem to stop functioning</i>

On analysing Table 2, one can notice that pre-service English language teachers diverge from their experienced counterparts in that the PST 1 regards the parent support as a (*crucial tool especially in teaching to young learners*). Similarly, the PST 4 considers the cooperation with parents as (*the necessity for language teachers ... in dealing with disruptive behaviours*). Even though other pre-service teachers' responses are not displayed here because of the space issue, one can infer that the pre-service English teachers seem to be open to cooperation with parents in CM ranging from teaching English to young learners and handling disruptive behaviours.

As for the in-service English language teachers, the stance for parent support might be deviant from that of pre-service teachers. To specify, the IST 1 prefers (*trying to solve the problems on her own, then resorts to parent support*) when she encounters with a problem. Likewise, the IST 2 tends to address to parent support (*if all techniques seem to stop functioning*). Therefore, it can be concluded that the in-service teachers seem to be reserved towards parent support and prioritise their way of CM and handling disruptive behaviours; however, if they are not able to do as such, they may resort to parent support.

2nd Research Question

As the second phase of the study, it is focused on PSTs' and ISTs' attitudes towards school administration support in terms of CM. In this vein, the expressions put forward by the interviewees are, respectively, (a) coded, (b) tabulated, and (c) categorised as in the case of the first research question. For each group, on summarising all responses, the best representative ones are displayed in Table 3.

Table 3. Prospective and practicum English language teachers' reflections about school administration support

Participant	Subcategories	Outcome
PST 2	<i>Stance/Behaviour</i>	- <i>School administration as the last option</i>
PST 3	<i>Stance/Behaviour</i>	- <i>School administration as the last option</i> - <i>School administration not to interfere with the classroom procedure</i>
IST 1	<i>Stance/Behaviour</i>	- <i>Not trusting on school administration</i>
IST 2	<i>Stance/Behaviour</i>	- <i>Relying, initially, on his/her skills,</i> - <i>Resorting to school administration if they do not function</i>

From Table 3, it can be understood that PSTs and ISTs do not seem to hold convergent stance in school administration support. To illustrate, the PST 2 regards the school administration as (*the last option*). As in the same vein, the PST 3 also considers it as (*the last option*) and also points out that she prefers school administrators (*not to interfere with the classroom procedure*). Thus, one can notice that the PSTs regards the school administration as a last address to resort.

The ISTs, on the other hand, appear to express variant responses. To specify, the IST 1, does (*not trusting on school administration*) and appears to stand aloof in relation to CM while the IST 2 prefers (*relying, initially, on her skills*) and addresses to it if other CM measures (*do not function*). In some aspects, the IST 2 retains similar stance with the PST 3. Nonetheless, one can deduce that PSTs and ISTs do not only seem to diverge in relation to their attitudes towards the school administration in CM, but ISTs also exhibit heterogeneous attitudes.

Overall, the PSTs' and ISTs' stance towards parent- and school administration-support can show variance both inter- and intra-group level. Therefore, by drawing on the related literature, possible explanations and remarks are provided in the discussion part.

Discussion and Conclusion

Teachers possess a crucial role in decreasing disruptive behaviours and increasing student achievement (Oliver et al., 2011). However, they are not the only actor responsible for attaining this aim; however, it is a team work and they are one of the significant stakeholders in CM as put forward by the ecological approach in CM (Back, et al., 2016). Classrooms have a dynamic and unforeseeable nature in that effective CM necessitates a harmonious coordination and collaboration among these stakeholders (Sánchez-Solarte, 2019). English language teachers are, therefore, expected to know their students and customise their teaching agenda in accordance with the students' needs (Sarıçoban, 2005) and CM practices can also benefit from this customisation. However, many actions taken by teachers seem to indicate that these course of actions mainly result from their own experiences (Macías, 2018). Macías' (ibid.) concern can be partly observable in this study.

Initially, for the first research question, the PSTs' and ISTs' views are sought in terms of parent support. In this regard, the PSTs have been found to be cooperative and ready to collaborate with parents. Especially, the PST 4's expressions about parent support as the necessity for language teachers which is in line with Savas' (2012) findings. Moreover, what Walker & Hoover-Dempsey (2013) have posited can be embodied in PST 1's ideas (see Table 2, PST 1) since they are knowledgeable about their needs and interests. However, ISTs do not seem to position themselves as willing as their pre-service counterparts in this vein. To specify, although both IST 1 and IST 2 point out the role of parent support, they regard this tool as a last resort if all the techniques do not work (see Table 2). ISTs' statements can be interpreted in a similar vein with the study carried out by Ng (2003), who has posited that despite their expression for the importance of parent involvement and support, teachers do not seem to be ready to cooperate with parents; additionally, those who are ready to cooperate prefer parent involvement and support not in the school, but at home. Therefore, the ISTs, in our study, may regard coordination with parents as a downgrading factor for their teaching even though they suggest they are open to resort to parent support as a last resort.

Then, the PSTs' and ISTs' stance towards the school administration support are inquired as the second research question. In this frame, PSTs do seem to exhibit the attitude that is shown by ISTs for the first research question, parent support. To clarify, both PST 2 and PST 3 address to the school administration support as the last option. Furthermore, this

position can be more salient in ISTs' expressions in that they do not much seem to be willing to cooperate with school administration and can be even against it (see Table 3, IST 1) In the same vein, Both PSTs' and ISTs' positioning themselves in school administration support can resonate what Brandisauskiene et al. (2019) postulate in teachers' reluctance to teamwork and openness to improvement proposals. What's more, the outcomes of this study can be in line with those of Clunies-Ross, et al., (2008), who suggest that teachers tend to be unwilling to be observed since they perceive this observation as an evaluation of their teaching manner. No matter what their status is, PST or IST, teachers/teacher candidates can view cooperation with school administration in CM as a kind of erosion in their authority in their classroom.

Although there exists an increasing volume of research in CM, more areas necessitate to be explored so as to deepen our understanding (van Tartwijk & Hammerness, 2011). Therefore, with this study it is aimed to comprehend the PSTs' and ISTs' opinions about parent and school administration support in CM. The current paper has put forward how PSTs and ISTs approach parent and school administration support. The results reveal that it is not plausible to notify a monolith point of view for both areas. Nonetheless, it can be concluded that the participants appear to be more open for parent support than that of school administration. But, both cases have their exceptions, too. Overall, with this study, it is aimed to account for the gap regarding English language teachers'/candidates' openness for cooperation with parents and school administration.

In this regard, some pedagogical implications for language teacher education need to be discussed. First, as Horwitz (2005) suggests, more specific CM courses are needed in teacher education rather than general one-for-all courses. Therefore, CM courses can be customised in relation to the necessities and pedagogy of foreign language teacher education. Second, although many teacher education programmes claim the inclusion of CM courses in their curricula, many seem to lack of feeding from the research as mentioned by Greenberg et al. (2014). Therefore, the research in CM can be amalgamated into foreign language teacher education pedagogy rather than providing this course as an end in itself. Third, the fact that Shamina and Mumthas (2018) have reported the limited amount of support and coordination between supervisors and pre-service teachers underscores the importance and role of collaboration in training PSTs. Without being unable to attain this coordination and collaboration even among each other, the openness for cooperation with

parents and school administration will probably be beyond the agenda of foreign language teachers and teacher candidates once the significance of the cooperation and collaboration among all the stakeholders in CM (Back, et al., 2016) is taken into consideration. To this end, more participatory and collaborative approaches to CM in relation to foreign language teaching pedagogy may be incorporated into language teacher education curricula without downgrading or the role of foreign language teachers. Fourth, ISTs can also benefit from cooperation with other actors in CM through seminars, workshops, parent-teacher meetings by not undermining their crucial role in their classrooms. To conclude, foreign language teachers, PSTs or ISTs, can be equipped with more comprehensive point of with CM which will positively correlate with their students' achievements in their language learning paths (Marashi & Assgar, 2019).

Nonetheless, the current study possesses some drawbacks in racing more in-depth understanding towards the participants' views. Relatedly, prospective research equipped with conversation analysis (e.g. Sacks, et al., 1974; ten Have, 2007) can focus on parent-teacher meetings and school principal-teacher meetings which may provide researchers, foreign language teacher educators, foreign language teachers, and pre-service foreign language teachers more fine-grained details in CM. Moreover, school principals and parents may have some take-away deductions from these meetings. Also, further research can examine the cooperation and collaboration among pre-service, in-service foreign language teachers, and supervisors within the scope of CM, which may bring fruitful insights into the pedagogy. Consequently, through collaboration among all the stakeholders in foreign language teaching classrooms, more progress can be achieved through research- and practice-oriented resources.

Acknowledgement

The current study is based on the second author's MA dissertation at the Institute of Educational Sciences, Hacettepe University. We present our gratitude for the lecturers and the students who gave their consent for this research.

Ethical Committee Permission Information

Name of the board that carries out ethical assessment: Hacettepe University Research and Publication Ethics Committee

The date and number of the ethical assessment decision: 07.11.2017 and 35853172/433-3703

Author Contribution Statement

İsmail Firat ALTAY: Conceptualization, literature review, data analysis, data collection, translation, and writing.

Tarık YÜTÜK: Conceptualization, literature review, data collection and writing.

References

- Back, L. T., Polk, E., Keys, C. B., & McMahon, S. D. (2016). Classroom management, school staff relations, school climate, and academic achievement: Testing a model with urban high schools. *Learning Environments Research*, 19, 397-410.
- Balli, S. J. (2011). Pre-service teachers' episodic memories of classroom management. *Teaching and Teacher Education*, 27, 245-251.
- Barraja-Rohan, A., & Pritchard, C. R. (1997). *Beyond talk: A course in communication and conversation skills for intermediate adult learners of English*. Western Melbourne Institute of TAFE.
- Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. *NursingPlus open*, 2, 8-14.
- Brandisauskiene, A., Cesnaviciene, J., & Bruzgeleviciene, R. (2019). Teacher leadership in Lithuania: Are teachers prepared to cooperate?. *Management: Journal of Contemporary Management Issues*, 24(Special Issue), 123-136.
- Brown, H. D. (2001). *Teaching by principles: An interactive approach to language pedagogy* (2nd ed.). Longman.
- Cangelosi, J. S. (1988). *Classroom management strategies: Gaining and maintaining students' cooperation*. Longman.
- Cheng, Y. H., & Chen, Y. C. (2018). Enhancing classroom management through parental involvement by using social networking apps. *South African Journal of Education*, 38(Supplement 2), s1-s14.
- Clunies-Ross, P., Little, E., & Kienhuis, M. (2008). Self-reported and actual use of proactive and reactive classroom management strategies and their relationship with teacher stress and student behaviour. *Educational Psychology*, 28(6), 693-710.
- Daloğlu, E. M. (2002). *Teacher perceptions on classroom management in teaching English as a foreign language*. Yayınlanmamış yüksek lisans tezi. Uludağ Üniversitesi, Bursa.
- Debreli, E., & Ishanova, I. (2019). Foreign language classroom management: Types of student misbehaviour and strategies adapted by the teachers in handling disruptive behaviour. *Cogent Education*, 6(1), 1648629.
- De Fina, A. (1997). An analysis of Spanish bien as a marker of classroom management in teacher-student interaction. *Journal of Pragmatics*, 28(3), 337-354.
- Doyle, W. (1986). *Classroom management techniques and student discipline*. Office of Educational Research and Improvement.
- Dörnyei, Z. (2007). *Research methods in applied linguistics quantitative, qualitative, and mixed methodologies*. Oxford University Press.
- Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative Content Analysis: A Focus on Trustworthiness. *Sage Open*, 4(1). <https://doi.org/10.1177/2158244014522633>
- Emeh, J. U., & Agbor, C. A. (2005). Teachers' classroom management variables and students' academic achievement in French in Cross River State, Nigeria. *Global Journal of Humanities*, 4(1), 25-27.

- Greenberg, J., Putman, H., & Walsh, K. (2014). Training our future teachers: Classroom management. Revised. *National Council on Teacher Quality*.
- Grim, F. (2010). L1 in the L2 classroom at the secondary and college levels: A comparison of functions and use by teachers. *Electronic Journal of Foreign Language Teaching*, 7(2), 193-209.
- Gultom, E., & Saun, S. (2016). The role of classroom management in creating an effective English learning. *Journal of English Language Teaching*, 5(1), 18-24.
- Harwood, T. G., & Garry, T. (2003). An overview of content analysis. *The marketing review*, 3(4), 479-498.
- Hoff, K. E., & DuPaul G. J. (1998). Reducing disruptive behavior in general education classrooms: the use of self-management strategies. *School Psychology Review*, 27, 290-303.
- Horwitz, E. K. (2005). Classroom management for teachers of Japanese and other foreign languages. *Foreign Language Annals*, 38(1), 56-64.
- Kerdikoshvili, N. (2012). Student-centered approach to classroom management in English language teaching. *Journal of Education*, 1(2), 53-60.
- Keskin, P. (2019). *Parental effect on YL's motivation and attitude towards English language learning*. (Unpublished MA Thesis). Hacettepe University, Ankara.
- Klattenberg, R. (2021). *Conversation analysis and classroom management: An investigation into L2 teachers' interrogative reproaches*. Springer-Verlag.
- Kunter, M., Baumert, J., & Köller, O. (2007). Effective classroom management and the development of subject-related interest. *Learning and Instruction*, 17, 494-509.
- Lojdová, K. (2020). Role comparison of a student teacher and cooperating teacher in classroom management: On the scene and behind the scenes. *Sodobna Pedagogika*, 71(1), 174-191.
- Macías, D. F. (2018). Classroom management in foreign language education: An exploratory review. *Profile Issues in Teachers Professional Development*, 20(1), 153-166.
- Malmgren, K. W., Trezek, B. J., & Paul, P. V. (2005). Models of classroom management as applied to the secondary classroom. The clearing house: *A Journal of Educational Strategies, Issues and Ideas*, 79, 36-39.
- Marashi, H., & Assgar, F. (2019). EFL teachers' effective classroom management and learners' anxiety and learning strategies. *Iranian Journal of Language Teaching Research*, 7(2), 65-82.
- Marzano, R. J., & Marzano, J. S. (2003). The key to classroom management. *Educational Leadership*, 61(1), 6-13.
- Ng, S. W. (2003). Are parents and teachers psychologically prepared for cooperation in Hong Kong?. *Pacific-Asian Education Journal*, 15(1), 60-76.
- Oliver, R. M., Wehby, J. H., & Reschly, D. J. (2011). Teacher classroom management practices: Effects on disruptive or aggressive student behavior. *Campbell Systematic Reviews*, 7(1), 1-55.
- Postholm, M. B. (2013). Classroom management: What does research tell us?. *European Educational Research Journal*, 12(3), 389-402.
- Reinke, W. M., Herman, K. C., & Stormont, M. (2013). Classroom-level positive behavior supports in schools implementing SW-PBIS: Identifying areas for enhancement. *Journal of Positive Behavior Interventions*, 15, 39-50.
- Sacks, H., Schegloff, E. A., & Jefferson, G. (1974). A simplest systematics for the organization of turn taking for conversation. *Language*, 50, 969-735.

- Sakui, K. (2007). Classroom management in Japanese EFL classrooms. *JALT Journal*, 29(1), 41.
- Sánchez Solarte, A. C. (2019). Classroom management and novice language teachers: Friend or foe?. *How*, 26(1), 177-199.
- Sarıçoban, A. (2005). Classroom management skills of the language teachers. *Journal of Language and Linguistic Studies*, 1(1), 1-11.
- Savas, A. C. (2012). The contribution of school-family cooperation on effective classroom management in early childhood education. *Educational Sciences: Theory and Practice*, 12(4), 3099-3110.
- Schreier, M. (2012). *Qualitative content analysis in practice*. Sage
- Seedhouse, P. (2004). *The interactional architecture of the language classroom: A conversation analysis perspective*. Blackwell.
- Shamina, E., & Mumthas, N. S. (2018). Classroom management: Implications for teacher preparation programmes. *IOSR Journal of Humanities and Social Science*, 23(1), 41-44.
- Stoughton, E. H. (2007). "How will I get them to behave?": Pre-service teachers reflect on classroom management. *Teaching and Teacher Education*, 23, 1024-1037.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research techniques*. Sage Publications.
- ten Have, P. (2007). *Doing conversation analysis*. Sage.
- Thangarajathi, S., & Joel, T. E. (2010). Classroom management: A challenging task for the teachers. *Journal on Educational Psychology*, 4(2), 11-18.
- Ünal, Z., & Ünal, A. (2012). The impact of years of teaching experience on the classroom management approaches of elementary school teachers. *International Journal of Instruction*, 5(2), 41-60.
- van Tartwijk, J., & Hammerness, K. (2011). The neglected role of classroom management in teacher education. *Teaching Education*, 22(2), 109-112.
- Walker, J. M., & Hoover-Dempsey, K. V. (2013). Why research on parental involvement is important to classroom management. In *Handbook of classroom management* (pp. 675-694). Routledge.
- Wellington, J. J. (2015). *Educational research: Contemporary issues and practical approaches*. Bloomsbury Academic.
- Willis, J. (1996). *A framework for task-based learning*. Longman.
- Wright, T. (2005). *Classroom management in language education*. Springer.
- Yütük, T. (2018). *Attitudes of prospective English language teachers and practice teachers towards disruptive behaviours* (Unpublished MA Thesis). Hacettepe University, Ankara.
- Zein, S. (2018). Classroom management for teaching English to young learners. In S. Garton & F. Copland (Eds.). *Routledge handbook of teaching English to young learners* (pp. 154-168). Routledge.

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Research Article

Podcasting as a Tool for Developing Oral Proficiency and Self-regulated Learning Strategies: Insights from Turkish EFL Learners

Seçil TÜMEN AKYILDIZ^{1,*} 

¹ Firat University Faculty of Humanities and Social Sciences Elazığ, Turkey stakyildiz@firat.edu.tr


* Corresponding Author: stakyildiz@firat.edu.tr

Article Info

Received: 23 July 2024

Accepted: 20 September 2024

Keywords: EFL, podcast, speaking skills, self-regulation

 10.18009/jcer.1521030

Publication Language: English

Abstract

This study examines the impact of podcasts on high school students' English language learning, focusing on speaking performance and self-regulated learning strategies. The widespread adoption of digital communication technologies has transformed education, necessitating the integration of technology to enhance learning outcomes. Using a qualitative approach, the study investigates the general English learning habits of students, their perceptions of using podcasts to improve speaking skills, and how podcasts influence their ability to self-regulate learning. Findings reveal that students actively engage with English-language media, benefiting from enhanced listening comprehension, vocabulary acquisition, and pronunciation. Recording podcasts fosters confidence and fluency in speaking, while also promoting goal setting, planning, and reflective practices. The study highlights the importance of integrating podcasts into EFL instruction to create a dynamic learning environment that supports students' language proficiency goals. The results contribute to the literature on educational technology and underscore the potential of podcasts to improve language learning experiences.



To cite this article: Tümen-Akyıldız, S. (2024). Podcasting as a tool for developing oral proficiency and self-regulated learning strategies: Insights from Turkish EFL learners. *Journal of Computer and Education Research*, 12 (24), 754-779. <https://doi.org/10.18009/jcer.1521030>

Introduction

The current worldwide educational environment in the twenty-first century is undergoing a significant shift due to the widespread adoption of digital communication technologies and pervasive networked applications. This transformation is also influenced by the evolving characteristics, requirements, and expectations of students. The utilization of technologies in the field of education holds significant importance as it serves to provide essential assistance to educators, students, and the overall learning process, hence enhancing their effectiveness in mastering the subject matter. Speaking skills are essential for effective communication; however, teaching speaking skills to non-native speakers in an environment where English is taught as a foreign language has always been a significant challenge for

educators. Students fail to engage in sufficient listening practice to acquire the appropriate speaking style, which leads to inadequate speaking abilities. The non-native speakers are significantly impeded by their inability to discern the tone and intonation, as well as their lack of vocabulary. Achieving speaking skills, including the correct pronunciation of English letters, intonation, confidence, and the correct use of vocabulary, is a persistent challenge for both instructors and learners, even when considering factors such as stress, accent, and pronunciation. Whenever they succeed in achieving one, they fail to accomplish the other. (Hamad, et al., 2019). Numerous studies have explored the integration of technology in language education. Hismanoglu (2012) highlighted that incorporating technology into the classroom benefits both teachers and students by fostering a positive learning environment, thereby improving the overall teaching and learning processes. The present study focuses on examining the potential impact of educational technology, particularly Pod-casts as a Web 2 tool on students' English language learning, with a specific emphasis on their speaking performance and students' using self-regulated strategies in speaking skills.

The pervasive integration of technology into everyday life has significantly enhanced the availability of resources and facilitated social contact, hence establishing informal learning venues as a prominent means of acquiring knowledge (Bonk, 2010). Whithaus and Neff (2006) posited that instructors can employ a web-based teaching methods and provided students with the opportunity to use videos for self-learning. Hong (2006) proposes the utilization of technology as a means to enhance students' oral performance in the acquisition of speaking abilities. As noted by Thornbury (2005), the effective teaching of speaking skills requires the implementation of "talking classrooms" where the active engagement in speaking activities is considered an essential component of the instructional setting. Consequently, students will improve their oral communication abilities and experience a growing sense of self-assurance when engaging in spoken discourse in the target language. In contemporary society, the acquisition of technological skills has become an essential prerequisite for individuals seeking job opportunities. There exist a multitude of educational technology applications, devices, and software that possess potential utility for learners. Alhamami (2013) investigated the effectiveness of YouTube LLVs as comprehensive language courses that do not necessitate supplementary language materials. As Mahrooqi and Naqvi (2014) stated the domain of education has had significant impact from the potential afforded by technology, which has carved out a specialized role in the realm of

foreign language instruction, thereby expanding the range of traditional teaching approaches. The acquisition of a foreign language poses challenges and intricacies for a significant number of students. Therefore, it is imperative for educational institutions to efficiently allocate time and resources in order to deliver language teaching tailored to accommodate students with diverse learning styles.

The facilitation of the self-regulation could be achieved through the utilization of technologies as well. Kitsantas and Dabbagh (2011) recognize the considerable potential of Web 2.0 social software technologies, encompassing communication tools, resource and experience exchange tools, and social network tools, in fostering self-regulation. Digital technologies provide a means for accessing many learning alternatives and possibilities that promote the development of self-regulation abilities (Bernacki, & Byrnes 2011). Taking advantage of self-regulated learning (SRL), a significant number of EFL learners actively pursue extracurricular opportunities to enhance their overall English proficiency, with a specific focus on improving their speaking abilities (Uztosun, 2020). Numerous scholars have conducted studies on the utilization of technology by EFL learners, both in synchronous settings within the classroom and asynchronously outside the confines of the class, without any temporal or spatial limitations. One of those technologies is the podcast. It is a digital medium that emerged during the era of Web 2.0 and has the potential to be utilized as an educational resource. Engaging in listening activities can facilitate the enhancement of students' listening skills, critical thinking abilities, and intrinsic motivation to actively engage in the act of listening, so fostering the cultivation of a genuine appreciation for the auditory experience. Cebeci and Tekdal (2006) explained the current discourse is around the potential of podcasting as an innovative e-learning technology that has the capacity to revolutionize the field of mobile learning. Podcasting, also known as audiocasting, is a straightforward implementation of audio content syndication that primarily focuses on delivering material to mobile digital devices using audioblogs hosted on the Internet. According to Meng (2005, p. 1), podcasting can be defined as the act of recording an audio event, such as a speech, song, or combination of sounds, and subsequently uploading the resulting digital sound object onto a website or blog using a data structure known as an RSS 2.0 envelope or feed.

Research studies investigating the use of podcasts in educational settings have demonstrated that podcasts possess the capacity to enhance not just auditory comprehension abilities but also spoken communication proficiencies (Stefancik & Stradiotová, 2020). As

exemplified by McGarr (2009), podcasting is the act of distributing audio or video content in a digital format. The software can be obtained either through manual downloading from the internet or through automatic distribution to subscribers. These files can be easily accessed directly from the desktop or transferred to a media device. One of the primary benefits of incorporating podcasting into educational settings is the inherent portability and ease it offers, allowing learners to access educational resources at their own discretion and in various locations, without necessitating substantial technological expertise. Podcasts have the capability to be downloaded automatically onto a wide range of mobile devices. The utilization of mobile devices allows learners to access and engage with learning materials at their convenience, enabling them to listen to the content at a location and timeframe of their choosing. However, despite the aforementioned technological benefit associated with podcasting, there exist certain considerations that need to be taken into account prior to incorporating podcasts into instructional methods that are centered around objects (Cebeci & Tekdal, 2006).

Podcasting offers educators the opportunity to access up-to-date and captivating resources for their students, thereby fostering motivation to engage with audio materials that align with their personal interests. Both teachers and students have the capability to produce their own podcasts.

Lim and Chan (2007) underscored the changing roles of teachers, evolving from recipients of knowledge to active constructors of knowledge, while also noting the shift in technology's role from simply being a learning tool to becoming a key facilitator of knowledge construction. Within this context, self-regulated learning (SRL) emerges as a pivotal concept. Azevedo, Cromley and Seibert (2004) argued that technology-enhanced learning environments utilize the SRL framework as a scaffold to assist students in learning. Chen (2021, 2022) highlighted the increasing importance of technology-enhanced self-regulated learning (SRL), especially in an era where technology influences every aspect of education.

Considering the fact that contemporary youth heavily rely on technology in general, podcasts in particular as a significant information resource, It can be said that this platform to be valuable in the context of the educational process. The efficiency of instruction can be enhanced when compared to the utilization of conventional teaching tools. From this conceptual standpoint the primary aim of this study is to investigate the viability of

developing speaking skills and the importance of SRL in enhancing the oral competency of EFL learners. This will be achieved through the development and implementation of learner podcasts. Consequently, the present study aimed to explore the perceptions of Turkish EFL learners enrolled in a Science High School about the effects of creating and using podcasts on their English speaking abilities and their use of SRL strategies. And it is hoped to contribute to the field with considerable results. By this aim, the current study will discuss using podcasts in EFL context in general, with a specific focus on teaching speaking, and the necessity of employing SRL in improving oral proficiency. Subsequently, the results will be presented and a comprehensive discussion will be held.

Podcasts as a Tool in EFL Teaching Classes

Research into podcasting as a pedagogical tool suggests that it can help students improve their mastery of the English language. Second Language Acquisition (SLA) theories have emphasized the importance of learning and teaching language in a communicative environment through the use of authentic resources. To enhance learners' English competence, the integration of podcasts into language education as additional materials, alongside course materials, has been suggested (Istanto, 2011; Lee & Chan, 2007). Learners' motivation can be boosted by providing them with understandable input in a relevant setting. As such, podcasts help educators realize these core aims of second language instruction. Learners can gain access to real-world examples through podcasts. Students can utilize these resources to practice their listening skills or create their own podcasts. Podcasts can be accessed and shared in a matter of seconds using the World Wide Web (Royal & Von Koss, 2008).

Podcasts encompass a wide range of content categories and are offered by diverse sources or individuals known as podcasters. The primary providers of content include broadcasters who distribute their radio programs or specially recorded content on the internet, performers seeking to promote their material, film studios offering film trailers for promotional purposes (both mainstream and independent studios), individuals with a desire to express or share something, and educational institutions and teachers who offer learning content across various disciplines. Originally, these were mostly focused on technological aspects (Rosell-Aguilar, 2007). According to Gromik (2008), podcasting gives students "full access authentic resources" even in non-English speaking environments. Furthermore,

podcasts provide a real-life source that all learners of a foreign language are free to benefit from.

Podcasting offers benefits for both students and educators, presenting two options for implementation: utilizing pre-existing podcasts or developing original podcasts. The advancements in podcasting technologies have yielded two primary prospective applications: the creation of podcasts and the utilization of the available podcast materials. The two-alternative model is depicted by Rosell-Aguilar (2007: 476) in the following manner.



Figure 1. Taxonomy of uses of podcasting for language learning (Rosell-Aguilar, 2007).

As stated by Dudeney and Hockly (2007), in the context of higher education, it is typical for instructors to utilize podcasts as a means of recording their lectures and disseminating them to students for subsequent auditory consumption. These lecture podcasts provide students who are unable to attend the courses with the opportunity to access the lecture content by downloading podcasts into their mobile devices, such as MP3 players or laptops.

This phenomenon is alternatively referred to as 'course casting'. Academic instructors have the ability to utilize pre-recorded standard lectures in the form of podcasts, which can be disseminated to students at designated intervals during the academic calendar. Furthermore, individuals have the capability to create and produce their own educational audio recordings, commonly referred to as lecture podcasts, with the intention of providing consistent learning opportunities for students. Likewise, podcasts can be advantageous in the context of teacher training. Trainees have the potential to enhance their understanding of methodology and enhance their teaching skills through the utilization of various podcasts.

There are two primary categories of podcasts for anyone interested in podcast creation: podcasts produced by educators and podcasts produced by students. According to Meng (2005:5), there are several potential applications for the creation of podcasts:

- The task involves the process of capturing and disseminating news broadcasts.
- The teacher's notes are recorded.
- Lectures are recorded and disseminated straight to students' MP3 devices.
- Documented minutes of meetings and conferences.
- Academic endeavors and interviews with the purpose of supporting student projects.
- The process of documenting and preserving oral history through archiving and facilitating access to it as per request.

Language learning podcast resources can be categorized into two primary kinds. The first group consists of real information created by native speakers of the target language, particularly intended for use by native speakers. Examples of such content include news feeds and radio programming. The second category comprises language courses or instructional materials that are expressly tailored for the purpose of language acquisition. This content can be categorized, similar to other online learning materials, as comprehensive independent courses that aim to function as virtual classrooms or supplementary activities to traditional classroom instruction or distance education (Rosell-Aguilar, 2007).

According to Fontichiaro (2008), offering students the opportunity to engage with podcasts that align with their personal interests can enhance their motivation to learn. In their study, Hasan and Hoon (2013) conducted an analysis of twenty scholarly journal articles in order to investigate the impact of podcasts on the language proficiency of English as a Second Language (ESL) learners, as well as their attitudes and beliefs towards the use of podcasts as a learning tool. The findings of the literature review have demonstrated that podcasts not only facilitate the improvement of learners' listening and speaking abilities, but also contribute to the development of other language skills, including vocabulary, grammar, and pronunciation. The investigation conducted by Sze (2006), an instructor from Hong Kong, focused on examining the particular benefits associated with utilizing podcasts for language acquisition. The author has examined the ways in which students' listening and speaking abilities can be enhanced by engaging with podcasts. According to Stanley (as mentioned in Sze, 2006), podcasting is characterized as an innovative technological tool that holds significant promise in improving the listening and speaking comprehension skills of

second language learners. Due to the ease of downloading podcasts on various devices, learners are afforded the opportunity to engage in several listening practices regardless of their location. The accessibility of podcast creation tools and the wide global reach of potential listeners serve as strong incentives for students to engage in the production of their own podcasts. Additionally, podcast production offers enough opportunities for learners to engage in meaningful language use.

Using Podcasts in Teaching Speaking

Podcasts offer learners the opportunity to engage in repeated listening experiences, serving as educational tools that facilitate the enhancement of students' speaking abilities within a meaningful environment. Furthermore, these opportunities provide students the ability to improve their self-monitoring skills, hence fostering the development of learner autonomy (Royal & Von Koss, 2008). Syosoyev (2014) proposed a potential algorithm with several steps for the improvement of listening and speaking abilities using podcasts. In that algorithm the teacher introduces the service platform, on which the placement of student podcasts and their network interaction will take place, as well as the assessment criteria for their participation in educational activities, before explaining to the class the project's purpose and goals in the first stage. The next stage allows the teacher to develop a unique page just for his particular group of students utilizing some social media tools. This page provides a summary of the assignment or project so that it is evident to all visitors what the posted podcasts are about (subjects) and who made them (students or learners). It is advised that the instructor record a podcast explaining the assignment and introducing the project participants in a foreign language for 1-2 minutes. The teacher instructs the students on the guidelines for online information security in the fourth phase. Then, the preparation of a speech's (or podcast's) text is encouraged for students. Each student may introduce himself and state his age, residence, and course of study at the commencement. The next step is to dedicate a podcast to the chosen subject. Students also gain writing abilities at this stage; depending on the assignment, they produce texts that are descriptive, argumentative, or comparative in nature. The teacher should assist the students in creating grammatically and lexically sound speech text that will then be recorded and placed on the podcast service for additional discussion. In the subsequent phase, the students have the capability to capture their remarks by utilizing contemporary network software. The utilization of network software enables the ability to repeatedly capture a performance till the learner attains a level

of satisfaction with the overall quality. The podcast will only be saved in the network and made accessible to all project participants subsequent to that. It is imperative that classmates and the teacher devote their full attention to viewing or listening to each of the podcasts produced by the students during extracurricular periods. Following the completion of each student's podcast, all students are cordially encouraged to engage in a network-based conversation pertaining to the podcasts. Students may be assigned the responsibility of engaging with a podcast by either viewing or listening to it, and subsequently sharing their concise reviews and comments on the content and/or structure of the podcast on a micro-blog platform. Subsequently, students engage in an assessment of their ability to clarify the fundamental nature of the topic being discussed. They attempt to appreciate the specific challenges encountered and the underlying reasons for these difficulties throughout the project. Additionally, they explain the necessary steps to enhance their performance in future endeavors. Finally, the instructor assesses the students' outcomes based on predetermined criteria.

In relation to the impact of podcasting on learners' speaking proficiency, McQuillan (2006) proposed a variety of activities that prioritize learners' oral expression. These responsibilities encompass many speaking activities, such as conducting talk shows, engaging in interviews with individuals who are native speakers, and utilizing audio diaries. In the assigned tasks, learners are expected to engage in the process of recording both themselves and their classmates as part of a classroom assignment. The purpose of this activity is to collect speech samples which will then be submitted to the teacher for assessment (p.16). Overall, there seems to be some evidence to indicate that the use of podcasts in the development of oral skills alone considerably boosts student enthusiasm and adds variety to the process of teaching languages at schools and colleges (Solomatina, 2011). The research conducted by Farangi et al. (2016) examined the incorporation of podcasts into English as a Foreign Language (EFL) schools. The results of the study indicated that the incorporation of podcasts into language classrooms had a notable impact on the enhancement of English as a Foreign Language (EFL) learners' oral communication abilities. Jain and Hashmi (2013) conducted a study to evaluate the benefits associated with the utilization of podcasts inside English Language Classrooms. Based on Jain and Hashmi (2013), both educators and students have the ability to produce their own podcasts utilizing

platforms. Podcast websites provide students the opportunity to engage in diverse listening exercises, so facilitating the enhancement of their oral competence skills.

Podcast's Role in Fostering Students' Self-Regulation

Contemporary research indicates an increasing recognition of the imperative to facilitate and promote learner autonomy across the entirety of the learning process (Dron, 2007). SRL is widely recognized as a highly impactful approach to learning. It pertains to the extent to which students exhibit proactive and responsible engagement in their own learning process (Zimmerman, 2008). Self-regulated learners assume full responsibility for all aspects of their learning, including but not limited to the stages of planning, monitoring, and evaluation. Furthermore, they actively participate in the learning process. The investigation of this student-centered learning approach, which aims to better prepare learners for real-life situations, is necessary in language classrooms in order to attain higher levels of success. Several researchers have turned their attention towards individuals who exhibit self-regulatory behaviors in regards to their academic activities and performance.

According to Zimmerman and Cleary (2009), a study was conducted to examine the performance of learners who are capable of regulating their own practices compared to pupils who lack this ability. The investigation revealed that the former group achieved superior outcomes. Scholars have conducted investigations on the ways in which learning technology can facilitate or enhance student self-regulated learning (Kitsantas & Dabbagh, 2011).

There is significant promise for the use of Web 2.0 social software applications to aid in students' efforts to self-regulate. Social software enables instructors to facilitate student engagement through online forums and aids in monitoring their progress towards achieving task mastery. This feature plays a crucial role in promoting students' self-regulation (Kitsantas & Dabbagh, 2011).

Purpose of the Study and the Research Questions

Most students follow the lead of their foreign language instructors by focusing on developing their ability to communicate effectively in English (Gryshchenko & Sydorenko, 2014). Regarding foreign language teaching, particularly in the Turkish context, EFL students have difficulties improving their speaking abilities because they are not exposed to the target language, English, outside of the classroom. Therefore, they require additional comprehensible input in addition to the speaking tasks they should complete in English

classes in order to practice English. Learners can develop their communicative skills in a stress-free environment outside of class by listening to recordings. One advantage of utilizing podcasts is the potential to offer students supplementary opportunities for hearing in a foreign language, so enhancing their listening abilities. Additionally, podcasts give a platform for practicing the target language and improving oral proficiency. Podcasts offer the flexibility to be accessed and utilized on various portable digital devices, regardless of whether an internet connection is available. This versatility eliminates limitations related to time and location. Therefore, students have the opportunity to enhance their language abilities independently outside of the traditional classroom setting, thereby fostering their autonomy as learners. Regarding this matter, the notion of learner autonomy can be defined as the capacity to independently regulate and direct one's own learning process (Holec, 1981). Hence, the utilization of podcasts has a significant impact on learners' self-regulation in the realm of language acquisition as a whole, with a specific emphasis on enhancing oral proficiency. Upon reviewing the pertinent literature, it was ascertained that there exist studies encompassing the perspectives of both students and teachers, which indicate that the utilization of Podcasts has a positive impact on the enhancement of other skills, (Gromik, 2008; Istanto, 2011; Li, 2012) and speaking skills (Farangi et al., 2016; Jain & Hashmi, 2013; McQuillan, 2006; Solomatina, 2011; Syosoyev, 2014). To the best of the researcher's knowledge, there is currently a lack of study investigating the impact of podcasts on students' self-regulation in the context of for EFL speaking skills. This research aimed to investigate the students' perspectives of using podcasts by formulating three research questions as the primary components of the study.

1-What are the general English language learning habits of high school students, and how do these habits influence their overall language proficiency and engagement in EFL contexts?

2- What are the perceptions of learners regarding the influence of using podcasts as a means of enhancing their EFL speaking skills?

3- What are the perceptions of learners regarding the influence of using podcasts on their ability to self-regulate their learning in terms of speaking skills?

Method

In the field of social sciences, researchers primarily strive to elucidate various perspectives on comprehending social reality (Jackson, et al., 2007). Qualitative research primarily centers on the examination of human experiences and reflections (Lincoln & Guba, 1985). According to Jackson and his colleagues. (2007), it is necessary for participants to provide detailed and comprehensive comments regarding their experiences, since this contributes to the overall depth and quality of study. This study was methodologically planned to employ a qualitative approach, utilizing semi-structured interviews to gather in-depth insights into the participants' experiences. The interviews were conducted in person, and data were collected through audio recordings, which were then transcribed and coded for the analysis. This approach allowed for a rich exploration of the participants' perceptions of podcasting in relation to their oral proficiency and self-regulated learning strategies. The qualitative methodology was chosen to capture the subjective experiences of the participants and to provide a deeper understanding of their engagement with podcasts.

Trustworthiness

According to Guba (1981), a widely recognized authority in this field, there are four criteria that must be satisfied in order to establish the trustworthiness of a study. The four key criteria that are commonly utilized in academic research are credibility, transferability, dependability, and confirmability. The researcher endeavored to adhere to these criteria during the course of the investigation, which will be expounded upon extensively in this section.

Credibility

Credibility is a fundamental factor in establishing trustworthiness, as emphasized by Lincoln and Guba (1985). According to Merriam (1998), researchers should strive to determine the level of congruence between their findings and reality. In the present study, many measures have been undertaken to assure the credibility of the research. One method that might be employed is the random sampling of participants. Bouma and Atkinson (1995) argue in favor of employing random sampling in qualitative research, asserting that the selection of participants through random means ensures their representativeness of the larger population. There exist several methods to promote integrity among participants.

According to Shenton (2004), it is imperative that participants are provided with the opportunity to decline participation in the study. The participants in this study were selected on a voluntary basis, a factor believed to enhance the research's credibility. Another crucial component in establishing credibility is the researcher's background, qualifications, and experience, as highlighted by Shenton (2004). Patton (1990) underscored the significance of the researcher's credibility as the principal actor responsible for data collection and interpretation (as mentioned in Shenton, 2004). The researcher involved in this study possesses a strong academic background, encompassing 10 years of experience in teaching English as a Foreign Language (EFL) and lecturing, along with a diverse range of qualitative research endeavors.

Transferability

Merriam (1998) posits that transferability refers to the concept of external validity, which pertains to the extent to which the findings of a study can be applied to different contexts or populations. However, Shenton (2004) argued that the generalizability of findings from a qualitative study with a limited sample size is limited and cannot be extrapolated to other populations and contexts. Given that the results are limited in scope to the persons involved. This research does not claim that the perspectives of the participants are representative of others, as it acknowledges the influence of their country-specific circumstances and personal factors.

Dependability

In other ways, it might be referred to as reliability. The statement implies that if the study were to be replicated under same circumstances, employing the same methodologies and involving the same people, comparable findings would be obtained (Shenton, 2004). According to Lincoln and Guba (1981), a robust correlation exists between credibility and dependability. If a researcher establishes the circumstances of the former, they will likewise establish the terms of the latter. According to Shenton (2004), it is imperative for researchers to provide a comprehensive account of the method in order to assure the trustworthiness of their findings. Therefore, this study is considered reliable since it presented multiple variables essential for establishing credibility and provided a comprehensive account of the research process.

Confirmability

According to Patton (1990) as stated in Shenton (2004), the attainment of objectivity in qualitative research poses a significant challenge when relying on human-made instruments. In order to mitigate the potential influence of subjectivity, the researchers sought the assistance of two academics from the Education Faculty to review the responses provided by the participants and validate the assigned codes. They were involved in reviewing the participants' responses. After an initial round of coding was completed by the researcher, the academics independently assessed the assigned codes for accuracy and consistency. Any discrepancies were discussed and resolved through a consensus, ensuring the reliability of the coding process. A voice recorder was used to capture the interviews, and these recordings will be retained to ensure confirmability.

Participants

"The study included a sample of 10 EFL learners, all of whom were 10th-grade female students currently enrolled in a science high school located in a city in the Eastern Anatolia region of Turkey. The school was intentionally selected due to the English language teacher's prior experience utilizing podcasts in the curriculum over the past two years. The participants, aged between 15 and 16, have been learning English as a foreign language since early in their educational journey, consistently demonstrating a strong interest in the English language. These students are particularly motivated to improve their English skills, frequently leveraging technology to enhance their learning experience, with a specific focus on podcasts. Under the guidance of their English language teacher, they have been using podcasts as a key tool for self-improvement. Based on their school curriculum and their teacher's evaluation, the students were at an intermediate to upper-intermediate level of English proficiency, allowing for meaningful engagement with the podcasting activities. Their sustained involvement in EFL provides a rich context for exploring their perceptions of how podcasting influences both their speaking skills and their ability to self-regulate in language learning. This specific cohort, with their solid EFL foundation and proactive use of technology, offers valuable insights at a crucial stage of their educational development."

Data Collection

The data were gathered by administering an interview form that was meticulously developed by the researcher, who thoroughly examined the relevant literature. The researcher sought guidance from two professors in the Education Faculty regarding the questions in order to ensure their breadth and applicability to the research. The questions were updated based on the recommendations provided. Therefore, a set of three inquiries was formulated in order to investigate the perspectives of EFL students about the impact of using podcasts on their oral proficiency and self-regulation in enhancing their speaking skills. The interviews, which were done in person, aimed to gather participants' comments on the procedure and were recorded using a voice recorder. In order to ensure a conducive atmosphere, the interviews were conducted in the participants' native tongue, specifically Turkish. The audio recordings were sequentially translated, transcribed, and afterwards subjected to analysis. In order to protect the privacy of the students, direct quotations were provided using codes such as S1 and S2, which corresponded to the first student participating in the interview.

Finding

The data analysis showed the participants' perspectives regarding their overall English language learning habits, the impact of utilizing podcasts, and the effect of using podcasts on their capacity to independently manage their learning in terms of speaking skills. The findings for each research topic are presented below.

RQ 1. What are the general English language learning habits of high school students, and how do these habits influence their overall language proficiency and engagement in EFL contexts?

The first research question provided the two categories and codes presented in Table 1.

Table 1. General English language learning habits and motivations of students

General Categories	Codes	Frequency
Study Habits and Techniques	Watching and Listening to English Content	9
	Regular Practice and Homework Completion	6
Motivation and Attitude	Intrinsic	6
	Extrinsic	4
	Attitude	3
TOTAL		28

The data analysis identified two major categories for the first research question. Analyzing the responses, the researcher categorized the first category as 'Study Habits and Techniques' (F=15). The respondents indicated the extent to which students watch English-language movies, TV shows, and videos, as well as listen to English-language music, podcasts, and audiobooks for the first code (F=9). S1 commented *'I love watching English-language movies and TV shows because it helps me understand the language better and pick up new words. I also listen to podcasts and audiobooks in English, which makes learning fun and keeps me engaged even outside of school'*. And S4 *'Listening to English music and watching videos on YouTube really helps me with my pronunciation and understanding different accents. It's a great way to learn without feeling like I'm studying'*. The findings indicate that a significant number of students actively engage with English-language movies, TV shows, videos, music, podcasts, and audiobooks as part of their language learning habits. This engagement is perceived to be highly beneficial in enhancing their language skills. The second code referred to the frequency and consistency with which students complete their English homework and engage in additional practice exercises (F=6). S9 reported *'I make sure to finish my English homework and often use language learning apps for additional practice. It helps me reinforce what I learn in class'*. S8 *'I do my English homework regularly, but I only do extra practice when I have upcoming exams. It's hard to find the time otherwise'*. The data indicated that most students consistently finish their English homework, but their level of involvement in additional practice assignments differs. Six students emphasized the significance of consistently doing their homework, acknowledging that it helps in reinforcing classroom learning and fostering confidence.

Based on the students' responses regarding their study habits and techniques, it is evident that these behaviors are influenced by a variety of motivational and attitudinal factors. The second category is 'Motivation and Attitude,' to understand how intrinsic and extrinsic motivations, as well as students' overall attitudes towards learning English, impact their language learning experiences and outcomes. Six students stated the internal drive and personal interest students have in learning English, including their passion for the language and its cultural aspects. S7 commented *'I have a strong desire to communicate with people from different backgrounds, and English is the key to doing that. My personal interest in languages fuels my motivation'*. S6 said *'I've always been curious about American culture, and learning English helps me explore that curiosity. Watching documentaries and reading articles in English makes the*

learning process enjoyable'. The other code is 'Extrinsic Motivation' (F=4). Students revealed the external factors motivating them to learn English, such as grades, parental expectations, and future career aspirations. S3 put it *'My parents always emphasize the importance of learning English for my future career. They believe that being fluent in English will give me better job opportunities and a competitive edge'*. The last code is 'Attitudes' (F=3) which referred to the overall attitude and mentality of students toward their learning of English, which encompasses their confidence levels, anxiety regarding speaking, and perception of the language's significance. S7 reported *'I know English is important for my future, especially for studying abroad and getting a good job. However, I often feel anxious during speaking exercises because I'm afraid of mispronouncing words or forgetting vocabulary'*.

Given these insights, it is essential to delve deeper into the second research question. Understanding how podcasts specifically impact students' speaking skills can provide valuable information for developing effective EFL teaching strategies that leverage students' interests and motivations, ultimately fostering a more engaging and productive learning environment.

RQ2. What are the perceptions of learners regarding the influence of using podcasts as a means of enhancing their EFL speaking skills?

The participants' responses to that question revealed two primary categories: listening to podcasts and recording podcasts as seen in Table 2.

Table 2. Podcast usage by participants

General Categories	Codes	Frequency
Listening to Podcasts	Listening Comprehension	10
	Vocabulary and Pronunciation	8
Recording Podcasts	Confidence and Fluency in Speaking	8
	Practical Application of Language Skills	7
TOTAL		33

By regularly engaging with podcasts, learners can improve their listening comprehension, familiarize themselves with different accents and enhance their vocabulary and pronunciation. This section revealed how listening to podcasts contributes to these aspects of language learning and its perceived benefits among the science high school students. The first code emerged was 'listening comprehension' (F=10). All of the participants indicated that how listening to podcasts helps them understand spoken English

better, including various accents. As S1 put it *'I follow a travel podcast where the host interviews people from various countries. This variety has greatly improved my comprehension skills, especially when it comes to understanding different accents and colloquial expressions'*. Talking about the same issue S2 stated *'Podcasts expose me to various speaking styles and speeds. For example, I listen to an American podcast where the hosts speak very quickly, and it has improved my ability to keep up with fast-paced conversations.'* 80% of those who were interviewed indicated that listening to podcasts improved their vocabulary and pronunciation. For example, S10 reported *'Podcasts that focus on current events help me learn how native speakers discuss news and use specific terms. This exposure has improved both my understanding and usage of up-to-date vocabulary.'* Likewise, S7 stated *'Listening to storytelling podcasts has introduced me to a wide range of expressions and idioms. I now feel more confident using these in my own conversations.'*

While listening to podcasts provides students with substantial benefits in terms of comprehension, vocabulary, and pronunciation, actively recording their own podcasts offers another dimension of language learning. This interactive and practical approach allows students to apply their language skills in real-world contexts, fostering confidence and fluency. It is time to delve into how recording podcasts influences learners' EFL speaking skills, emphasizing the development of their speaking abilities (F=8) and practical language application (F=7). S8 commented *'Recording podcasts made me realize how much my speaking has improved. Listening back to my recordings shows me where I can still improve and where I've made progress.'* S5 reported *'I noticed a big difference in my speaking abilities after starting to record podcasts. It forces me to think quickly and structure my sentences properly, which is great practice.'* Having established how recording podcasts can significantly enhance students' speaking abilities by fostering confidence and fluency, it is also crucial to explore the practical applications of this activity. By creating their own podcasts, students not only practice speaking but also engage in structuring their thoughts and presenting them coherently, thereby applying their language skills in meaningful ways. S6 said *'The process of planning and recording podcasts has taught me to pay attention to my grammar and vocabulary usage. It's a practical way to apply what I learn in class to real-world scenarios.'* S9 also stated *'Working on podcasts has been a great way to practice and improve my language skills. I've learned to think on my feet and express my ideas more clearly and confidently.'*

Having explored the benefits of both listening to and recording podcasts for enhancing students' EFL speaking skills, it is essential to consider how these activities impact

students' ability to self-regulate their learning. Self-regulation in language learning involves setting goals, monitoring progress, and reflecting on performance. The next section delves into learners' perceptions of how using podcasts influences their self-regulation abilities in developing their speaking skills, providing insights into the strategies they adopt to manage and improve their learning process.

RQ 3. What are the perceptions of learners regarding the influence of using podcasts on their ability to self-regulate their learning in terms of speaking skills?

Engaging with podcasts as a language learning tool not only aids in skill development but also significantly impacts students' ability to self-regulate their learning. The responses revealed the categories and codes as seen in table 3.

Table 3. Podcasts on the students' ability on self-regulation

General Categories	Codes	Frequency
Goal Setting and Planning	Setting Specific Language Goals	8
	Planning Practice Sessions	7
Monitoring and Reflecting	Tracking Progress Over Time	6
	Self-Assessment and Feedback	4
	Reflective Learning Practices	2
TOTAL		27

One of the key aspects of self-regulation is goal setting and planning. This category explores how students use podcasts to set specific language goals, plan their practice sessions, and identify areas for improvement in their speaking skills (F=15). The first code emerged is 'Setting Specific Language Goals' (F=8). S7 commented '*Podcasts inspire me to set weekly speaking goals. For instance, if I hear a new expression or phrase, I make it a goal to use it in my conversations that week.*' From another perspective S10 commented '*I use podcasts to set detailed language goals, like focusing on improving my ability to understand and use idiomatic expressions that native speakers frequently use.*' Having established that students use podcasts to set specific language goals, it is also important to consider how they plan their practice sessions to achieve these goals. The second code (F=7) explored how podcasts assist the participants in organizing and structuring their language practice activities, ensuring they make the most of their learning time and stay on track with their objectives. S9 put it '*I organize my language practice by incorporating podcast activities. I plan to listen to a podcast, take notes on key phrases, and then practice using those phrases in my own recordings.*' On the other

hand, S6 reported *'I use podcasts to create a structured practice routine. For example, I listen to a podcast in the morning and then spend the evening practicing speaking about the same topics'*. While goal setting and planning practice sessions are crucial components of self-regulated learning, monitoring and reflecting on progress are equally important. The next category revealed how students use podcasts to track their improvement, assess their performance, and engage in reflective learning practices to enhance their EFL speaking skills (F=12). The first code is *'Tracking Progress Over Time'* (F=6). S7 alluded *'Listening to my recorded podcasts helps me identify areas where I've made progress, such as speaking more naturally and confidently'*. S1 stated *'I track my progress by regularly listening to my old podcast recordings. It's encouraging to hear how much my pronunciation and fluency have improved over time'*. The second code is *'Self-Assessment and Feedback'* (F=4). S3 reported *'I often ask my friends or teachers to listen to my podcast recordings and provide feedback. Their input helps me understand my strengths and weaknesses better'*. Similarly, S9 stated *'Getting feedback on my podcast recordings has been invaluable. My teacher's comments on my pronunciation and use of expressions have guided my learning process.'* The last code explored how podcasts encourage students to reflect on their learning processes and adapt their approaches to improve their EFL speaking skills (F=2). S7 said *'I use a journal to reflect on my podcast activities. Writing about what I learned and how I felt during the process helps me understand my learning journey better and stay motivated'*. S5 reported *'I analyze my mistakes and successes, which helps me refine my language learning strategies'*. Overall, the incorporation of podcasts into EFL instruction not only helps in the establishment and attainment of specific language objectives but also enables structured practice, ongoing self-assessment, and reflective learning, thereby substantially improving students' self-regulation capabilities and speaking abilities.

Discussion and Conclusion

The current worldwide educational environment in the twenty-first century is undergoing a significant shift due to the widespread adoption of digital communication technologies and pervasive networked applications. This transformation is influenced by the evolving characteristics, requirements, and expectations of students. As mentioned in the literature review part the use of technologies in education holds significant importance as it provides essential assistance to educators, students, and the overall learning process, enhancing their effectiveness in mastering the subject matter (Bonk, 2010). Creating a technology-enhanced learning environment has become an essential aspect of 21st-century

education, and understanding how to implement this effectively is crucial. Hong (2006) proposed that utilizing technology can enhance students' oral performance in acquiring speaking abilities, while Thornbury (2005) emphasized the importance of creating "talking classrooms" where active engagement in speaking activities is integral. This is essential for improving oral communication abilities and building self-assurance in spoken discourse. Additionally, Mahrooqi and Naqvi (2014) highlighted the significant impact of technology on the field of education, particularly in foreign language instruction, where it expands traditional teaching approaches.

The facilitation of self-regulation through technology is also noteworthy. Kitsantas and Dabbagh (2011) recognized the considerable potential of Web 2.0 technologies in fostering self-regulation by providing tools for communication, resource exchange, and social networking. Technologies offer access to numerous learning alternatives and possibilities that promote self-regulation abilities (Bernacki & Byrnes, 2011). In the context of EFL learning, podcasts have emerged as a valuable tool for enhancing both listening and speaking skills, as well as fostering self-regulation (Uztosun, 2020).

The findings from this study provide valuable insights into the general English language learning habits of high school students, the influence of podcasts on enhancing EFL speaking skills, and the impact of podcasts on students' ability to self-regulate their learning. The data analysis revealed that high school students engage in a variety of study habits and techniques, with a significant number of students actively watching and listening to English-language content such as movies, TV shows, music, podcasts, and audiobooks. This engagement has been perceived as highly beneficial in enhancing their language skills, particularly in comprehension, pronunciation, and vocabulary acquisition. The consistency in completing homework and engaging in additional practice exercises further reinforces classroom learning and builds confidence. These results align with the findings of Arıkan and Yılmaz (2020), who emphasized the value of technology in minimizing errors and enhancing language learning. Their study suggested that incorporating more advanced technology, such as waveforms for recorded speech, would lead to more precise results and reduce rater error. These findings also parallel with previous research by Bonk (2010) who highlighted the importance of engaging with authentic language resources and the benefits of technology in language learning. Motivational and attitudinal factors play a crucial role in shaping these study habits. Intrinsic motivations, such as a personal interest in English

culture and literature, drive students to improve their language proficiency. Extrinsic motivations, including parental expectations and future career aspirations, also influence their learning behaviors. However, some students experience anxiety regarding speaking, which impacts their overall attitude towards learning English. Addressing these motivational and attitudinal factors can help in developing more effective teaching strategies that cater to students' interests and needs. This is consistent with the findings of Mahrooqi and Naqvi (2014), who emphasized the impact of technology on foreign language instruction and the need to tailor teaching methods to diverse learning styles.

Students expressed that listening to podcasts seemed to improve their listening comprehension, helped them become more familiar with various accents, and contributed to enhancing their vocabulary and pronunciation. Engaging with podcasts allows students to immerse themselves in authentic spoken English, making the learning process enjoyable and effective. The practical benefits of listening to podcasts are evident in the students' ability to understand different speaking styles and speeds, as well as their increased confidence in using new vocabulary and expressions. These results support the findings of Hasan and Hoon (2013) and the potential benefits highlighted by Cebeci and Tekdal (2006), who identified the advantages of using podcasts to improve listening comprehension and pronunciation. Hamad and his colleagues (2019) also found the utilization of the videos technique positively influences the proficiency of EFL learners in speaking, including their fluency and pronunciation. The study the conducted determined that utilizing videos and listening audio tracks is a highly successful method in enhancing students' speaking abilities. Recording podcasts offers an additional dimension of language learning by providing an interactive and practical approach to applying language skills. Students noted that recording their own podcasts fosters confidence and fluency in speaking, as it forces them to think quickly and structure their sentences properly. This activity not only improves their speaking abilities but also helps them apply what they learn in class to real-world contexts. By creating their own podcasts, students engage in meaningful language practice, which enhances their overall language proficiency. This is in line with the work of Stanley (2006), who highlighted the benefits of creating podcasts for practicing and improving language skills.

The use of podcasts has a significant impact on students' ability to self-regulate their learning. Students use podcasts to set specific language goals, plan their practice sessions,

and identify areas for improvement in their speaking skills. This goal-setting and planning process helps students stay organized and motivated, ensuring they make the most of their learning time. Additionally, students track their progress over time by listening to their old podcast recordings, which helps them identify improvements and areas that need further practice. This supports the findings of Kitsantas and Dabbagh (2011) and Bernacki and Byrnes (2011), who emphasized the role of technology in promoting self-regulation. Self-assessment and feedback are crucial components of self-regulation. Students often seek feedback from friends and teachers on their podcast recordings, which provides valuable insights into their strengths and weaknesses. This feedback helps guide their learning process and informs their practice strategies. Reflective learning practices, such as journaling about podcast activities and analyzing mistakes and successes, further enhance students' ability to self-regulate their learning. These reflective practices help students understand their learning journey better and make necessary adjustments to their study strategies. This aligns with the framework proposed by Zimmerman (2002) and Little (2007) on the importance of self-regulation in enhancing learning outcomes.

Overall, the incorporation of podcasts into EFL instruction offers numerous benefits for high school students. Podcasts are perceived as an engaging and potentially effective tool for improving listening comprehension, vocabulary, and pronunciation. Recording podcasts adds an interactive and practical dimension to language learning, fostering confidence and fluency in speaking. Furthermore, podcasts significantly impact students' ability to self-regulate their learning by promoting goal setting, planning, monitoring progress, and reflective practices.

To maximize the benefits of podcasts in EFL instruction, educators should consider integrating both listening and recording activities into their teaching strategies. This integration can help students develop essential language skills, increase their motivation and engagement, and enhance their ability to manage their own learning effectively. By leveraging the potential of podcasts, educators can create a more dynamic and productive language learning environment that supports students in achieving their language proficiency goals. This study contributes to the growing body of literature on the use of technology in language education and underscores the importance of incorporating innovative tools like podcasts to enhance students' learning experiences and outcomes.

Limitation

One limitation of this study is that all the participants were female, which may affect the generalizability of the findings. The female students were volunteers, and according to reports from their teacher, they demonstrated a higher willingness to both listen to and record podcasts compared to their male peers. This greater enthusiasm for podcast activities may have influenced the outcomes related to self-regulation and oral proficiency. Future research should aim to include a more gender-balanced sample to examine whether similar results would be observed with male students or a mixed-gender group.

Acknowledgement

This study was conducted within the scope of 2209-A Student Projects. In this context, the project coordinator and team assisted the article author only in data collection. Therefore, I extend my thanks to the students involved in the current project.

Ethical Committee Permission Information

Name of the board that carries out ethical assessment: Frat University Scientific Research and Publication Ethics Board

The date and number of the ethical assessment decision: 04.04.2024-23555

Author Contribution Statement

Seçil TÜMEN AKYILDIZ: *Conception, design, literature review, data collection, data analysis, interpretation, writing, and editing.*

References

- Alhamami, M. (2013). Observation of YouTube language learning video (YouTube LLVS). *Teaching English with Technology*, 13(3), 3-17.
- Arıkan, A. & Yılmaz, A.F. (2020). Pre-service english language teachers' problematic sounds. *International e-Journal of Educational Studies (IEJES)*, 4 (7), 1-26. <https://doi.org/10.31458/iejes.594715>
- Azevedo, R., Cromley, J. G., & Seibert, D. (2004). Does adaptive scaffolding facilitate students' ability to regulate their learning with hypermedia? *Contemporary Educational Psychology*, 29(3), 344-370. <https://doi.org/10.1016/j.cedpsych.2003.09.002>
- Bernacki, M. L., Aguilar, A. C., & Byrnes, J. P. (2011). Self-regulated learning and technology-enhanced learning environments: An opportunity-propensity analysis. In G. Dettori, & D. Persico (Eds.), *Fostering self-regulated learning through ICT*, (pp. 1-26). IGI Global Publishers.
- Bonk, C. J. (2010). For openers: How technology is changing school. *Educational Leadership*, 67, 60-65.
- Bouma, G. D., & Atkinson, G. B. J. (1995). *A handbook of social science research* (2nd ed.). Oxford University Press.

- Cebeci, Z. & Tekdal, M. (2006). Using podcasts as audio learning objects. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 2, 047-057. <https://doi.org/10.28945/400>
- Chen, C. W. (2021). A study on the construction of evaluation indexes of classroom for promote selfregulated learning in junior high school [Unpublished doctoral dissertation]. National Chengchi University. <https://doi.org/10.6814/NCCU202100741>
- Chen, C. W. (2022). The inner treasure of cultivating self-regulated learning. In M.-w, & Chang (Eds.), *Proactively engage in SRL, encounter quality teaching and learning* (pp. 14–27). Education Department.
- Dron, J. (2007). Designing the undesignable: Social software and control. *Educational Technology & Society*, 10(3), 60-67
- Dudenev, G. & Hockly, N. (2007). *How to teach with technology*. Pearson Education Limited.
- Farangi, M. R., Nejadghanbar, H., Askary, F. & Ghorbani, A. (2016). The effects of podcasting on EFL upper-intermediate learners' speaking skills. *CALL-EJ*, 16(2), 1-18.
- Fontichiaro, K. (2008) *Podcasting at school*. Libraries Unlimited.
- Gromik, N. (2008). EFL learner use of podcasting resources: A pilot study. *The JALT CALL Journal*, 4(2), 47–60.
- Gryshchenko, Ya. S., Sydorenko, I. A. (2014). The role of the newest interactive distance technologies in formation of foreign language sociocultural competence of part-time students in technical universities. *Advanced Education*, 2, 27-33.
- Guba, E. G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Communication and Technology Journal*, 29, 75–91.
- Hamad, M. M., Metwally, A. A., & Alfaruque, S. Y. (2019). The impact of using YouTubes and audio tracks imitation (YATI) on improving speaking skills of EFL learners. *English Language Teaching*, 12(6), 191-197. <https://doi.org/10.5539/elt.v12n6p191>
- Hasan, M. M., & Hoon, T. B. (2013). Podcast applications in language learning: A review of recent studies. *English Language Teaching*, 6(2), 128-135.
- Hismanoglu, M. (2012). The impact of globalization and information technology on language policy in Turkey. *Procedia-Social and Behavioral Sciences*, 31, 629-633.
- Holec, H. (1981). *Autonomy and foreign language learning*. Pergamon.
- Hong, B. T. M. (2006). Teaching speaking skills at a Vietnamese university and recommendations for using CMC. *Asian EFL Journal*, 14(2), 1-24.
- Istanto, J. W. (2011). Pelangi Bahasa Indonesia podcast: What, why and how? *Electronic Journal of Foreign Language Teaching*, 8(1), 371-384.
- Jain, S., & Hashmi, F. (2013). Advantages of podcasts in English language classroom. *Journal of Indian Research*, 1(2), 158-163.
- Jackson, R. L., Drummond, D. K., & Camara, S. (2007). What is qualitative research? *Qualitative Research Reports in Communication*, 8(1), 21–28.
- Kitsantas, A., & Dabbagh, N. (2011). The role of Web 2.0 technologies in self-regulated learning. *New Directions for Teaching and Learning*, 126, 99-106.
- Lee, M. J. W., & Chan, A. (2007). Pervasive, lifestyle-integrated mobile learning for distance learners: An analysis and unexpected results from a podcasting study. Open Learning. *The Journal of Open and Distance Learning*, 22(3), 201-218.
- Li, H. C. (2012). Using podcasts for learning English: Perceptions of Hong Kong secondary 6 ESL students. *ELT World Online*, 4, 78-90.
- Lim, C. P., & Chan, B. C. (2007). Microlessons in teacher education: Examining pre-service teachers' pedagogical beliefs. *Computers & Education*, 48(3), 474–494.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage.

- McGarr, O. (2009). A Review of podcasting in higher education: Its Influence on the traditional lecture. *Australasian Journal of Educational Technology*, 25(3), 309-321.
- McQuillan, J. (2006). Languages on the go: Tuning in to podcasting. *The International Journal of Foreign Language Teaching*, 2(1), 16-18.
- Meng, P. (2005). Podcasting & vodcasting: Definitions, discussions & implications. A white paper by IAT Services at University of Missouri. Retrieved September 12, 2023, from http://edmarketing.apple.com/adcinstitute/wpcontent/Missouri_Podcasting_White_Paper.pdf
- Merriam, S. B. (1998). *Qualitative research and case study applications in education*. Jossey-Bass.
- Royal, K. B. & Von Koss, N. (2008). Using podcasting in the foreign language classroom. INTO Faculty and Staff Publications. Paper 11. Retrieved September 28, 2023 from http://scholarcommons.usf.edu/into_facpub/11
- Rosell-Aguilar, F. (2007). Top of the pods: In search of a podcasting “podagogy” for language learning. *Computer Assisted Language Learning*, 20(5), 471–492.
- Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, 22, 63–75.
- Solomatina, A.G., 2011. Developing speaking and listening comprehension skills via podcasts. *Language and Culture*, 2 (14), 130-134.
- Stefancik, R. & Stradiotová, E. (2020). Using web 2.0 tool podcast in teaching foreign languages. *Advanced Education*, 14, 46-55.
- Sysoev, P. V. (2014). Podcasts in teaching a foreign language. *Language and Culture* 2, 189-201.
- Stanley, G. (2006). Podcasting: Audio on the Internet comes of age. *TESL-EJ*, 9(4).
- Sze, P. (2006). Developing students’ listening and speaking skills through ELT podcasts. *Education Journal-Hong Kong-Chinese University of Hong Kong*, 34(2), 115.
- Thornbury, S. (2005). *How to teach speaking*. Pearson Education Limited.
- Uztosun, M. S. (2020). The development of a scale for measuring the self-regulated motivation for improving speaking English as a foreign language, *The Language Learning Journal*, 48(2), 213-225.
- Whithaus, C., & Neff, J. M. (2006). Contact and interactivity: Social constructionist pedagogy in a video-based, management writing course. *Technical Communication Quarterly*, 15(4), 431-456. https://doi.org/10.1207/s15427625tcq1504_2
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, 41(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2
- Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal*, 45(1), 166-183.
- Zimmerman, B. J., & Cleary, T. J. (2009). Motives to self-regulate learning: A Social cognitive account. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 247-264). Routledge.

Copyright © JCER

JCER’s Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Review Article/İnceleme Makalesi

Integration of Research and Practice in Education: A Theoretical Perspective on Design Based Research

Aysu KARADEMİR¹  Derya GİRGIN^{* 2} 

¹ Alanya Alaaddin Keykubat University, Antalya, Turkey, aysu.karademir@alanya.edu.tr

² Çanakkale Onsekiz Mart University, Çanakkale, Turkey, deryagirgin@comu.edu.tr


* Corresponding Author: deryagirgin@comu.edu.tr

Article Info

Received: 26 July 2024

Accepted: 23 September 2024

Keywords: Design-based research, educational design research, research methods, narrative literature review

 10.18009/jcer.1522744

Publication Language: Turkish

Abstract

Design-based research is utilised to develop innovative solutions in learning areas in order to improve the quality of education and training processes. This study is a review study that aims to provide a general impression of design-based research (DBR) by mentioning the basic principles and methods of DBR. The narrative literature review technique, one of the types of literature review, is used in the study. It is thought that this study will be a guide for researchers who want to study DBR for the methodological parts of their studies. In this context, DBR, which combines theory and practice, which is one of the best examples of research and practice in education, is presented in detail.



To cite this article: Karademir, A., & Girgin, D. (2024). Eğitimde araştırma ve uygulamanın buluşması: Tasarım tabanlı araştırmaya kuramsal bir bakış. *Journal of Computer and Education Research*, 12 (24), 780-799. <https://doi.org/10.18009/jcer.1522744>


Eğitimde Araştırma ve Uygulamanın Buluşması: Tasarım Tabanlı Araştırmaya Kuramsal Bir Bakış

Makale Bilgisi

Geliş: 26 Temmuz 2024

Kabul: 23 Eylül 2024

Anahtar kelimeler: Tasarım tabanlı araştırma, eğitim tasarımı araştırması, araştırma yöntemleri, anlatı alanyazın incelemesi

 10.18009/jcer.1522744

Yayın Dili: Türkçe

Öz

Eğitim ve öğretim süreçlerinin kalitesini arttırmaya yönelik öğrenme alanlarında yenilikçi çözümlerin geliştirmesi için tasarım tabanlı araştırmadan yararlanılmaktadır. Bu çalışma, tasarım tabanlı araştırmanın (TTA) temel ilkelerinden, yöntemlerinden bahsederek TTA ile ilgili genel bir izlenim ortaya koymayı amaçlayan derleme bir çalışmadır. Çalışmada alanyazın incelemesi çeşitlerinden anlatı alanyazın incelemesi tekniği kullanılmaktadır. Bu çalışmanın TTA çalışmak isteyen araştırmacılara, çalışmalarının yöntem kısımları için yol gösteri olacağı düşünülmektedir. Bu bağlamda çalışmada eğitimde araştırma ve uygulamanın iyi örneklerinden olan teori ve pratiği birleştiren TTA detaylandırılarak sunulmaktadır.

Summary

Integration of Research and Practice in Education: A Theoretical Perspective on Design Based Research

Aysu KARADEMİR¹  Derya GİRĞİN^{*2} 

¹ Alanya Alaaddin Keykubat University, Antalya, Turkey, aysu.karademir@alanya.edu.tr

² Çanakkale Onsekiz Mart University, Çanakkale, Turkey, deryagirgin@comu.edu.tr

* Corresponding Author: deryagirgin@comu.edu.tr

Introduction

Educational psychology has been criticized for not providing usable information (Lagemann, 2002). One of the reasons for this is that academic studies are conducted in laboratory settings. Collins (1992) and Brown (1992) who observed that most educational research was conducted in a controlled laboratory setting, believed that this laboratory research was not as useful for practitioners as expected. Brown (1992) showed through his studies that the information obtained from the laboratory was limited in explaining learning in the classroom. According to Brown, the challenge is to develop theories of learning that consider the interactions of people in a complex social life where they are situated. Design experiments provide a way to look carefully at how a design is implemented in practice and how social and contextual variables interact with cognitive variables (Dede, 2004). O'Neill (2012) who has worked in DBR throughout his career, defines design-based research as the type of research that makes you regularly wonder what you are after.

Design-based research is referred to by a variety of names due to its different history in different countries. Common terms used for DBR are: Developmental or development research, design experiments, design-based research, educational design research and formative experiments. In the view of this information, it can be said that the diversity in the terminology of DBR stems from the development process of design-based research and the researchers who conducted different studies at different times. When the terminology in the literature is analysed, it is seen that the word design is mostly used in the nomenclature.

When we consider the characteristics of design-based research, it is seen that it is interventionist, iterative and pragmatic. In addition, its characteristics include collaboration, being theory-oriented and practicability. The iterative and interventionist nature of design-based research is one of the common features of design-based research with experimental

research and action research. When we look at the comparison of design-based research with other research approaches, it is seen that DBR is compared with action research and experimental research due to its interventionist nature. While design-based research has common points in comparison with experimental research, there are also points where they differs from each other. The fact that design-based research is used practically in educational research causes it to be compared with action research. Although it has common points with action research, it should be noted that DBR has its unique characteristics. In addition to all these, it can also be said that research approaches are mutually reinforcing concepts.

Method

This study, which aims to provide an overview of design-based research and to provide a scientific summary by interpreting DBR, uses the narrative literature review technique. The content of the study includes information in books written on design-based research and studies accepted in the literature. International and current sources are used in the study. Attention is paid to ensuring that the study has the same contextual integrity as the requirements of the narrative literature review technique and to provide convenience to the reader with templates in the study. The information obtained from the study is interpreted, and a general conclusion is drawn.

Results

Recently, it is thought that applicable knowledge is more effective than theoretical knowledge in educational research. Therefore, design-based research studies that are tested in the real world and serve education are becoming more common today. In addition, these studies have become more specialized, and there are educational design research models specific to education. As a result of the literature review, it is seen that design-based research has many steps and the steps need to be understood. The process of a proper design-based research is quite difficult to conduct. Design-based research is a journey with points that need to be considered from planning to the end. To help this journey, this study presents a theoretical overview of design-based research through the narrative literature review technique.

Discussion and Conclusion

When we look at the section on the use of multiple terms for DBR, it is seen that there is no common terminology for design-based research among both national and international studies. The concept of educational design research is preferred to indicate that design-based research is specific to education.

When we look at the characteristics of design-based research, we see that the design-based research approach has characteristics as in each of the research approaches. The characteristics of DBR are being theoretical, interventionist, prospective, circular and real. These characteristics of DBR are like those of both experimental research and action research, so there are distinctive tables between these approaches.

When we look at the comparison of design-based research with experimental research or action research used in educational research, it is seen that these three research approaches are similar and different from each other. In research approaches that have similar aspects, the interventionist and iterative features in design-based research makes its process efficient. The name of this process is DBR steps. The steps of design-based research may change due to researchers conducting different studies at different times but there are also common steps in the process.

When we look at the international literature, there are many sources defining DBR. However, there are a few studies in the literature of our country that provide an overview of design-based research and can serve as a guide for researchers who want to conduct design-based research. International literature includes many studies indicating that PhD students should conduct design-based research, as well as studies that develop models for PhD students to conduct design-based research efficiently.

Consequently, this study aims to provide the reader with an overview of design-based research by discussing the basic principles, methods, potential and process of this approach. This study is intended for students who want to study design-based research and researchers who want to be part of a research team. One of the aims of this study is to help early career researchers interested in design-based research to fill the gaps in the methodology part of their work. As Bronkhors and Kleijn (2016) noted, for early career researchers, using design-based research is rewarding.

Giriş

Psikoloji alanının geçmişten günümüze kadar eğitimle uzun bir geçmişi bulunmaktadır. Eğitim psikolojisi, öğrenme konularının eğitim bağlamında nasıl çalıştığı üzerinde yadsınamaz bir etkiye sahip olmuştur ve bu etkiye sahip olan eğitim psikolojisi, kullanılabilir bilgiler sunamadığı için eleştirilmiştir (Bell & Sandoval, 2004; Lagemann, 2002). Bunun nedenlerinden birinin eğitim çalışmalarının laboratuvar ortamında yürütülmesi olarak düşünülmektedir. Eğitim araştırmalarının çoğunun kontrollü bir şekilde laboratuvar ve benzeri ortamlarda yapıldığını gözlemleyen Collins (1992) ve Brown (1992) bu laboratuvar araştırmalarının uygulayıcılar için beklenen kadar faydalı olmadığına inanmaktaydılar (Armstrong ve diğ., 2018). Brown (1992) bu düşüncesini laboratuvardan elde ettiği bilgilerin sınıfta öğrenmeyi açıklamada sınırlı olduğunu gösterdiği çalışmalarıyla desteklemektedir. Bu nedenle Brown, öğrenmeye ilişkin laboratuvar deneyleri ile öğretim müdahalelerine ilişkin çalışmalar arasında köprü kurma çabası olarak tanımladığı tasarım deneyi yaklaşımını öne sürmektedir. Brown'a göre asıl zor olan karmaşık bir sosyal hayatta yer edinen insanların onların bulunduğu yerde etkileşimlerini hesaba katarak öğrenme teorilerinin geliştirilmesidir. Aynı zamanda Collins (1992) eğitim araştırmalarının, havacılık ve uzay mühendisliği gibi bilimlerin birer tasarım bilimi olduğu fikrini ortaya atarak bu bilimler için bir yönteme ihtiyaç duyulduğunu öne sürmektedir. Tüm bunlar sonucunda tasarım tabanlı araştırmanın temelleri atılmıştır.

Collins (1992) tasarım tabanlı deneyleri şu şekilde tanımlamaktadır: Tasarım deneyleri, eğitimdeki iyileştirmelerin daha iyi olması için kritik iki parçayı bir araya getirmektedir. Bu parçalar tasarım odağı ve kritik tasarım unsurlarının değerlendirilmesidir. Tasarım deneyleri, bir tasarımın pratikte nasıl uygulandığına ve sosyal ile bağlamsal değişkenlerin bilişsel değişkenlerle nasıl bir etkileşime girdiğine dikkatle bakmamız için bir yöntem sağlar (Dede, 2004). Kariyeri boyunca tasarım tabanlı araştırma (TTA) uygulayıcısı olarak çalışan O'Neill (2012) tasarım tabanlı araştırmayı neyin peşinde olduğunuzu düzenli olarak merak ettiren araştırma türü olarak tanımlamaktadır.

TTA'yı tanımlamak ve onu kavramsallaştırmak oldukça zordur bu nedenle TTA'yı yürütmek için bazı sorulara yanıt almak gerekmektedir. TTA'nın tanımlarında bilimsel bir karşılığının olmaması TTA'nın değerlendirilmesini ve bu çalışmaların ilerlemesini

sınırlandırmaktadır (Christensen & West, 2018). TTA'yı sınırlandıran başlıklar makalenin devamında incelenmektedir. Bunlardan ilki TTA'nın terminolojisidir.

Tasarım Tabanlı Araştırma İçin Kullanılan Yaygın Terimler

Tasarım tabanlı araştırma ülkelerdeki farklı geçmişi nedeniyle çeşitli isimlerle kendinden bahsettirmektedir. TTA için kullanılan yaygın terimler şunlardır:

- Gelişimsel veya Gelişim Araştırması (Gravemeijer, 1994; Lijnse, 1995; van den Akker, 1999)
- Tasarım Deneyleri (Brown, 1992; Collins, 1992)
- Tasarım Tabanlı Araştırma (Design Based Research Collective, 2003; Hoadley, 2002)
- Eğitim Tasarımı Araştırması (Mckenney & Reeves, 2012; Plomp & Nieveen, 2013; van den Akker, Gravemeijer, Mckenney, & Nieveen, 2006)
- Biçimlendirici Deneyler (Reinking & Bradley, 2008).

Bu noktada TTA'nın isimlendirilmesi ile çeşitliliği arasında bağlantı olduğunu hatırlatmakta fayda vardır. Bu çeşitlilik durumu TTA'nın tarihsel gelişiminden kaynaklanmaktadır. Tarihsel gelişiminde TTA'nın temellerini atan Brown (1992) deneysel çalışmalar konusunda eğitim almış ünlü bir psikologdur ve TTA için tasarım deneyi ifadesini kullanmıştır. Brown tarafından kullanılan deney terimi TTA'nın kulağa bilimsel gelmesini sağlamaktadır ve deney terimini kullanarak yapılan çalışmaların tasarım deneyleri metodolojisinin kabul görmesini kolaylaştırdığı söylenebilir. Fakat herkes bu terimden o kadar memnun değildir ve bugün diğer terimlerden daha az kullanılmaktadır (Bakker, 2018, s.28). Twente Üniversitesi'nde biraz daha farklı bir terim olan gelişim araştırması kullanılmaktadır ancak odak noktası belirli öğrenme teorilerini test etmekten ziyade müfredat geliştirme olan bir araştırma temeli oluşturmaktadır.

Design Based Research Collective (Tasarım Tabanlı Araştırma Kolektifi) ile pek çok kişi Hoadley (2002) tarafından önerilen tasarım tabanlı araştırma terimini kullanmaktadır. Bakker, Hoadley ile yaptığı görüşmesinde Hoadley'in tasarım deneyi teriminin bir "Google sorunu" ya da o zamanın kullanılan internet tarayıcısı "Yahoo sorunu" olduğunu çünkü aramalarında araştırma tasarımı ve deneyler hakkında bilgi bulurken tasarım deneyleri hakkında bilgi bulamadığını aktarmaktadır (Bakker, 2018, s.29). Bu tarihsel gelişim sürecinin sonucu olarak günümüzde TTA terimi oldukça popüler hale gelmiştir.

Tasarım tabanlı arařtırmadaki taban kelimesi aslında arařtırmanın tasarıma kıyasla göreceli önemini vurgulamaktadır. Eğitim alanında ise McKenney ve Reeves (2012) eğitsel tasarım arařtırması terimini tercih etmektedir. Tasarım arařtırmasının önündeki eğitsel sıfatı eğitime odaklanmayan tasarım arařtırmalarından ayırt etmek için kullanılmaktadır. Eğitimde ya da eğitimsel olarak tercih edilebilmektedir.

Oppl ve Stary'in (2022) terim çeřitlilięi ile ilgili yorumu ise řu řekildedir: Tasarım tabanlı arařtırmalara atıfta bulunmak için farklı terimler kullanan yaklařımlar mevcut olsa dahi (Örneęin; tasarım deneyleri, tasarım arařtırması, eğitsel tasarım arařtırması..) hepsi iki temel hedefi takip etmektedir. Birincisi, eğitim alanındaki sorunları çözmek ve tasarım tabanlı arařtırma süreçleri yoluyla pratik yapmaktır. İkincisi ise teori gelişimine katkıda bulunmak için tasarlanmış çözümlerin deęerlendirilmesiyle yeni aktarılabilir bilgi üretmektir.

Terminolojisinin fazla olduęu bu arařtırma yaklařımının hangi isimle tercih edileceęine dair TTA yürütücülerinden Rick West ile çevrimiçi iletişim kurmuřtur. West bu konuyu řu řekilde ifade etmektedir: "Çoęu zaman bu sözcükler eşanlamlıdır ve aslında aynı anlama gelir. Asıl önemli olan arařtırmayı nasıl tanımladığınızdır." (Kişisel iletişim, 20 Nisan 2024). Türkiye'de de tasarım tabanlı arařtırma ile tasarım temelli arařtırmalar aynı ifadelerdir. Çünkü taban ve temel kelimeleri kullanım durumuna göre Türkçede anlam olarak benzer řekilde ele alınabilmektedir. Tüm bunların doęrultusunda tasarım tabanlı arařtırmanın isimlendirilmesinden ziyade çalıřmanın tanımlanmasının ve sürecinin daha önemli olduęu söylenebilir.

Türkiye'deki alanyazın taramasında TTA, Büyüköztürk ve dię. (2020) tarafından yazılan Eğitimde Bilimsel Arařtırma yöntemleri kitabında tasarım ve geliştirme arařtırmaları olarak yer almaktadır. Mutlu (2016) TTA'yı, eğitim ve öğretim teknolojisinde kullanılan isimle tasarım ve geliştirme olarak ele almaktadır ve kitap bölümünde bu isimle detaylandırmaktadır. TTA'nın ele alındığı dięer bir çalıřma Kuzu ve dię. (2011) yaptıkları çalıřmadır. Bu çalıřmanın isimlendirilmesinde tasarım tabanlı arařtırma ismine yer verilmektedir. Böylece TTA'nın isimlendirilmesinde hem yurt içi hem yurt dıřı çalıřmalarda olmak üzere ortak bir noktada buluřulmadığından söz edilebilir.

Bu bilgiler ışığında TTA'nın isimlendirilmesindeki çeřitlilięin tasarım tabanlı arařtırmanın gelişim sürecinden ve farklı zamanlarda farklı çalıřmalar yapan arařtırmacılardan kaynaklandığı söylenebilir. Alanyazında yer alan isimlendirmeler

incelendiğinde isimlendirmede en çok tasarım kelimesinin yer aldığı görülmektedir. O yüzden ortak paydanın tasarım olduğu söylenebilir. Çalışmaların isimlendirmesine yönelik elde edilen bilgilere baktığımızda isimlendirmeden ziyade araştırma sürecinin daha önemli olduğu belirtilmektedir. Tasarım tabanlı araştırma sürecini yönetmede ise TTA'nın özellikleri karşımıza çıkmaktadır.

Tasarım Tabanlı Araştırmanın Özellikleri

McKenney ve Reeves (2012) yılında yaptığı çalışmada eğitim tasarımı araştırmasının karakteristik özelliklerini ele almaktadır. Alanyazında yaygın kullanılan özelliklere, eğitim tasarımı araştırmalarının tanımlayıcıları olarak yer verilmektedir. Yaygın tanımlayıcılar şunlardır: Pragmatik, temellendirilmiş, teorik, müdahaleci, yinelemeli, işbirlikçi, uyarlanabilir ve müdahalecidir. Eğitim tasarımı araştırması pragmatiktir çünkü kullanılabilir bilgi ve uygulamadaki sorunlara kullanılabilir çözümler üretmekle ilgilenir. Eğitim tasarımı araştırması temellidir çünkü çalışmaya rehberlik etmek için teori, ampirik bulgular ve zanaat bilgeliğini kullanır. Eğitim tasarımı araştırması müdahalecidir çünkü belirli bir eğitim bağlamında bir değişiklik yapmayı üstlenir. Eğitim tasarımı araştırması yinelemelidir çünkü genellikle birden fazla tasarım, geliştirme, test ve revizyon döngüsünden geçerek gelişir. İşbirlikçidir çünkü araştırmacılar ve uygulayıcılar da dahil olmak üzere çok disiplinli ortaklıkların uzmanlığını gerektirir, aynı zamanda sıklıkla başka alan uzmanlarını da (örneğin konu uzmanları, yazılım programcıları veya kolaylaştırıcılar) gerektirir. Eğitim tasarımı araştırması uyarlanabilirdir çünkü müdahale tasarımı ve bazen de araştırma tasarımı ortaya çıkan içgörüler doğrultusunda sıklıkla değiştirilir. Son olarak eğitim tasarımı araştırması çalışmayı temellendirmede sadece teoriyi kullandığı için değil, aynı zamanda bilimsel anlayışa katkıda bulunmayı üstlendiği için teori odaklıdır.

TTA üzerine detaylı çalışmaları olan ve eğitimde tasarım tabanlı araştırma ile ilgili detaylı kitabı olan Baker (2018) çalışmasında Cobb ve diğ. (2003) tarafından tanımlanan TTA'nın beş temel özelliğini özetlemektedir.

1. İlk özellik, amacının öğrenme ve bu öğrenmeyi desteklemek için tasarlanan araçlar hakkında teoriler geliştirmek olmasıdır. Bu madde yukarıda bahsedilen temellendirilmiş özelliği ile paraleldir çünkü teorinin pratiği temellendirmesi beklenmektedir.

2. Tasarım araştırmasının ikinci özelliği müdahaleci doğasıdır. Birçok araştırma yaklaşımında, bir durumu değiştirmek ve anlamak birbirinden ayrıdır. Ancak tasarım araştırmasında bunlar bir fikir doğrultusunda iç içe geçmiştir: Bir şeyi değiştirmek istiyorsanız onu anlamak zorundasınız ve bir şeyi anlamak istiyorsanız onu değiştirmek zorundasınız (Bakker, 2004).
3. Üçüncü özellik, tasarım araştırmasının bir deneme ya da öğretim deneyi ile ayrılması gerekmeyen ileriye dönük ve yansıtıcı bileşenlere sahip olmasıdır (Steffe & Thompson, 2000).
4. Dördüncü özellik ise tasarım araştırmasının döngüsel doğasıdır: Buluş ve revizyon yinelemeli bir süreç oluşturur. Öğrenme üzerine birden fazla varsayım bazen çürütülür ve alternatif varsayımlar üretilip test edilebilir. Bu madde Wang ve Hannafin'in (2005) çalışmasında 'etkileşimli, yinelemeli ve esnek' olarak ele alınmaktadır.
5. Tasarım araştırmasının beşinci özelliği, geliştirilmekte olan teorinin gerçek bir iş yapmak zorunda olmasıdır. Tasarım araştırmalarından elde edilen teori, örneğin tarih eğitimi gibi belirli bir alanda geliştirildiği için tipik olarak mütevazıdır; ancak diğer ülkelerdeki diğer okullardaki sınıflar gibi farklı bağlamlarda uygulanabilecek kadar genel olmalıdır.

TTA'nın özelliklerini ele aldığımızda müdahaleci, yinelemeci ve pragmatik özelliklerinin öne çıktığı görülmektedir. Ayrıca özellikleri arasında işbirlikçilik, teori odaklı olmak ve uygulanabilirlik yer almaktadır. Özellikleri arasında yer alan yinelemeci ve müdahaleci doğası özelliği TTA'nın deneysel araştırmalar ve eylem araştırmaları ile ortak özelliklerinden biridir. Bu özellikler ve daha birçok özelliği benzer olan bu araştırma türlerinden seçileni diğerlerinden ayırt etmek gerekmektedir. Dolayısıyla çalışmanın devamında TTA'nın hangi yöntemde ele alınabileceği ile deneysel araştırmalar ve eylem araştırmalarıyla karşılaştırması yer almaktadır.

Bir Yöntem Olarak Tasarım Tabanlı Araştırma

Bu kısmın anlaşılması için araştırmalarda kullanılan metodoloji ve yöntemin ne olduğuna bakmak gerekmektedir. Araştırma sonucunda elde edilen bulguların nasıl değerlendirileceği ve bu değerlendirmeye ilişkin kuralların neler olduğunun belirlenmesi bilimsel metodolojidir (Yüksel, 2023). En basit anlamıyla metodoloji, araştırmacının yola

çıkarken sorduğu soruya yanıt alabilmek için yaptığı seçimlerdir (Şatana, 2015). "Loji" eki sonuna geldiği kavramın incelenmesini bilimsel hale getirir. Örneğin psikoloji, psikolojiyi inceler. Bu yüzden yöntem anlamına gelen metot kelimesinin sonuna gelen 'loji' eki ile oluşan metodoloji, yöntemin incelendiği bilim olarak ele alınabilir. Araştırma yöntemi ise araştırmanın sonucuna giderken izlenen sistematik yoldur. Yurtdışı çalışmalarında tasarım tabanlı araştırmanın metodoloji mi yoksa yöntem mi olduğu konusunda ortak bir payda yoktur (Baker, 2018). Barab ve Squire'ye göre (2004) tasarım tabanlı araştırma, doğal ortamlarda öğrenme ve öğretmeyi açıklayan ve öğrenme ve öğretmeye potansiyel olarak tesir eden yeni teoriler, eserler ve uygulamalar üretmek amacıyla ortaya konan bir dizi yaklaşımdır.

Tasarım tabanlı araştırmanın isimlendirilmesinde karşımıza çıkan tasarım ve geliştirme araştırmasını ele alan Büyüköztürk ve diğ. (2020) tasarım ve geliştirme çalışmalarının birden fazla aşamadan oluştuğunu ve bu çalışmada da nicel, nitel ve karma veri toplama yöntemlerinin kullanılabileceğinden bahsetmektedirler. Fakat tasarım tabanlı araştırmaların hangi yöntem altında alınması gerektiğine kafa yorarken Schoenfeld'in (2007, s.103) "Göz önünde bulundurulması gereken ciddi soru, bu araştırma şu ya da bu türen mi değil, hangi varsayımlarda bulunuyor ve ortaya atılan sonuçlar ne kadar güçlü olmalıdır?" ifadesini hatırlamak güzel olacaktır.

Tasarım Tabanlı Araştırmanın Deneysel Araştırma ile Karşılaştırılması

Tasarım tabanlı araştırma süreci itibariyle deneysel araştırmalar ile karşılaştırılmaktadır (Bakker, 2018, Gravemeijer & Cobb, 2013; Scott ve diğ., 2020). Çünkü tasarım tabanlı araştırma ve deneysel araştırma doğası gereği müdahaleci yaklaşımlardır. Müdahaleci çalışmalar doğal olarak gerçekleşene müdahale eder ve araştırmacılar kasıtlı olarak bir durumu manipüle eder veya belirli teorik fikirlere göre öğretir. Bu tür çalışmalar, araştırmacıların araştırmak istediği öğrenme türü doğal ortamlarda mevcut değilse gereklidir. Müdahaleci yaklaşımlara örnek olarak deneysel araştırma, eylem araştırması ve tasarım araştırması verilebilir (Bakker, 2018). Bu nedenle fikir sahibi olmak adına bu bölümde tasarım tabanlı araştırma ile deneysel araştırmanın farklılıklarına değinilmektedir. Scott ve diğ. (2020) çalışmalarında tasarım tabanlı yaklaşım ile deneysel araştırmanın karşılaştırmasına yer vermektedir. Bu karşılaştırma özetlenerek maddeler halinde Tablo 1'de okuyucuya sunulmaktadır.

Tablo 1. Tasarım tabanlı araştırma ve deneysel araştırmanın karşılaştırılması

Kriterler	Deneysel Yaklaşım	Tasarım Tabanlı Araştırma
Katılımcıların rolü	Deneysel yaklaşımda araştırmacı, deneyin nasıl uygulanacağı ve analiz edileceğine dair tüm kararları vermekten sorumludur; eğitmen ise deneysel uygulamaları kolaylaştırır.	Tasarım tabanlı araştırmada ise hem araştırmacılar hem de eğitmenler, kavrama aşamasından yansıtma aşamasına kadar araştırmanın tüm aşamalarında yer alırlar.
Hipotezlerin araştırılması	Deneysel çalışmalarda araştırmacılar, müdahale sonrasında sınıfta test edilir, müdahalenin etkilerini yalın hale getirmek için çalışmanın parçası olmayan diğer değişkenler kontrol edilir.	Tasarım tabanlı araştırmalarda hipotez, belirli bir müdahaleden ziyade tasarım çözümü olarak kavramsallaştırılır. TTA'da belirli müdahalenin test edilmesinden ziyade aşamalı bir iyileştirme çabası ortaya konmaktadır.
Araştırma süreci	Deneysel araştırmalarda müdahale, deneysel dönem boyunca sabittir ve herhangi bir düzenleme ancak deney sonuçlandıktan sonra gerçekleşir.	Tasarım tabanlı araştırmada, öğretim araçlarının uygulanırken yerinde değiştirilmesine olanak tanıyan daha esnek bir yaklaşım benimsenir.
Araştırmanın etkisi	Deneysel araştırma "Anlamlı bir şeyin gerçekleştiğini tespit edebilir; ancak müdahalenin bu hikayenin ortaya çıkmasına neden olduğunu açıklayamaz" (Barab, 2014, s. 162). Başka bir deyişle, deneysel yöntemler, öğrenmedeki farklılıkların nedenini değil nerede meydana geldiğini ortaya koyar.	Tasarım tabanlı araştırmalar öğrenme mekanizmalarını ortaya çıkarma potansiyeline sahiptir, çünkü öğrenciler öğretimsel müdahaleleri deneyimledikçe öğrenci düşüncesinin doğasının nasıl değiştiğini araştırır.

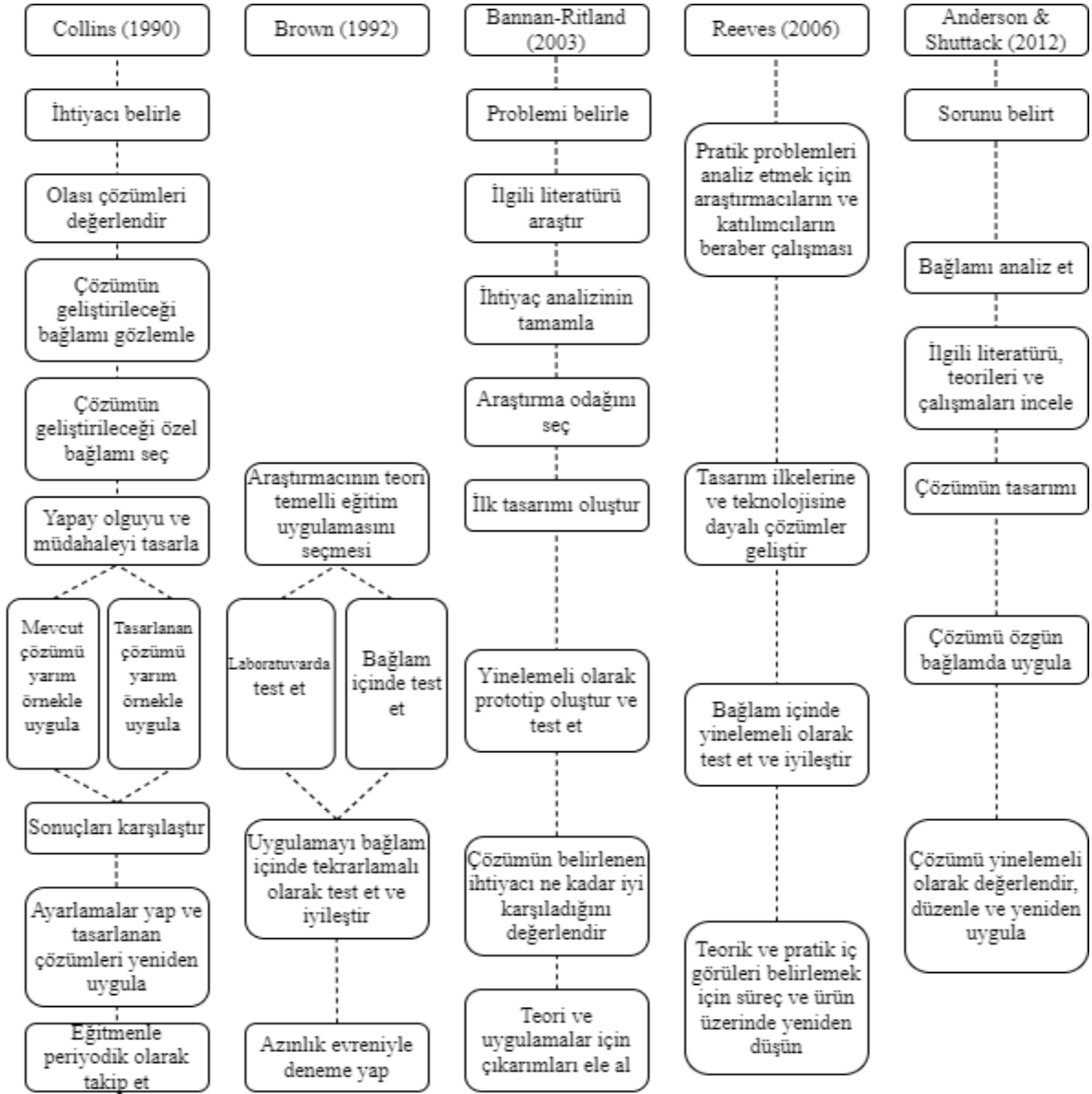
Tablo 1'de tasarım tabanlı araştırma ve deneysel araştırmanın karşılaştırılması verilmektedir. Tasarım tabanlı araştırma ile deneysel araştırmanın karşılaştırılmasında anahtar noktalar kriterler olarak ele alınmaktadır. Campanella ve Penuel (2021, s.4) tasarım tabanlı araştırmayı ele aldıkları çalışmalarında tüm müdahale araştırma sorularının tasarım tabanlı araştırma ile ele alınamayacağını ve bir durumun işe yarayıp yaramadığını ele alan sorularda deneysel araştırmanın tasarım tabanlı araştırmadan daha uygun olabileceğine yer vermektedir. Fakat deneysel araştırmaların katılımcılar müdahaleye katılmasaydı ne olurdu sorusuna cevap verdiğini, tasarım tabanlı araştırmaların ise "Nasıl...?, değerlendirme tasarımı araçları öğretmenlere nasıl yardımcı olabilir?, öğrenciler için daha adil değerlendirmeler yapılabilir mi?" gibi nedensel soruların yanıtlanabileceği çalışmalar olduğunu belirtmektedir. Tasarım tabanlı araştırmalar deneysel araştırmalardan farklıdır. Teorilerin salt uygulamasını hedeflemez, tasarımları ve modelleri kontrollü bir şekilde

geliştirmeyi amaçlamaktadır. Tasarım tabanlı araştırma hem teoriyi hem de uygulamayı geliştirmeyi amaçlar (Abdallah & Wegerif, 2014, s.3).

Tasarım Tabanlı Araştırmanın Eylem Araştırması ile Karşılaştırılması

Pratik sorunlara odaklanması ve araştırmayı uygulayıcıların aktif katılımıyla gerçek dünya ortamında yürütme doğası göz önüne alındığında, tasarım araştırmaları eylem araştırmalarına benzeyebilir. Eylem araştırmasının amacı genellikle araştırmanın yürütüldüğü yerel ortamda değişiklik yapmakla sınırlıdır; tasarım araştırması ise yeniliğin neleri içerebileceğini ve bunun nasıl başarılabilirliğini öğrenmeyi amaçlar (Gravemeijer & Cobb, 2013). Eylem araştırması daha çok öğretmenlerin sorunlara çözüm bulmasına odaklanmaktadır. Eğitim alanında öğretmenler tarafından gerçekleştirilen eylem araştırması, pratik olarak var olan sorunu çözmeyi amaçlamaktadır. Bu durumda eylem planı hazırlaması gerçekleşmektedir.

İki araştırma çeşidi de eğitimde önemli rol oynamaktadır. TTA kapsamlı ve teorik çerçeveler oluşturmayı hedeflemektedir. Tasarım tabanlı araştırma ile eylem araştırmasını birbirinden ayırmak kolay değildir. Tasarım tabanlı araştırmada tipik bir sorun tanımlanır ve analiz edilir sonrasında tasarım ve değerlendirme gerçekleştirilir. Eylem araştırmasında ise bir sorun tanımlanır, potansiyel çözüm geliştirilir, uygulanır, değerlendirilir ve gözden geçirip yansıtılır. Her ikisi de esasen teorik olmaktan ziyade pratiktir ve sorunlara çözüm bulmayı amaçlar. Her ikisi de zaman alır (Watling, 2014). Tasarım tabanlı araştırmanın diğer yaklaşımlarla karşılaştırılması TTA'nın adımlarını önümüze çıkarmaktadır. Deneysel yaklaşım ve eylem araştırması adımlarının yanı sıra TTA'nın adımlarının incelenmesinin karşılaştırma yaparken kolaylık sağlayacağı söylenebilir. Şekil 1'de Christen ve West'in (2018) yaptığı çalışmadan kendilerinden izin alınarak tasarım tabanlı araştırmanın adımları sunulmaktadır.



Şekil 1. Tasarım tabanlı araştırmanın adımları

Şekil 1’de görüldüğü üzere TTA çıkışından günümüze kadar geldiği süreçten kaynaklı olarak çeşitli araştırmacılar tarafından farklı süreçlerle ifade edilmektedir. Bu kısımda okuyucuya TTA süreçlerinin modellere entegre edildiğini ve TTA’nın birden çok modeli olduğunu hatırlatmakta fayda vardır. Tasarım tabanlı araştırmanın diğer araştırma yaklaşımlarıyla karşılaştırılmasına baktığımızda müdahaleci doğasından dolayı TTA’nın eylem araştırması ve deneysel araştırmalar ile kıyaslandığı görülmektedir. Tasarım tabanlı araştırmanın deneysel araştırma ile karşılaştırılmasında ortak yönleri olmasının yanında birbirinden ayrıldığı noktalar da mevcuttur. Tasarım tabanlı araştırmanın eğitim araştırmalarında uygulamalı olarak kullanılması eylem araştırmaları ile kıyaslanmasına neden olmaktadır. Yine eylem araştırması ile ortak noktaları olmasına rağmen TTA’nın kendine has özelliklerinin olduğunu belirtmek gereklidir. Tüm bunların yanında araştırma yaklaşımlarının birbirlerinin besleyen yapılar olduğu da söylenebilir.

Tüm bunların sonucunda bu çalışma tasarım tabanlı araştırmanın temel ilkelerinden, yöntemlerinden ve bu yaklaşımın potansiyeli ile sürecinden bahsederek TTA ile ilgili genel bir izlenim ortaya koymayı amaçlayarak okuyucuya sunulmuştur. Bu çalışmanın amaçlarından biri de tasarım tabanlı çalışmak isteyen araştırmacılara, çalışmalarının yöntem kısımlarındaki boşluklar için yardımcı olabilmektir.

Yöntem

Tasarım tabanlı araştırmanın yorumlanarak bilimsel bir özetle ele alınmasının amaçlandığı bu derleme makalede anlatı alanyazın incelemesi tekniği kullanılmaktadır. Anlatı alanyazın incelemesinin, nitel araştırma yöntemleri altında yer alan anlatı çalışmalarından farklı olduğunu belirtmek gerekmektedir. Anlatı alanyazın incelemesi ve anlatı çalışmaları yurtdışındaki alanyazında ‘narrative’ kelimesinin kullanımıyla yer almaktadır. Fakat anlatı incelemeleri ‘narrative rewies’ olarak karşımıza çıkmakta ve anlatı alanyazın incelemesi olarak belirtilmektedir (Green ve diğ., 2006; Greenhalgh ve diğ., 2018; Gregory & Dennis, 2018; Randolph, 2009; Sukhera, 2022; Sylvester ve diğ., 2013).

İki standart alanyazın incelemesi türü bulunmaktadır. Bunlardan ilki meta-analiz çalışmalar tarafından takip edilebilen sistematik alanyazın incelemeleridir. Diğer geleneksel olan fakat sistematik olmayan olarak bilinen anlatı incelemesidir. Anlatı incelemesi, bu iki standart alanyazın incelemesi türlerinden daha eski olanıdır. Anlatı incelemesi belli bir konuda mevcut alanyazının bir özetini ve analizini sunar (Gregory & Denniss, 2018, s.893).

Kaliteli anlatı incelemeleri yazmak için pek çok iyi neden vardır. Anlatımın ön planda olduğu genel bakışlar, birçok bilgiyi okunabilir formatta bir araya getirdikleri için faydalı eğitim makaleleridir. Öğretim üyeleri bu tarz genel bakışları kullanmayı severler çünkü bunlar genellikle ders kitaplarından daha güncellerdir ve öğrencileri hakemli alanyazına maruz bırakırlar (Green ve diğ., 2006, s.104).

Çalışmanın içeriğinde tasarım tabanlı araştırma üzerine yazılmış olan kitaplardaki bilgiler ve alanyazında kabul görmüş çalışmalar yer almaktadır. Çalışmada uluslararası kaynaklardan ve güncel kaynaklardan yararlanılmaktadır. Çalışmanın anlatı incelemesi yönteminin gereklilikleri olarak bağlamsal bir bütünlüğe sahip olmasına ve çalışmada şablonlarla okuyucuya kolaylık sağlanmasına özen gösterilmektedir. Çalışmadan elde edilen bilgiler yorumlanarak genel bir sonuca ulaşılmaktadır.

Tartışma ve Sonuç

Son zamanlarda eğitim arařtırmalarında teorik bilgi yerine uygulanabilir bilginin daha etkili olduđu düşünölmektedir. Dolayısıyla gerçek dünyada test edilen ve eğitime hizmet eden tasarım tabanlı araştırma çalışmaları günümüzde yaygınlaşmaktadır. Ayrıca bu çalışmalar özele indirgenmiştir ve eğitime özel olarak eğitim tasarımı araştırması modelleri bulunmaktadır. Alanyazın incelemesi sonucunda tasarım tabanlı araştırmanın birçok adımdan oluştuđu ve bu adımların anlaşılması gerektiđi görölmektedir. Usulüne uygun bir tasarım tabanlı araştırma yürütme sürecinin yapılandırılması oldukça zordur. Tasarım tabanlı araştırma, planlanmasından sonlandırmasına kadar dikkat edilmesi gereken noktalara sahip bir yolculuktur. Bu çalışma ise bu yolculuđa yardımcı olmak adına anlatı alanyazın incelemesi tekniđi ile tasarım tabanlı arařtırmaya dair kuramsal bir bakış sunmaktadır.

TTA'nın tanımlanmasının ele alındıđı bölümde alanında uzman ve TTA çalışmış öne çıkan isimlerin tanımlamaları yer almaktadır. Ortak bir tanım olmamasına rağmen tanımlar içinde ortak kavramlardan bahsedilebilir. TTA için birden çok terim kullanılması bölümüne baktığımızda tasarım tabanlı araştırmanın isimlendirilmesinde hem yurt içi hem yurt dışı çalışmalar arasında ortak bir isimlendirme olmadığı görölmektedir. Brown ve Collins (1992) teoriyle uygulamayı birleřtiren çalışmalarına tasarım deneyleri isimlendirmesini tercih etmektedir fakat gelişim sonucunda artık günümüzde yaygın olarak kullanılan ve tercih edilen tasarım tabanlı araştırma isimlendirilmesi ön plandadır. Tasarım tabanlı

araştırmaların eğitime özgü olduğunun belirtilmesi adına eğitim tasarımı araştırması kavramı tercih edilmektedir. Araştırmacılar isimlendirilmeden ziyade önemli olanın sürecin doğru adımlarla ilerlemesi olduğunu belirtmektedir.

Tasarım tabanlı araştırmanın özelliklerine baktığımızda araştırma yaklaşımlarının her birinde olduğu gibi tasarım tabanlı araştırma yaklaşımının da özelliklerinin olduğu karşımıza çıkmaktadır. Cobb ve diğ. (2003) TTA'nın özelliklerini; teorik, müdahaleci, ileriye dönük, döngüsel ve gerçek bir iş yapması olarak ele almaktadırlar. McKenney ve Reeves (2012) ise TTA'nın özelliklerini; pragmatik, temellendirilmiş, müdahaleci, yinelemeli, işbirlikçi, uyarlanabilir ve teori odaklıdır olarak ele almaktadırlar. Bu özellikler arasında yinelemeli, müdahaleci, pragmatik ve teorik özellikleri alanyazında yaygın olmak üzere karşımıza çıkmaktadır. TTA'nın bu özellikleri hem deneysel araştırma hem de eylem araştırması ile benzer özelliklerdir dolayısıyla bu yaklaşımlar arasında ayırt edici tablolar yer almaktadır.

Tasarım tabanlı araştırmanın eğitim araştırmalarında kullanılan deneysel yöntem ya da eylem araştırmalarıyla karşılaştırması bölümüne baktığımızda bu üç araştırma yaklaşımının da birbirine benzediği ve birbirinden ayrıldığı noktalar olduğu görülmektedir. Benzer yönlere sahip olan araştırma yaklaşımlarında tasarım tabanlı araştırmalardaki müdahaleci ve yinelemeli döngü TTA'nın sürecini verimli kılmaktadır. Bu süreç TTA adımları olarak yer ifade edilebilir. Farklı zamanlarda farklı çalışmalar yapan araştırmacılardan kaynaklı olarak tasarım tabanlı araştırmanın adımları değişebilmektedir ama süreçte ortak adımlar yer almaktadır.

Scott ve diğ. (2020) çalışmalarında tasarım tabanlı araştırmanın deneysel araştırma ile karşılaştırmasını dört kriter ile ele almaktadır. Bu kriterler; katılımcıların rolü, hipotezlerin araştırılması, araştırma süreci, araştırmanın etkisi olarak yer almaktadır. Örneğin deneysel araştırmada araştırma süreci kriterinde müdahale süreci deneysel dönem boyunca sabitken TTA süreçte daha esnek olarak benimsenmektedir. Campanella ve Penuel (2021) ise TTA ile deneysel araştırmaların karşılaştırılmasında araştırma yaklaşımlarının müdahaleci doğalarına dikkat çekmektedir. Deneysel araştırmaların "Ne olurdu" sorusuna cevap verdiğini tasarım araştırmalarının ise "Nasıl olurdu" gibi nedensel sorulara cevap verdiğinden bahsetmektedir. Abdallah ve Wegerif (2014) ise bu iki araştırma yaklaşımının

karşılaştırılmasında tasarım tabanlı araştırmanın deneysel arařtırmalardan farklı olduğunu çünkü hem teoriyi hem de uygulamayı geliřtirmeyi amaçladığından bahsetmektedir.

Tasarım tabanlı araştırmanın eylem araştırması ile karşılaştırılmasına baktığımızda iki araştırma yaklaşımının da pratik sorunlara odaklanması nedeniyle benzedikleri söylenebilir. Bu iki araştırma yaklaşımının kıyaslanmasını ele alan Watling (2014) TTA ile eylem araştırmasını birbirinden ayırt etmenin kolay olmayacağını altını çizmiş tasarım tabanlı arařtırmada sorunun tanımlanması ve kapsamlı çözümüne yönelik tasarım ve değerlendirme süreci olduğundan bahsetmektedir. Eylem araştırmasında ise sorun tanımlanır ve potansiyel çözüm geliştirilir. Her ikisinin de esasen teorikten ziyade pratiğe, uygulamaya yönelik olduğu söylenebilir.

Yurt dışı alanyazına baktığımızda TTA'nın anlatıldığı birçok kaynak mevcuttur. Fakat ülkemizin alanyazında tasarım tabanlı arařtırmaya genel bakış sağlayan ve tasarım tabanlı araştırma çalışmak isteyen arařtırmacılar için kılavuz niteliği taşıyabilecek çalışma sayısı azdır. Dolayısıyla ülkemizde tasarım tabanlı araştırma yaklaşımının çalışma yürütmek için çok fazla tercih edilmediği söylenebilir. Oysaki yurt dışında tasarım tabanlı arařtırmaya teşvik vardır. Örneğin doktora öğrencilerinin tasarım tabanlı araştırma yapmaları gerektiğini belirten birçok (Bakker, 2018; Mckenney & Reeves, 2012; Scott ve diğ., 2020) çalışma yer alırken doktora öğrencilerinin tasarım tabanlı arařtırmayı yürütme süreçlerinin sağlıklı geçmesi için model geliřtiren çalışmalar mevcuttur (Abdallah & Wegerif, 2014).

Kariyerlerinin başında olan ve tasarım tabanlı çalışmak isteyen arařtırmacılara, çalışmalarının yöntem kısımlarındaki boşluklara yardımcı olması için bu çalışmadan yararlanmaları önerilebilir. Bronkhors ve Kleijn'in (2016) ifade ettiği gibi, kariyerlerinin başındaki arařtırmacılar için tasarım tabanlı araştırma yapmak onlar için ödüllendiricidir.

Bilgilendirme

Bu çalışmada insan veya hayvan deneklerinden veri toplanmamıştır. Bu nedenle çalışma, etik kurul onayı gerektiren çalışmalar kapsamında yer almadığından etik kurul onayı alınmamıştır.

Yazar Katkı Beyanı

Aysu KARADEMİR: Kavramsallařtırma, metodoloji, verilerin toplanması, işlenmesi, analizi, yorumlanması, denetim, inceleme-yazma ve düzenleme, çeviriyi düzenleme.

Derya GİRĞİN: Kavramsallařtırma, verilerin toplanması, analizi, yorumlanması, inceleme-yazma ve düzenleme, çeviriyi düzenleme.

Kaynaklar



- Abdallah, M. M. S., & Wegerif, R. B. (2014). Design-based research (DBR) in educational enquiry and technological studies: A version for PhD students targeting the integration of new technologies and literacies into educational contexts. [Online Submission, ERIC: ED546471.] Alınan yer <http://files.eric.ed.gov/fulltext/ED546471.pdf>
- Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *Educational Researcher*, 41(1), 16–25. <https://doi.org/10.3102/0013189X11428813>
- Armstrong, M., Dopp, C., & Welsh, J. (2018). *Design-based research*. In R. Kimmons (Ed.), *The students' guide to learning design and research*. EdTech Books.
- Bakker, A. (2004). *Design research in statistics education: On symbolizing and computer tools*. CD-β Pres.
- Bakker, A. (2018). *Design research in education: A practical guide for early career researchers*. Routledge. <https://doi.org/10.4324/9780203701010>
- Bannan-Ritland, B. (2003). The role of design in research: The integrative learning design framework. *Educational Researcher*, 32(1), 21–24. <https://doi.org/10.3102/0013189X032001021>
- Barab, S., & Squire, K. (2004). Design-based research: Putting a stake in the ground. *The Journal of the Learning Sciences*, 13(1), 1-14. https://doi.org/10.1207/s15327809jls1301_1
- Bell, P., & Sandoval, W. A. (2004). Design-based research methods for studying learning in context: Introduction. *Educational Psychologist*, 39(4), 109-201. https://doi.org/10.1207/s15326985ep3904_1
- Bronkhorst, L. H., & de Kleijn, R. A. (2016). Challenges and learning outcomes of educational design research for PhD students. *Frontline Learning Research*, 4(3), 75–91. <http://dx.doi.org/10.14786/flr.v4i3.198>
- Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences*, 2(2), 141–178.
- Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş. & Demirel, F. (2020). *Eğitimde bilimsel araştırma yöntemleri*. Ankara: Pegem Akademi.
- Campanella, M., & Penuel, W. R. (2021). *Design based research in educational settings: Motivations, crosscutting features, and considerations for design*. In Z. A. Philippakos, E. Howell, & A. Pellegrino (Ed.), *Design-based research in education: Theory and applications* (pp. 3- 22). Guilford Publications.
- Christensen, K. D. N., & West, R. E. (2018). *The development of design-based research*. In R. E. West (Ed.), *Foundations of learning and instructional design technology*. BYU Open Learning Network.
- Cobb, P., Confrey, J., diSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher*, 32(1), 9–13.
- Collins, A. (1992). *Toward a design science of education*. In E. Scanlon & T.O'Shea (Ed.), *New directions in educational technology* (pp. 15–22). Springer-Verlag.
- Dede, C. (2004). If design-based research is the answer, what is the question? *Journal of the Learning Sciences*, 13(1), 105-114. https://doi.org/10.1207/s15327809jls1301_5

- Design Based Research Collective. (2003). Design based research: An emerging paradigm for educational inquiry. *Educational Researcher*, 32(1), 5–8. <http://doi.org/10.3102/0013189X032001005>
- Gravemeijer, K. & Cobb, P. (2013). Design research from the learning design perspective. In T. Plomp & N. Nieveen (Ed.). *Educational design research part A: An introduction* (pp. 72-113). SLO.
- Gravemeijer, K. P. E. (1994). Educational development and developmental research in mathematics education. *Journal for Research in Mathematics Education*, 25(5), 443–471. Alınan yer <https://www.jstor.org/stable/749485>
- Green, B. N., Johnson, C. D., & Adams, A. (2006). Writing narrative literature reviews for peer-reviewed journals: Secrets of the trade. *Journal of Chiropractic Medicine*, 5(3), 101–117. [https://doi.org/10.1016/S0899-3467\(07\)60142-6](https://doi.org/10.1016/S0899-3467(07)60142-6)
- Greenhalgh, T., Thorne, S., & Malterud, K. (2018). Time to challenge the spurious hierarchy of systematic over narrative reviews? *European Journal of Clinical Investigation*, 48(6). 1-6. <https://doi.org/10.1111/eci.12931>
- Gregory, A. T., & Denniss, A. R. (2018). An introduction to writing narrative and systematic reviews - tasks, tips and traps for aspiring authors. *Heart, lung & Circulation*, 27(7), 893–898. <https://doi.org/10.1016/j.hlc.2018.03.027>
- Hoadley, C. P. *Creating context: Design based research in creating and understanding CSCL*. (2002, January 7-11) Proceedings of the Conference on Computer Support for Collaborative Learning: Foundations for a CSCL Community [Conference paper] Boulder, CO.
- Kuzu, A., Çankaya, S., & Mısırlı, Z. A. (2011). Tasarım tabanlı araştırma ve öğrenme ortamlarının tasarımı ve geliştirilmesinde kullanımı. *Anadolu Journal of Educational Sciences International*, 1(1), 19-35.
- Lagemann, E. C. (2002). *An elusive science: The troubling history of education research*. University of Chicago Press.
- Lijnse, P. L. (1995). “Developmental research” as a way to an empirically based “didactical structure” of science. *Science Education*, 79(2), 189–199.
- McKenney, S., & Reeves, T. C. (2012). *Conducting educational design research*. Routledge.
- Mutlu, N. (2016). Tasarım ve geliştirme araştırma modeli. Y. Özden & L. Durdu (Ed.), *Eğitimde üretim tabanlı çalışmalar için nitel araştırma yöntemleri içinde* (1.baskı, ss.49–70). Anı Yayıncılık.
- O’Neill, D. K. (2012). Designs that fly: What the history of aeronautics tells us about the future of design-based research in education. *International Journal of Research & Method in Education*, 35(2), 19–140. <http://doi.org/10.1080/1743727X.2012.683573>
- Oppl, S., Stary, C., & Oppl, S. (2022). On the ambiguous nature of theory in educational design-based research – reflecting and structuring from an is perspective. *Educational Design Research*, 6(1), 1-33. <https://doi.org/10.15460/eder.6.1.1808>
- Plomp, T., & Nieveen, N. (2013). *Educational design research: Introduction and illustrative cases*. SLO.
- Randolph, J.J. (2009). A Guide to writing the dissertation literature review. *Practical Assessment, Research & Evaluation*, 14(13), 1-13. <https://doi.org/10.7275/b0az-8t74>
- Reeves, T. C. (2006). *Design research from a technology perspective*. In J. van den Akker, K. Gravemeijer, S. McKenney, & N. Nieveen (Ed.), *Educational design research* (pp. 52–66). Routledge.

- Reinking, D., & Bradley, B. A. (2008). *On formative and design experiments: Approaches to language and literacy research*. Teachers College Press.
- Schoenfeld, A. H. (2007). *Method*. In Lester (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 69-107). Information Age Publishing.
- Scott, E. E., Wenderoth, M. P., & Doherty, J. H. (2020). Design-based research: A methodology to extend and enrich biology education research. *Life Sciences Education*, 19(11), 1–12. <https://doi.org/10.1187/cbe.19-11-0245>
- Steffe, L. P., & Thompson, P. W. (2000). Teaching experiment methodology: Underlying principles and essential elements. In R. Lesh & A. E. Kelly (Ed.), *Handbook of research design in mathematics and science education* (pp.267-306). Erlbaum.
- Sukhera J. (2022). Narrative reviews: Flexible, rigorous, and practical. *Journal of Graduate Medical Education*, 14(4), 414–417. <https://doi.org/10.4300/JGME-D-22-00480.1>
- Sylvester, A., Tate, M., & Johnstone, D. (2013). Beyond synthesis: re-presenting heterogeneous research literature. *Behaviour & Information Technology*, 32(12), 1199–1215. <https://doi.org/10.1080/0144929X.2011.624633>
- Şatana, N. S. (2015). Uluslararası ilişkilerde bilimsellik, metodoloji ve yöntem. *Uluslararası İlişkiler Dergisi*, 12(46), 10-33. <https://doi.org/10.33458/uidergisi.463026>
- van den Akker, J. (1999). Principles and methods of development research. In J. van den Akker, R. M. Branch, K. Gustafson, N. Nieveen, & T. Plomp (Ed.), *Design approaches and tools in education and training*. Springer.
- van den Akker, J., Gravemeijer, K. P. E., McKenney, S., & Nieveen, N. (2006). *Educational design research*. Routledge.
- Wang, F., & Hannafin, M. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development* 53(4), 5–23. <http://doi.org/10.1007/BF02504682>
- Watling, S. (2014, March 23). *Educational design research or educational action research: What's the difference?* Alınan yer <https://suewatling.blogs.lincoln.ac.uk/2014/03/23/educational-design-research-or-educational-action-research-whats-the-difference/>
- Yüksel, A. (2023). Bilimsel araştırma: Temel yaklaşımlar ve metodoloji. *Sosyal bilimlerde araştırma yöntemleri: Yeni perspektifler araştırma yöntemleri: Yeni uygulamalar ve bakış açıları içinde* (1.baskı, ss.89-92). Seçkin Yayıncılık

Research Article/Araştırma Makalesi

Bibliometric Analysis of Studies on Emotional Blackmail

Mehmet BİÇER^{1,*}  Fatıma Firdevs ADAM² 

¹ Sivas Provincial Directorate of National Education, Sivas, Turkey mehmetbcr@yandex.com

² Sivas Cumhuriyet University, Faculty of Education, Sivas, Turkey firdevs@cumhuriyet.edu.tr


* Corresponding Author: mehmetbcr@yandex.com

Article Info

Received: 05 August 2024

Accepted: 27 September 2024

Keywords: Bibliometric analysis,
emotional blackmail, Scopus

 10.18009/jcer.1528256

Publication Language: Turkish

Abstract

Emotional blackmail is a psychological process that an individual experiences sometimes consciously and sometimes unconsciously. There are many publications on emotional blackmail. Analysing these studies collectively will provide us with the opportunity to approach this issue from a general perspective. Based on this idea, in this study, it is planned to examine the studies on emotional blackmail published in the Scopus database between 1973 and 2023 by bibliometric analysis method. Scopus database was selected to access comprehensive results on emotional blackmail. The 32 records obtained as a result of the search using the keyword "emotional blackmail" between 12-22 July 2024 were examined using descriptive bibliometric analysis. When the 32 studies were examined, 14 of them were single authored. The average annual citation of the articles is 6.06. The average age of the articles is 10.2 years. Procedia - Social and Behavioural Sciences journal leads with 2 articles in "emotional blackmail" themed publications.



To cite this article: Biçer, M. & Adam, F.F. (2024). Duygusal şantaj ile ilgili yapılmış çalışmaların bibliyometrik analizi. *Journal of Computer and Education Research*, 12 (24), 800-822. <https://doi.org/10.18009/jcer.1528256>


Duygusal Şantaj İle İlgili Yapılmış Çalışmaların Bibliyometrik Analizi

Makale Bilgisi

Geliş: 05 Ağustos 2024

Kabul: 27 Eylül 2024

Anahtar kelimeler: Bibliyometrik analiz, duygusal şantaj, Scopus

 10.18009/jcer.1528256

Yayın Dili: Türkçe

Öz

Duygusal şantaj bireyin bazen farkında olarak bazen de farkında olmadan yaşadığı psikolojik bir süreçtir. Duygusal şantajla ilgili olarak yapılan birçok yayın bulunmaktadır. Bu çalışmaların toplu olarak incelenmesi bize genel bir bakış açısıyla bu konuya yaklaşma fırsatı sunacaktır. Bu düşünceden yola çıkılarak bu çalışmada duygusal şantaj konusunda 1973-2023 yılları arasında Scopus veri tabanında yayımlanan araştırmaların bibliyometrik analiz yöntemiyle incelenmesi planlanmıştır. Duygusal şantajla ilgili olarak geniş kapsamlı sonuçlara erişebilmek adına Scopus veri tabanı seçilmiştir. 12-22 Temmuz 2024 tarih aralığında "emotional blackmail" anahtar sözcüğü kullanılarak yapılan arama sonucunda elde edilen 32 adet kayıt belirlenen çalışmalar betimsel bibliyometrik analiz kullanılarak incelenmiştir. Yapılan 32 çalışma incelendiğinde 14 tanesi tek yazarlıdır. Makalelere yapılan yıllık ortalama atıf ise 6.06'dır. Makalelerin ortalama yaşı ise 10.2'dir. "Duygusal şantaj" temalı yayınlarda Procedia-Social and Behavioral Sciences dergisi 2 makale ile öncülük etmektedir.

Summary

Bibliometric Analysis of Studies on Emotional Blackmail

Mehmet BİÇER^{1,*}  Fatma Firdevs ADAM² 

¹ Sivas Provincial Directorate of National Education, Sivas, Turkey mehmetbcr@yandex.com

² Sivas Cumhuriyet University, Faculty of Education, Sivas, Turkey firdevs@cumhuriyet.edu.tr

* Corresponding Author: mehmetbcr@yandex.com

Introduction

Emotional blackmail, first articulated by Forward and Frazier (1997), is a form of psychological manipulation in which individuals use fear, obligation, and guilt to control others. This manipulation typically occurs in close relationships, where perpetrators exploit emotional bonds to exert control. Forward and Frazier describe the process in six stages: demand, resistance, pressure, threat, compliance, and repetition, leading to a cycle that undermines the victim's autonomy and self-esteem. Emotional blackmail is both overt and covert, making it difficult for victims to recognize the abuse, which can result in significant psychological distress and long-term relational impacts (Phelps & Austin, 1987; Karnani & Zelman, 2019).

This study conducts a bibliometric analysis of publications on emotional blackmail to identify key research trends over the past 50 years. Bibliometric methods, such as publication and citation analysis, are employed to evaluate the field's development and highlight influential authors and works that have shaped the understanding of this phenomenon.

Method

This study employs a descriptive bibliometric analysis to systematically evaluate the literature on emotional blackmail. Bibliometric analysis quantitatively assesses research impact by examining metrics such as publication counts, citation frequencies, authorship patterns, and collaborative networks, providing insights into research trends and key contributors. Data was sourced from the Scopus database due to its extensive coverage and indexing of high-quality literature. The search, conducted on July 22, 2024, using the keyword "emotional blackmail," included publications from 1973 to 2023. This yielded 32 records, from which bibliometric data, including authors, publication years, journal titles,

document types, and citation counts, was extracted and analyzed using descriptive techniques.

Results

The bibliometric analysis of emotional blackmail research revealed key trends in publication output, authorship, and citation impact. A total of 31 sources, including research articles, conference papers, book chapters, and notes, were analyzed from 1973 to 2023, showing an annual growth rate of 2.22%. Among the 32 documents, 22 were research articles, highlighting strong academic interest. The 67 contributing authors included both single and collaborative efforts, with 14 single-authored works. The documents received 1,368 citations, averaging 8.78 citations per document, indicating significant scholarly impact. *Procedia - Social and Behavioral Sciences* was the leading journal, and Chen H.T. emerged as the most prolific author. Geographically, China led in publication output, followed by the UK and the Netherlands, reflecting global research engagement in this field..

Discussion and Conclusion

The bibliometric analysis of emotional blackmail research reveals a steady growth in publications and citations over the past five decades, reflecting increasing academic interest in this topic. China emerged as the leading country in publication output, suggesting a strong focus on this phenomenon, possibly driven by cultural or academic factors. Prolific authors like Chen H.T. have significantly influenced the field, highlighting the impact of individual researchers. The mix of single-authored and collaborative works indicates a dynamic research environment that values both independent and team efforts. The study underscores the importance of international collaboration and diverse research approaches to deepen the understanding of emotional blackmail. Future research should explore innovative methodologies, including longitudinal, cross-cultural, and advanced analytical techniques, to further investigate the underlying mechanisms, effects, and interventions related to emotional blackmail.

Giriş

Toplumsal bir varlık olan insan, sosyal ve medeni bir grubun içinde yaşamaktadır. Dolayısıyla eğilimleri ve tutumları, diğer insanlarla başa çıkarken farklı davranış biçimleri ve kalıpları oluşturmaktadır. Birlikte yaşadığı diğer insanlardan zaman zaman bazı şeyleri talep ederken kendisi de diğer insanların istediklerini yerine getirmektedir. Bazı durumlarda karşı taraftan istediğini almak için farklı yollar denemektedir (Al-Kreimeen, ve diğ., 2022). Kendi kişisel çıkarları için diğerlerine karşı duygusal manipülasyonu yani duygusal şantajı bir davranış kalıbı olarak benimseyebilir. Forward ve Frazier (1997) duygusal şantajı tarafından “bize yakın olan kişilerin, istediklerini yapmazsak bizi doğrudan veya dolaylı olarak cezalandırmakla tehdit ettikleri güçlü bir manipülasyon biçimi” olarak tanımlanmıştır. Duygusal şantaj, ilişkilerde insanları korku, zorunluluk, suçluluk duygularıyla kontrol etme ve kontrol eden ile kontrol edilen kişi arasındaki işlemsel dinamiklerdir. Bu dinamikleri anlamak, duygusal şantaj uygulayan kişinin kontrolcü, rahatsız edici, istenmeyen, külfetli veya fedakârlık gerektiren davranışlarından kurtulmaya çalışan kişi için faydalıdır (Johnson, 2014). Duygusal şantaj yaklaşımı, duygusal şantajı uygulayan kişinin, duygusal şantajın uygulandığı kişideki olumsuz sonuçlar doğurabilecek negatif duyguların tetiklenmesine dayanır (Chen & Hsieh, 2018; Chen, ve diğ., 2024; Chen & Wang, 2017). Bu yaklaşımın en büyük zorluğu, tanımı gereği duygusal baskının, yapının kendisinden ziyade birçok duygusal şantaj özelliğinden biri olmasıdır (Forward & Frazier, 1997). Etkileme ve duygulanım temelli taktikleri, duygusal şantajı, duygusal şantajı uygulayanın kendi hedeflerine ulaşmak için karşısındaki kişiyi etkileme niyeti olarak tanımlanmaktadır (Chen, ve diğ., 2023; Liu, 2019).

Duygusal şantaj genellikle kişisel veya samimi bir ilişki kurmuş iki kişiyi (ebeveyn ve çocuk, eşler, kardeşler veya iki yakın arkadaş) içerir (Phelps & Austin, 1987). Örneğin çocuklar aile sistemi içinde kendi çıkarlarını ve kişisel gelişimlerini desteklemek için özel yalvarma ve duygusal şantaj yöntemlerine başvurabilmektedir (Rapport, 2002). Duygusal şantaj uygulayanlar, ilişkilerinde korku, zorunluluk ve suçluluk duygularını kullanarak karşısındaki kişinin kendisini (duygusal şantaj uygulayanı) kızdırmaktan korkmasını, istediklerini yapmak zorunda hissetmesini ve direnirse suçluluk duygusuna kapılmasını sağlarlar. Ayrıca yakınlarından birinin sevgi, onaylanma ve öz saygı istediğini bilen

şantajcılar, bunları geri çekmekle (örneğin sevgiyi geri çekmekle) veya tamamen ortadan kaldırmakla tehdit edebilirler (Miller, 2004).

Duygusal şantajın altı temel özelliği; talep, direnç, tehdit, baskı, itaat ve tekrar olduğu ifade edilmektedir (Forward & Frazier, 1997). Talep etmek duygusal şantajın ilk basamağı olmaktadır. Bunu yapan kişi açıkça ifade edebildiği gibi taleplerini sanki karşısındaki kişiyi önemsiyormuş bir ifade ile de dile getirebilir. Direnç aşamasında ise duygusal şantajı uygulayan kişi talep ettiği şeyi elde edemezse muhtemelen şantaj yapan kişi tarafından geri püskürtülmüş ve bir direnç göstermiştir. Duygusal şantaj, doğrudan veya dolaylı tehditler içerebilir. Ayrıca bir tehdidi olumlu bir söz olarak maskeleyebilir. Bu pek tehdit gibi görünmese bile yine de karşısındaki bireyi manipüle etmeye çalışmaktadır. Şantajcı, duygusal şantaja maruz kalan kişinin reddetmesinin sonuçlarını açıkça ifade etmese de sürekli direnmesinin ilişkiye yardımı olmayacağını ima eder. İnsanlar sağlıklı bir ilişkide ihtiyaç ve arzularını belirtir (Chen, ve diğ., 2024).

Sağlıklı bir ilişkide, bir kez direnç gösterdiğinizde, diğer kişi genellikle baskı yapmayı bırakarak veya birlikte bir çözüm bulmaya çalışarak yanıt verir. Ancak bir şantajcı, belki birkaç farklı yaklaşımla, karşısındaki kişiye taleplerini karşılaması için baskı yapacaktır. Duygusal şantajcıya maruz kalan birey, şantajcının tehditlerini yerine getirmek istemezse pes eder ve teslim olur. Diğer ifadeyle itaat ederek karşı tarafın istediklerini yerine getirir. Bir kez pes ettiğinde, kargaşa yerini barışa bırakır (Forward & Frazier, 1997). İsteddiği şeye sahip olan şantajcı, en azından bir süreliğine özellikle kibar ve sevgi dolu görünebilirler. Ancak itaat, şantaja maruz kalan bireyi zamanla baskı ve tehditlerle yıprattığı için ilişkinin süreci nihai bir son olabilir. Şantaja maruz kalan birey, duygusal şantaj yapan kişiye sonunda kabul edeceğini gösterdiğinde, şantajcı gelecekte benzer durumlarda rolünün nasıl olması gerektiğini tam olarak bilir. Zamanla, duygusal şantaj süreci, şantaja maruz kalan bireye boyun eğmenin sürekli baskı ve tehditlerle yüzleşmekten daha kolay olduğunu öğretir. Birey, duygusal şantajcının sevgisinin koşullu olduğunu ve onunla aynı fikirde olana kadar saklayacağı bir şey olduğunu kabul etmeye başlayabilir (Forward & Frazier, 1997). Ayrıca duygusal şantaja maruz kalan kişi, duygusal şantajla karşılaştığında olumsuz duygular yaşar ve başlangıçta bu isteğe karşı çıkabilir. Ancak olumsuz duygulara gömüldükçe ve direndikçe ilişkinin potansiyel olarak zarar göreceğinden korkar ve sonuçta dirençten itaate geçiş yapabilir. Duygusal şantajı uygulayan kişi bu tür bir manipülasyon yoluyla hedefi başarılı

bir şekilde ve tekrar tekrar etkileyebildiğinde, bu etkileme taktiğini düzenli olarak kullanır (Karnani & Zelman, 2019).

Forward ve Frazier'in (1997) öncü çalışmalarından bu yana duygusal şantaj, araştırmacıların büyük ilgisini çekmiştir (Chen ve diğ., 2023). Alan yazında duygusal şantaj ile ilişkili (Besemeres, 2007; Kao, 2024; Karnani, & Zelman, 2019; Leung, 2005; Thi & Duong, 2024) çalışmalar bulunmaktadır. Bu noktadan hareketle mevcut araştırmanın amacı, dikkat çeken bir kavram olan duygusal şantaj ile ilgili yapılmış çalışmaların ülkelere, yazarlara, yayın yıllarına, dillerine göre gösterdiği dağılım ve eğilimleri ortaya çıkarmaya çalışmaktır. Ulaşılan literatürde "Emotional Blackmail (Duygusal Şantaj)" kavramına ilişkin bir bibliyometrik analiz bulunamamıştır. Bu çalışma ile "Duygusal Şantaj" alanında bibliyometrik analiz yapılmış ve literatürdeki bu boşluğun giderilmesi amaçlanmıştır. Duygusal şantaj ile ilgili Scopus indexinde yayımlanan makaleler yayın yılı, en fazla atıf alan dergiler ve yazarlar, en üretken yazar, tarihsel süreçte birbirlerinden etkilenen makaleler, en yaygın anahtar kelimeler en fazla yayın yapan ülkeler çerçevesinde incelenmiştir. Bu çalışmada elde edilen bulguların yaklaşık 50 yıllık bir birikimi incelenen değişkenler açısından ortaya koyacağı ve bunun da alan yazınında çalışma yapan paydaşlara katkı sunacağı kabul edilmektedir. Mevcut araştırmanın, duygusal şantaj konusunda en verimli çalışmaların ve araştırmacıların belirlenmesi; ülkeler arası karşılaştırma yapılabilmesi, konuyla ilgili yapılan çalışmaların optimal dağılımını göstermesi bakımından önem arz ettiği düşünülmektedir.

Yöntem

Araştırma Modeli

Bu çalışmada, araştırma amacı doğrultusunda nitel veri toplama yöntemleri arasında yer alan doküman incelemesi kullanılmış ve elde edilen veriler bibliyometrik analiz ile değerlendirilmiştir. Nitel araştırma, sosyal ve davranışsal bilimlerde kullanılan bir araştırma yöntemidir ve karmaşık olguların derinlemesine anlaşılmasını sağlamaktadır. Bu yaklaşım, bireylerin deneyimlerini, düşüncelerini ve duygularını anlamak için kullanılmaktadır. Nitel araştırma yöntemleri arasında görüşmeler, odak grupları, gözlemler ve doküman incelemeleri yer almaktadır. Nitel veri toplama yöntemleri, araştırmacıların katılımcılarla doğrudan etkileşime girmesini gerektirip genellikle küçük örneklem grupları üzerinde

yoğunlaşmaktadır (Morgan, 2022). Doküman incelemesi ise nitel araştırma yöntemlerinden biridir ve mevcut belgelerin analiz edilmesini içermektedir. Bu yöntem, araştırmacıların katılımcılarla etkileşime girmeden mevcut belgeleri analiz ettiği etkileşimli olmayan bir yöntemdir (Morgan, 2022). Doküman incelemesi, zamanlama ve katılımcıların katılımını gerektiren görüşmeler veya odak gruplarına kıyasla daha uygun maliyetli ve daha az zaman almaktadır (Sun ve diğ., 2023). Aynı zamanda mevcut belgeleri analiz etmek, katılımcıların rızasını ve katılımını gerektiren yöntemlere kıyasla daha az etik sorun içermektedir (Morgan, 2022). Doküman incelemesi, geçmiş bağlam veya yerleşik uygulamalara ilişkin içgörüler sağlayan statik verilere (örneğin, raporlar, politikalar) odaklanmaktadır (Blohm ve diğ., 2024). Bibliyometrik analiz ise, toplanan verilerin sistematik olarak incelenmesi ve araştırmacının belirlediği bir düzen çerçevesinde sunulması amacıyla kullanılmaktadır.

Bibliyometrik analiz, belirli bir alandaki bilimsel literatürün etkisini ve gelişimini değerlendirmek için kullanılan nicel bir araştırma yöntemidir. Bu yöntem, yayınlanmış eserlerin yayın sayısı, alıntı kalıpları, yazarlık ve iş birliği ağları gibi çeşitli yönlerini analiz etmek için istatistiksel araçları kullanır (Alaminos ve diğ., 2024). Bibliyometrik çalışmalar genellikle yayınların farklı ülkeler, dergiler ve yıllar arasındaki dağılımları gibi çeşitli istatistiksel değerlendirmelerle başlar. Aynı zamanda araştırma çıktısındaki büyümeyi ve eğilimleri haritalamaya da yardımcı olur (Li ve diğ., 2023). Yapılan analizler, eserlerin başkaları tarafından ne sıklıkla alıntılındığını araştırarak belirli bir alandaki etkili makaleleri ve yazarları ortaya çıkarır. Ortak atıf analizi, paylaşılan alıntılara dayalı olarak farklı eserler arasındaki ilişkileri tanımlar ve bu da araştırma kümelerini ve tematik alanları vurgular (Pahrudin ve diğ., 2022). Bibliyometrik analiz, yazarların bağlantılarını ve iş birliklerini inceleyerek araştırmacılar ve kurumlar arasındaki iş birliği modellerini ortaya çıkarıp bilginin literatürde nasıl paylaşıldığını gösterir (Maulana, 2022). Bibliyometrik çalışmalar, literatürdeki boşluklar üzerine tartışmalar ve gelecekteki araştırmalar için önerilerle sona erip bilim insanlarına yeterince keşfedilmemiş alanları belirlemede rehberlik eder (Li ve diğ., 2023; Maulana, 2022; Pahrudin ve diğ., 2022).

Araştırma Materyali

Bir inceleme için doküman seçerken, çeşitli stratejiler analizin etkinliğini ve alaka düzeyini artırabilmektedir. Belge seçim sürecine rehberlik eden belirli araştırma soruları veya hedefler belirlendikten sonra çalışmanın amaçlarıyla doğrudan ilgili belgelerin

belirlenmesi analizin odaklanmış olmasını ve amaçlı kalmasını sağlamaktadır (Morgan, 2022). Hangi belgelerin incelemeye dahil edileceğini belirlemek için bir dizi kriter oluşturmak önemlidir. Bu kriterler arasında; belgelerin doğrudan araştırma sorularıyla ilgili olması, dokümanların güncel ve uygulanabilir olduğundan emin olmak için bir zaman çerçevesinin olması, hangi tür belgelerin (örneğin, raporlar, makaleler, politika belgeleri) dahil edileceğini kararlaştırmak yer almaktadır (Blohm et al., 2024). Doküman incelemesinde çeşitli belgeleri toplamak için birden kapsamlı veri tabanında aramalar yapmak önemlidir. Tarama da kullanılan anahtar kelimeler ve belgeleri dahil etme veya hariç tutma gerekçesi dahil olmak üzere arama sürecinin ayrıntılı kayıtlarını tutmak ise sistematik bir yaklaşımın parçasıdır (Sun ve diğ., 2023). Bu çalışmada, geniş kapsamlı sonuçlara erişebilmek adına Scopus veri tabanı seçilmiştir. 22.07.2024 tarihinde, “Emotional Blackmail (Duygusal Şantaj)” anahtar sözcüğü kullanılarak İngilizce dilinde 1973-2023 yılları arasında yapılan arama sonucunda elde edilen 22 adet araştırma makalesi, 4 adet konferans bildirisi, 3 adet kitap bölümü, 2 adet kitap ve 1 adet not olmak üzere toplam 32 adet kayıt kullanılmıştır.

Verilerin Toplanması ve Analiz Süreci

Bibliyometrik bir analizin yürütülmesinde yer alan temel adımlar bulunmaktadır. İlk adım, akademik veri tabanlarından ilgili makalelerin toplanmasını içermektedir. Seçilen alanda kapsamlı bir literatür koleksiyonu sağlamak için anahtar kelimelerin ve arama kriterlerinin tanımlanmasını içermektedir (Büyükkıdık, 2022). İkinci adım olarak hangi makalelerin analize dahil edileceğini belirlemek için yayın yılı, alaka düzeyi ve çalışma türü gibi net kriterler oluşturulmaktadır (da Silva & de Souza, 2021). Daha sonra ilgili bilgileri belirlemek için toplanan makaleler kapsamlı bir şekilde gözden geçirilmektedir (García-León et al., 2021). Verileri analiz etmek için R, VOSviewer veya SciMAT'taki bibliyometrix paketi gibi bibliyometrik araçları ve yazılımları kullanılmaktadır (Sharma & Niwamat, 2023).

Bibliyometrik analizinde öncelikle Scopus, Web of Science, PubMed gibi çeşitli bilimsel veri tabanlarının seçilmesiyle başlar, buradan elde edilecek verilerin indirilmesi için hazırlıklar yapılmıştır (Li ve diğ., 2010). İlk adımda, belirli bir veri tabanı üzerinde karar kılınarak, daha sonra bu veri tabanı içerisinde spesifik filtremeler gerçekleştirilmiştir (Jonkers & Derricks, 2012). Bu süreçte, doküman türü, yayın dili, formatı ve yayın yılı gibi çeşitli kriterler kullanılarak literatür daraltılır. Elde edilen veriler, daha sonra .csv formatında

indirilerek analiz için hazır hale getirilmiştir. Bu aşamada, performans analizi ve bilimsel haritalama gibi spesifik analiz türlerine yönelik kararlar alınmıştır (Verma & Gustafsson, 2020). Son olarak, bu tür analizleri gerçekleştirebilmek için R, RStudio, VOSviewer gibi çeşitli yazılım araçlarının kullanımına yönelik seçimler yapılmıştır. Bu süreç, bilimsel literatürün kapsamlı bir şekilde incelenmesini ve analiz edilmesini sağlayarak, araştırma alanlarındaki eğilimlerin ve boşlukların belirlenmesine olanak tanımaktadır (Donthu ve diğ., 2021).

Bu çalışmada, geniş kapsamlı sonuçlara erişebilmek adına Scopus veri tabanı seçilmiştir. 22.07.2024 tarihinde, “Duygusal Şantaj” anahtar sözcüğü kullanılarak İngilizce dilinde 1973-2023 yılları arasında yapılan arama sonucunda elde edilen 32 adet kayıt .csv formatında indirilmiştir. İndirilen bütün makaleler analiz sürecine dâhil edilmiştir. Analiz süreçlerinin yürütülmesinde Biblioshiny yazılımından yararlanılmıştır. Biblioshiny yazılımı, elde edilen veri setinin detaylı bir şekilde incelenmesi ve bilimsel literatürdeki eğilimlerin yanı sıra, araştırma alanları arasındaki ilişkilerin görselleştirilmesi için tercih edilmiştir. Bu yazılım söz konusu tematik alandaki bilgi birikiminin derinlemesine analiz edilmesine ve araştırma boşluklarının belirlenmesine olanak tanımıştır.

Bulgular

Yapılan bu çalışmada yayınlanan makalelerin detaylı özetlerini göstererek makalelerdeki yıllık değişim oranları, bir makaleye düşen ortalama atıf sayısı, kullanılan anahtar kelime sayısı gösterilmektedir. Ayrıca literatüre en sık katkı sağlayan ve en sık atıf alan dergiler ve üniversiteler de gösterilmektedir. Bunlara ek olarak literatürde en fazla makalesi bulunan ve en yüksek atıflara sahip olan yazarlar ve ülkeler gösterilmektedir. Ülke, yazar ve anahtar kelimeler ilişkisinde de önde gelenler Sankey Diyagramı ile gösterilmiştir.

Tablo 1. Ana bilgiler

Bilgi	İstatistik
Zaman Aralığı	1973-2023
Kaynak Sayısı	31
Doküman Sayısı	32
Yıllık Büyüme Oranı	%2.22
Yazar Sayısı	67
Tek Yazarlı Dokümanlar	14
Uluslararası Ortak Yazarlı Çalışmaların Oranı	%6.25
Doküman Başına Ortalama Yazar Sayısı	2,12
Yazarların Kullandığı Anahtar Kelime Sayısı	111
Atıf Sayısı	1368
Dokümanların Ortalama Yaşı	10.5
Doküman Başına Ortalama Atıf Sayısı	8.78

Tablo 1’de yer alan bilgilere göre bibliyometrik analiz, 1973-2023 yılları arasındaki belirli bir alandaki bilimsel literatürün gelişimini ve etkisini değerlendirmektedir. Analiz, toplamda 50 yıllık bir dönemi kapsamaktadır ve bu süre zarfında 31 farklı kaynaktan alınan 32 doküman incelenmiştir. Yayınların yıllık büyüme oranı %2.22 olarak belirlenmiştir, bu da alandaki literatürün zaman içinde istikrarlı bir şekilde büyüdüğünü göstermektedir. Çalışmalara toplamda 67 yazar katkıda bulunmuştur. Bu yazarların 14’ü tek yazarlı dokümanlar üretmiş olup bu durum alanda bireysel çalışmaların da önemli bir yer tuttuğunu göstermektedir. Bununla birlikte, uluslararası iş birliği oranı %6.25 olarak hesaplanmıştır; bu oran, yayınların küçük bir kısmının uluslararası yazarlarla birlikte yazıldığını ifade etmektedir. Doküman başına düşen ortalama yazar sayısı ise 2.12 olup, çalışmaların genellikle iş birliği ile yürütüldüğünü göstermektedir. Yazarlar toplamda 111 farklı anahtar kelime kullanmış, bu da alandaki çalışmaların geniş bir konu yelpazesinde yoğunlaştığını göstermektedir. İncelenen dokümanlar, toplamda 1368 atıf almıştır ve bu dokümanların ortalama yaşı 10.5 yıldır. Her bir dokümana ortalama 8.78 atıf yapılmıştır, bu da çalışmaların alandaki diğer araştırmacılar tarafından ne kadar kullanıldığını ve etkili olduğunu ortaya koymaktadır. Bu veriler, ilgili alandaki bilimsel literatürün genel özelliklerini, yazarların iş birliği ağlarını, anahtar kelime kullanımını ve atıf dağılımını kapsamlı bir şekilde değerlendirmektedir.

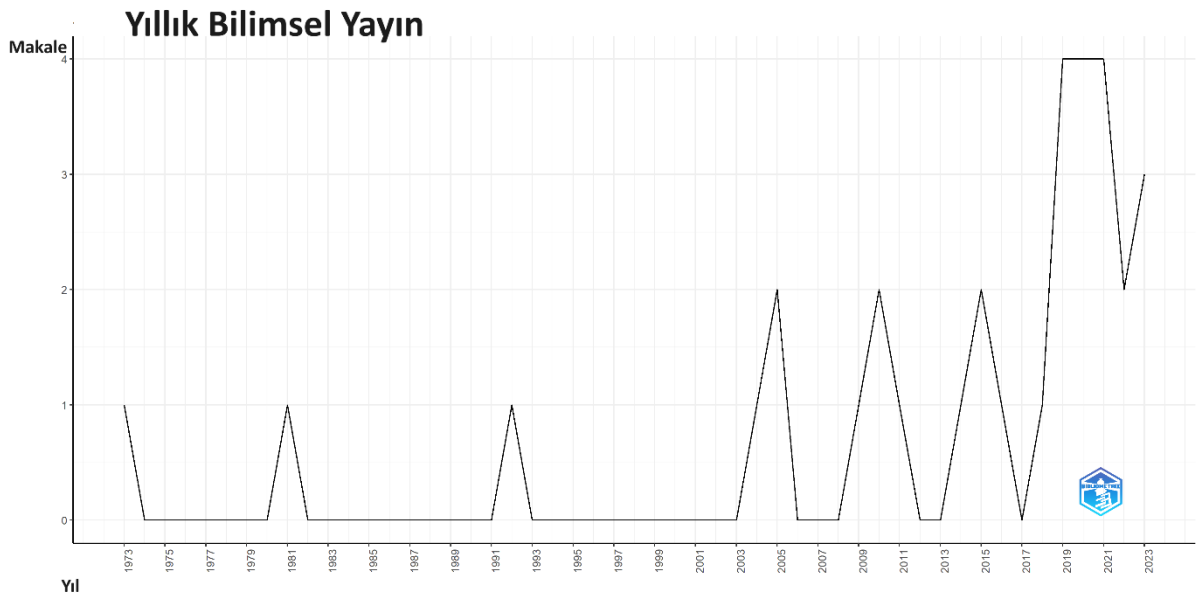
Tablo 2. Kaynak bilgileri

Bilgi	Yayın Sayısı	Oran
Araştırma Makalesi	22	%69.8
Konferans Bildirisi	4	%12.5
Kitap Bölümü	3	%9.4
Kitap	2	%6.3
Not	1	%3.1
Toplam	32	%100

Tablo 2’de sunulan veriler, araştırma alanındaki literatürün çeşitliliğini göstermektedir. Toplam 32 kaynağın 22’si (%68.75) araştırma makalesi olup, bu durum akademik çevrede konunun yoğun bir şekilde incelendiğini ve tartışıldığını ortaya koymaktadır. Konferans bildirileri 4 (%12.5), kitap bölümleri 3 (%9.37), kitaplar 2 (%6.25) ve notlar ise 1 (%3.13) kaynakla temsil edilmektedir. Araştırma makalelerinin yüksek sayısı, alanın bilimsel gelişimine önemli katkılar sağladığını gösterirken, diğer kaynak türleri de

konunun farklı açılardan ele alındığını ve zengin bir literatür oluşturulduğunu göstermektedir.

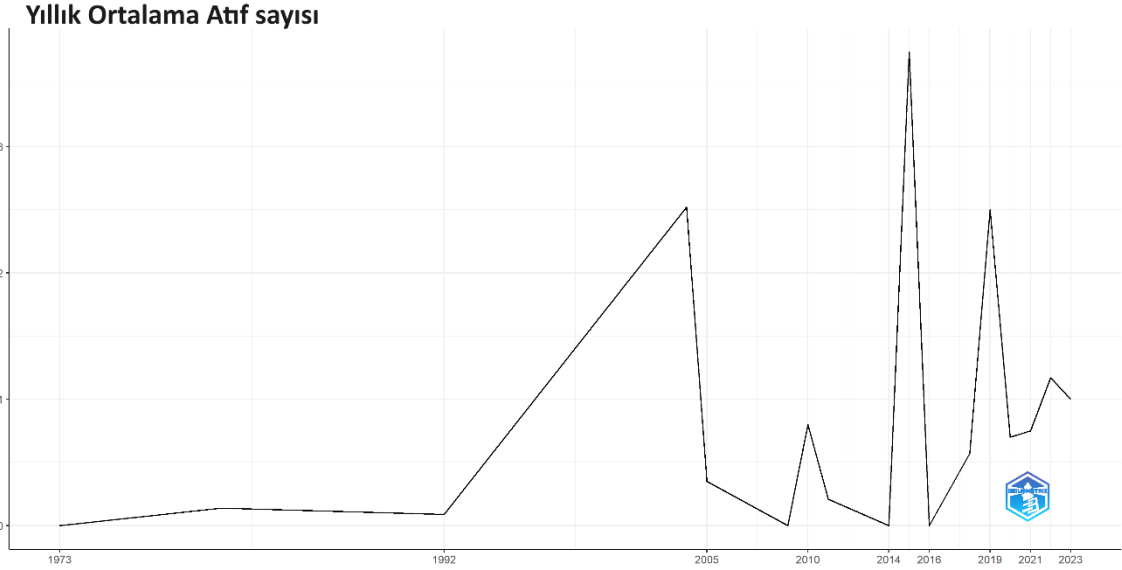
Şekil 1, duygusal şantaj konusuna odaklanan çalışmaların bibliyometrik analizini yansıtmakta olup, yıllara göre artış ve azalış eğilimlerinin var olduğunu göstermektedir. Özellikle son yıllarda, bu alanda yapılan araştırma sayısında dalgalanmalar gözlemlenmiştir. Bu gözlemler, araştırma faaliyetlerinin zaman içinde nasıl değiştiğini ve belirli dönemlerdeki ilgi alanlarının nasıl dalgalanmalar gösterdiğini ortaya koymaktadır.



Şekil 1. Duygusal şantaj konulu yayınların yıllık durumu

Şekil 1'e göre 2023'te 3 tane, 2022'de 2 tane, 2021'de 4, 2020'de 4 tane, 2019'de 4 tane makale yayınlanmıştır.

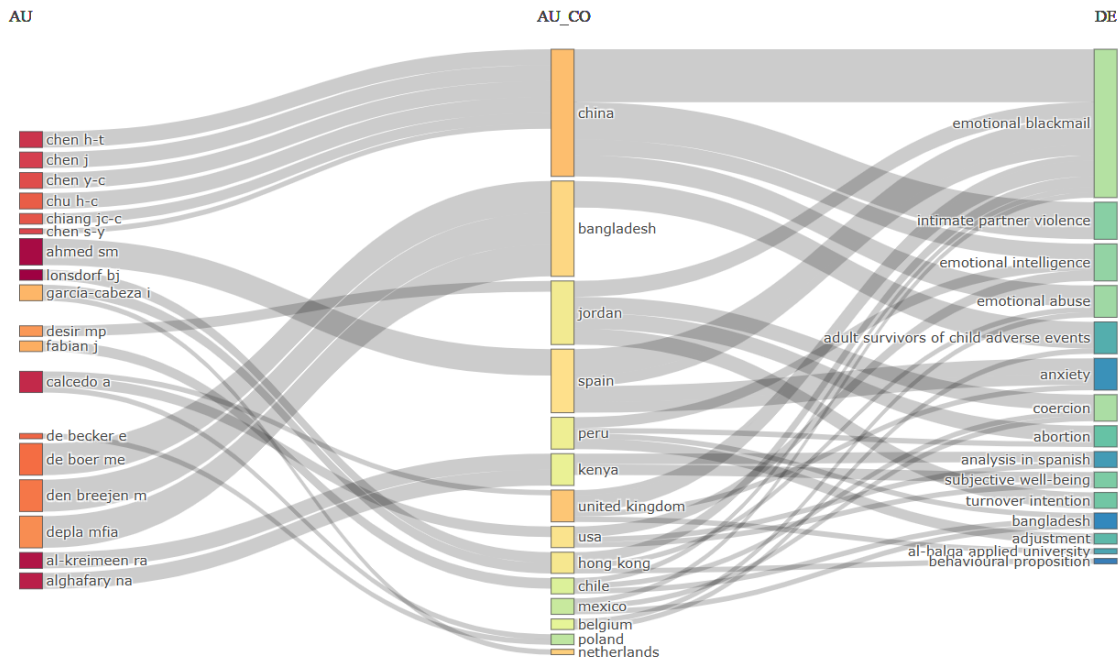
Duygusal şantaj ile ilgili yapılan yayınların yıllar itibari ile aldıkları atıflar Şekil 2'de sunulmuştur.



Şekil 2. Yıllık ortalama atıf durumu

Şekil 2'ye göre atıfların yıllara göre farklılık gösterdiği söylenebilir. 2023'te 1.00, 2022'de 1.17, 2021'de 0.75, 2020'de 0.75, 2019'da 2.50 ortalama yıllık atıf aldığı görülmektedir.

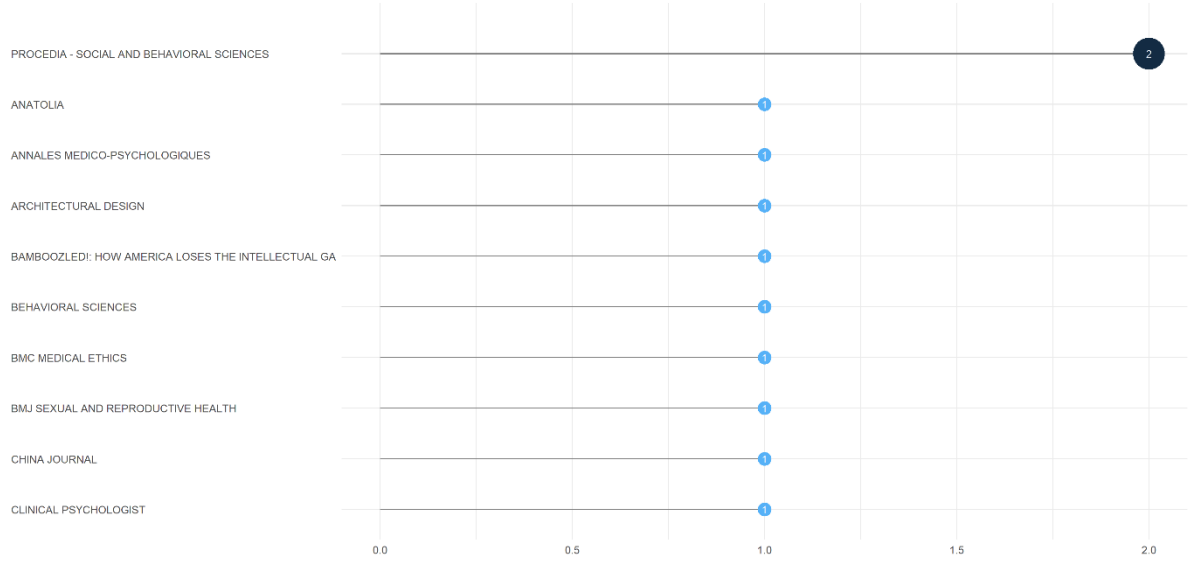
İlişkilendirilmesi istenen üç değişken olan ülke, yazar, anahtar kelime Bibliosihny programında seçenekler kısmından ayarlanarak her bir parametrenin en iyileri Şekil 3'te verilmiştir.



Şekil 3. Üç alan diyagramı (ülke, yazar, anahtar kelime)

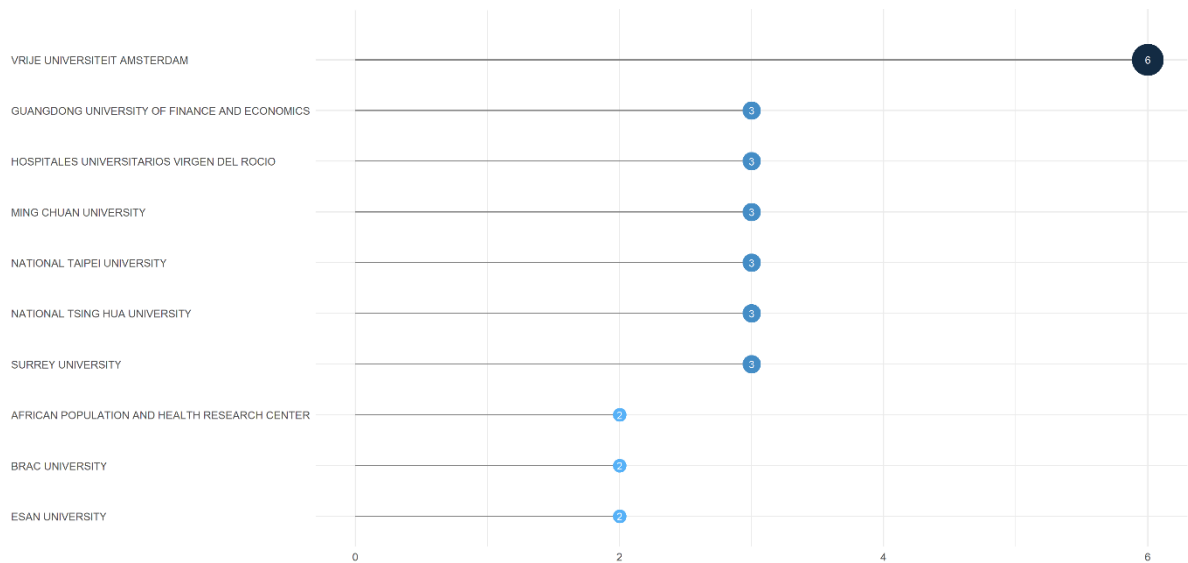
Şekil 3'e göre dikdörtgenlerin büyüklüğü kullanılan değişkenlerin literatürdeki önemini göstermektedir. Sankey diyagramına göre duygusal şantaj alanında en fazla eser veren ülke Çin'dir. Chen H.T. isimli yazar ise literatüre en fazla eser verendir.

Duygusal Şantaj konusunda yayın yapan dergilerin sıralaması Şekil 4'te verilmiştir.



Şekil 4. Duygusal şantaj konusu için en sık yayın yapan dergiler

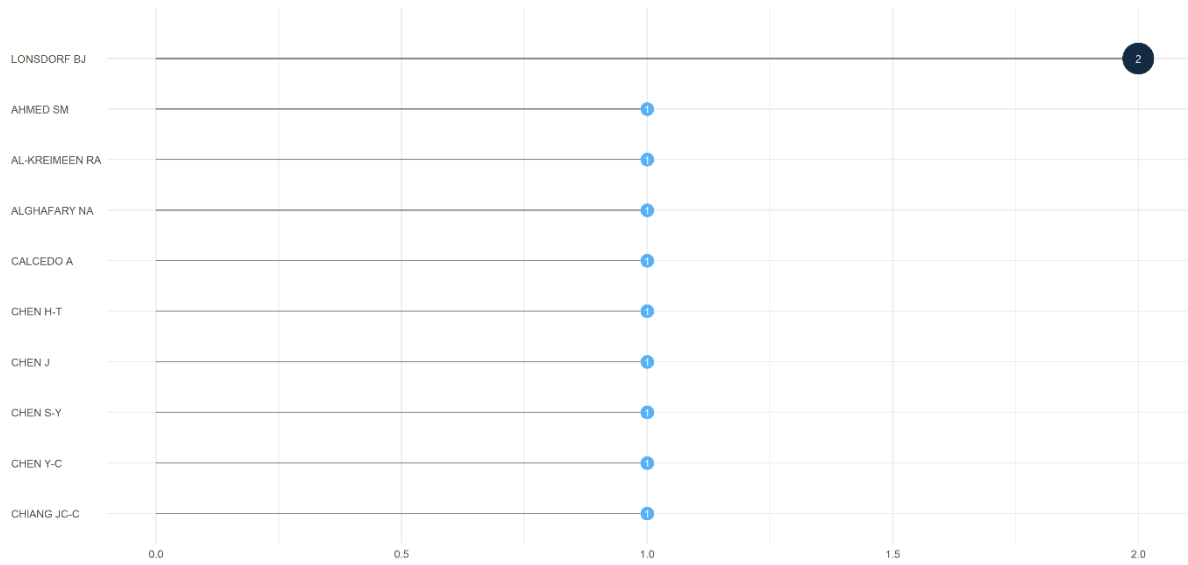
Şekil 4'te yer alan analize dayanarak, duygusal şantaj temalı yayınlarda Procedia - Social and Behavioral Sciences dergisi 4 makale ile öncülük etmekte, diğer dergiler ise 1 yayınlı takip etmektedir. Duygusal şantaj konusu ile ilgili çalışan yazarların bağlı olduğu üniversiteler Şekil 5'te gösterilmiştir.



Şekil 5. En sık yayın yapan kurumlar

Şekil 5'e göre duygusal şantaj konusu için Vrije Universiteit Amsterdam 6 çalışma ile ilk sırada, Guangdong University Of Finance And Economics, Hospitales Universitarios Virgen Del Rocio, Ming Chuan University, National Taipei University, National Tsing Hua University ve Surrey University 3 çalışma ile en sık yayın yapan kurumlar olarak yer almıştır.

Duygusal şantaj anahtar kelimesini kullanarak en sık yayın yapan yazarlar Şekil 6'da gösterilmiştir.

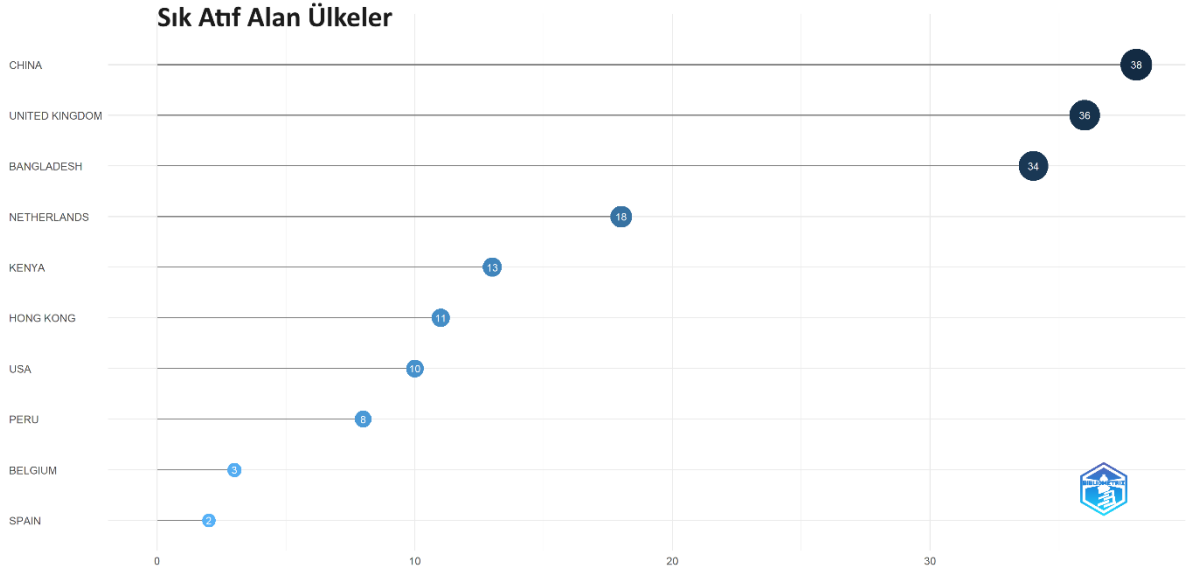


Şekil 6. En sık yayın yapan yazarlar

Tablo 3. Yayın yapan ülkeler listesi

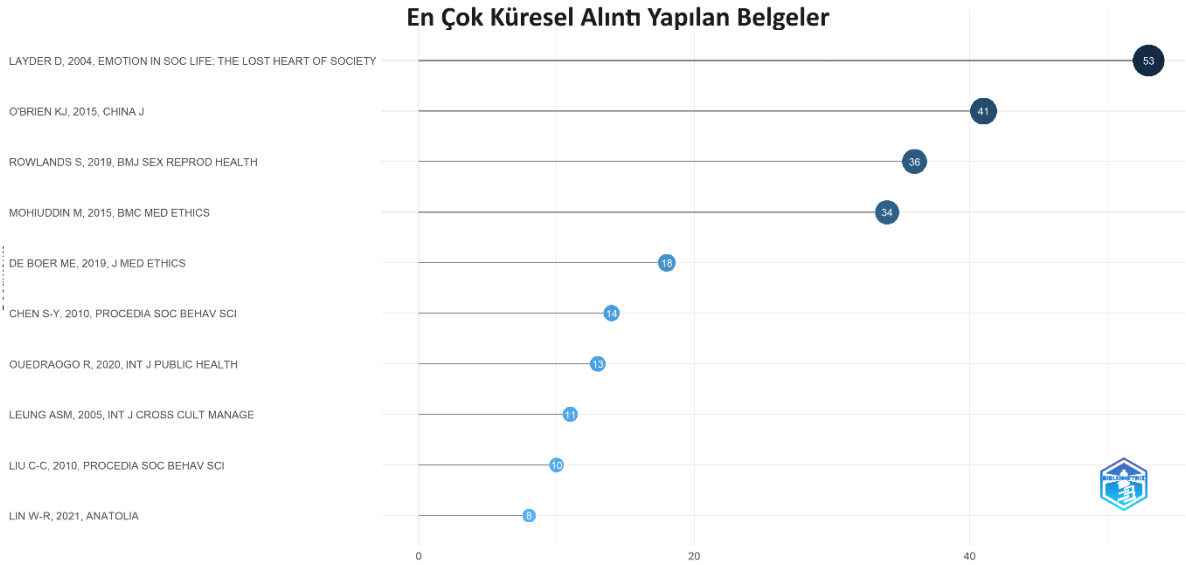
Ülke	Yayın Sayısı
Çin	17
Birleşik Krallık	8
Hollanda	6

Duygusal şantaj anahtar kelimesi ile çalışan ülkelerin yoğunluk haritası Tablo 3'te gösterilmiştir. Tabloya göre 17 makale ile en sık yayın yapan ülkeler sıralamasında Çin birinci sırada, 8 makale ile Birleşik Krallık ikinci sırada, 6 makale ile Hollanda üçüncü sırada yer almaktadır.



Şekil 7. Sık atf alan ülkeler

Duygusal şantaj anahtar kelimesi ile sık atf alan ülkeler Şekil 7’de gösterilmiştir. Şekle göre 38 atf ile en sık atf alan ülkeler sıralamasında Çin birinci sırada, 36 atf ile Birleşik Krallık ikinci sırada, 34 atf ile Bangladeş üçüncü sırada yer almaktadır.

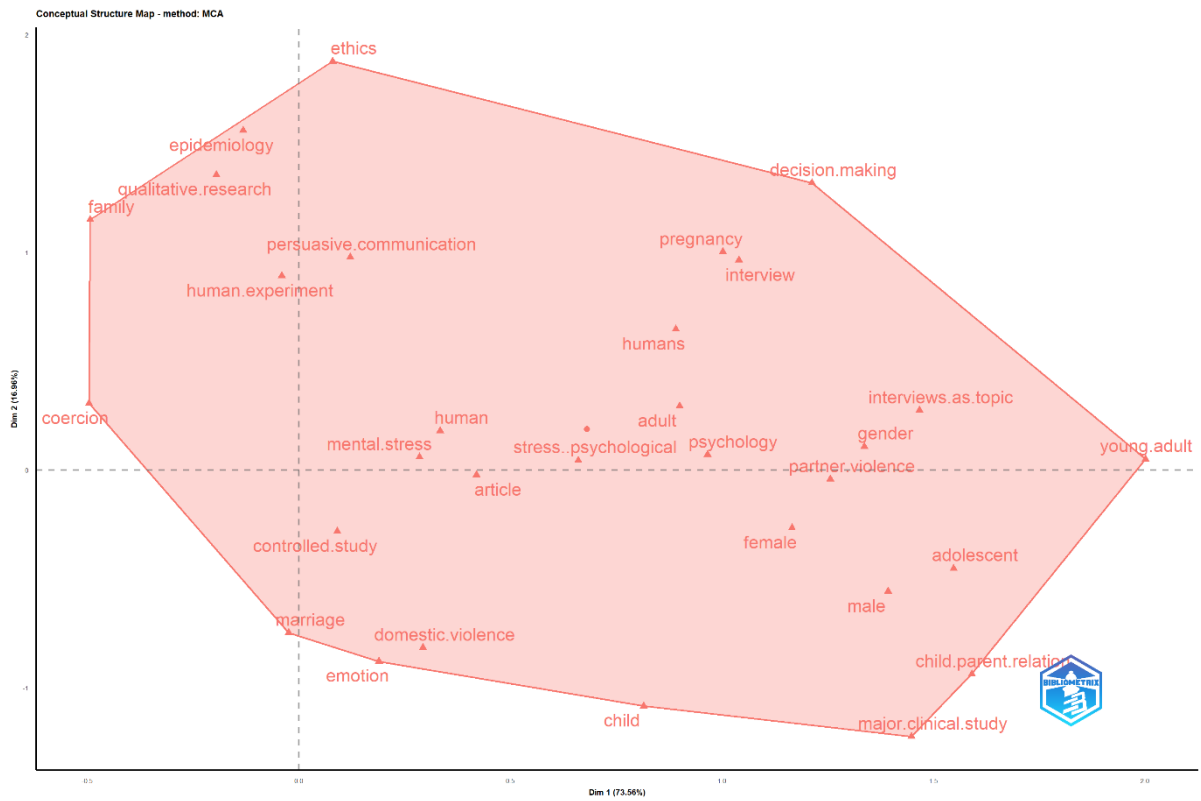


Şekil 8. En sık atf alan makaleler

Şekil 8’e göre Layder, D. (2004) tarafından yazılan Emotion in social life: The lost heart of society. başlıklı kitabın 53 atıfla en çok takip edilen eser olduğu görülmektedir. İkinci sırada ise O’Brien, K. J., ve Deng, Y. (2015). tarafından yazılan The China Journal dergisinde yayınlanan “The reach of the state: Work units, family ties and “harmonious

demolition"" başlıklı makale 41 atıfla en çok takip edilen ikinci yayındır. Rowlands, S., ve Walker, S. (2019) tarafından yazılan BMJ Sexual & Reproductive Health dergisinde yayınlanan "Reproductive control by others: means, perpetrators and effects" başlıklı makale 36 atıfla en çok atıf olan üçüncü yayındır.

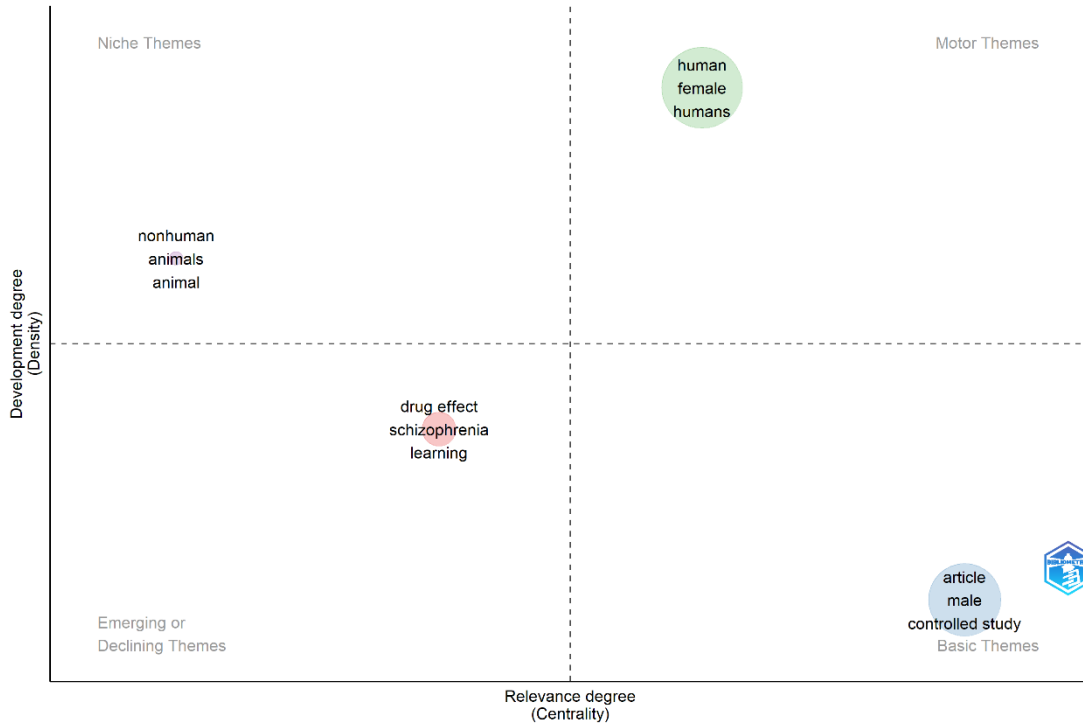
Farklı bilimsel ve teknik işlemlerin görselleştirilip analiz edilmesi ve model şeklinde gösterilmesi için analiz tekniklerinin bütün şeklinde uygulanmasına bilimsel haritalama denilmektedir (Demir ve diğ., 2024). Çalışma da faktör analizi, tematik harita, trend konular, anahtar kelimelerin ağaç haritası ve anahtar kelimelere bağlı ağ haritası gösterilmiştir.



Şekil 9. Faktör analiz haritası

Şekil 9'da verilen Faktör Analizine göre makaleler incelendiğinde bazı kavramlar faktör yüklerine göre yatay eksen (Dim 1) verilerin %73.56'sını açıklarken, dikey eksen (Dim 2) verilerin %16.45'ini açıklamaktadır. Bu iki boyut, kavramlar arasındaki temel ayrışmayı ve ilişkileri ortaya koymaktadır. Merkezde yer alan kavramlar, genel temaları ve araştırma alanının çekirdek konularını temsil etmektedir. Örneğin, "" insanlar", "", ""psikoloji"", "psikolojik stres" ve "zihinsel stres" gibi kavramlar, merkezde yoğunlaşarak araştırmanın odaklandığı temel konuları göstermektedir. Bu durum, psikolojik stres ve genel insan

psikolojisi üzerine yoğun bir araştırma ilgisi olduğunu işaret etmektedir. Kenar ve köşelerde yer alan kavramlar ise daha spesifik ve belirgin konuları temsil etmektedir. Örneğin, "etik" ve "karar verme" gibi kavramlar, etik ve karar verme süreçlerine odaklanan çalışmaları işaret ederken, " aile içi şiddet" ve "zorlama" gibi kavramlar, aile içi şiddet ve zorlamaya ilişkin araştırmaları göstermektedir. Bu tür kavramların marjinalde yer alması, bu konuların belirli bir alt alanı temsil ettiğini ve ana temalardan daha spesifik olduğunu göstermektedir. Haritada ayrıca, "gebelik", "çocuk-ebeveyn ilişkisi" ve "evlilik" gibi kavramların, aile dinamikleri ve ilişkiler üzerine yapılan çalışmaları temsil ettiği görülmektedir. "Cinsiyet", "genç yetişkin", "kadın" ve "erkek" gibi kavramlar ise cinsiyet ve yaş gruplarına yönelik araştırmaların varlığını göstermektedir.



Şekil 10. Tematik harita

Şekil 10'da ki tablo, belirli bir araştırma alanındaki temaların merkeziyet (relevance degree - centrality) ve yoğunluk (development degree - density) derecelerine göre dört kategoriye ayrılmasını göstermektedir. Kavramsal yapı haritası dört ana bölüme ayrılmıştır: Niche Themes (Boş Temalar), Motor Themes (Gelişmiş Temalar), Emerging or Declining Themes (Gelişmekte Olan Temalar), ve Basic Themes (Temel Temalar). Bu temalar, araştırma alanındaki anahtar kavramların nasıl organize edildiğini ve birbirleriyle olan ilişkilerini

anlamamıza yardımcı olmaktadır. Gelişmiş Temalar, üst sağ köşede yer alır. Bu temalar hem yüksek merkezîyet hem de yüksek yoğunluk derecelerine sahiptir. Araştırma alanının merkezinde yer alır ve güçlü bir şekilde gelişmiştir. Örneğin, "insan", "makale" ve "yetişkin" kavramları bu bölümde yer almaktadır. Bu kavramların araştırmada merkezi bir rol oynadığını ve iyi gelişmiş olduğunu göstermektedir. Boş Temalar, üst sol köşede yer alır. Bu temalar yüksek yoğunluğa sahip, ancak merkezîyeti düşüktür. Konuların oldukça spesifik olduğunu ve sınırlı bir alanda derinlemesine çalışıldığını göstermektedir. Bu haritada boş tema alanında belirgin bir tema bulunmamaktadır. Gelişmekte Olan Temalar, alt sol köşede yer alır. Bu temalar hem düşük merkezîyet hem de düşük yoğunluk derecelerine sahiptir. Temaların ya yeni ortaya çıktığını ya da araştırma ilgisini kaybetmekte olduğunu göstermektedir. Örneğin, "kontrollü çalışma" ve "evlilik" kavramları bu bölümde yer almaktadır. Bu temaların şu anda fazla ilgi görmediğini veya yeni ortaya çıktığını işaret etmektedir. Temel Temalar, alt sağ köşede yer alır. Bu temalar yüksek merkezîyete sahip, ancak düşük yoğunluk derecelerine sahiptir. Konuların araştırma alanında temel ve yaygın olduğunu, ancak detaylı bir şekilde çalışılmadığını göstermektedir. Örneğin, "ikna edici iletişim", "insan deneyi", ve "nitel araştırma" kavramları bu bölümde yer almaktadır. Bu temaların araştırma için temel olduğunu ancak derinlemesine çalışılmadığını göstermektedir.

Bu tematik harita, belirli bir araştırma alanındaki anahtar kavramların nasıl organize edildiğini ve birbirleriyle nasıl ilişkili olduğunu görselleştirmektedir. Motor temalar, araştırma alanının kalbinde yer alır ve güçlü bir şekilde gelişmiştir. Temel temalar, geniş bir şekilde kabul görmüş ve yaygın olarak çalışılan ancak derinlemesine araştırılmamış konulardır. Gelişmekte olan temalar, ya yeni yeni ilgi görmeye başlayan ya da ilgi kaybetmekte olan konulardır. Boş temalar ise spesifik ve dar bir alanda yoğunlaşmış çalışmalardır.

Tablo 4. Anahtar kelimelerin yıllara göre dağılımı

Anahtar Kelime	Sayısı	İlk Çeyrek	İkinci Çeyrek	Üçüncü Çeyrek
İnsan	12	2010	2018	2020
Yetişkin	10	2018	2019	2020
Makale	10	2013	2019	2020
KAdın	10	2018	2019	2020
İkna Edici İletişim	6	2015	2017	2019
Ergen	6	1984	2018	2020
Çocuk	5	1973	2011	2018
Psikoloji	5	2019	2020	2020

Tablo 4'e göre "İnsan" kelimesi 2010'un ilk çeyreğinde, 2018'in ikinci çeyreğinde, 2020'nin üçüncü çeyreğinde 12 kere kullanılan kelime olmuştur. "Yetişkin" kelimesi ise 2018'in ilk çeyreğinde, 2019'un ikinci çeyreğinde, 2020'nin üçüncü çeyreğinde 10 kere kullanılan kelime olmuştur. "Makale" kelimesi 2013'ün ilk çeyreğinde, 2019'un ikinci çeyreğinde, 2020'nin üçüncü çeyreğinde 10 kere kullanılan kelime olmuştur.

Tartışma ve Sonuç

Bu çalışmanın bulguları, duygusal şantaj konusundaki akademik literatürün zamanla nasıl evrildiğini ve bu alandaki önemli eğilimleri ortaya koymaktadır. Literatürde 1973-2023 yılları arasında duygusal şantajla ilgili çalışmaların istikrarlı bir şekilde arttığı, yıllık büyüme oranının %2.22 olduğu görülmüştür. Bu artış, duygusal şantajın toplumdaki etkilerinin ve bireyler arasındaki ilişkilerdeki rolünün giderek daha fazla anlaşılmaya başladığını göstermektedir. Forward ve Frazier'in (1997) tanımladığı gibi duygusal şantajın, bireyler arasında bir kontrol ve manipülasyon aracı olarak kullanılması, bu alandaki araştırmalara duyulan ilgiyi artırmaktadır.

Çalışmalara katkıda bulunan toplam 67 yazar bulunmaktadır ve bu yazarların 14'ü tek yazarlı dokümanlar üretmiştir. Bu durum, alanda bireysel çalışmaların da önemli bir yer tuttuğunu göstermektedir. Uluslararası iş birliği oranı %6.25 olup, bu oran yayınların küçük bir kısmının uluslararası yazarlarla birlikte yazıldığını ifade etmektedir. Doküman başına düşen ortalama yazar sayısı 2.12 olup, çalışmaların genellikle iş birliği ile yürütüldüğünü göstermektedir.

Anahtar kelimeler analiz edildiğinde, toplamda 111 farklı anahtar kelimenin kullanıldığı görülmüştür. Bu durum, çalışmaların geniş bir konu yelpazesinde yoğunlaştığını göstermektedir. İncelenen dokümanlar, toplamda 1368 atıf almış olup, dokümanların ortalama yaşı 10,5 yıldır. Her bir dokümana ortalama 8,78 atıf yapılmıştır; bu da çalışmaların diğer araştırmacılar tarafından ne kadar kullanıldığını ve etkili olduğunu ortaya koymaktadır.

Özellikle son yıllarda "duygusal şantaj" konusuna olan ilginin arttığı görülmektedir. Bu artış, bu alanda yapılan araştırma sayısında dalgalanmalarla birlikte gözlemlenmiştir. Ayrıca, alan yazında Çin'in en fazla eser veren ülke olduğu ve Chen H.T.'nin literatüre en fazla katkı sağlayan yazar olduğu belirlenmiştir. Bu bulgular, "duygusal şantaj" konusunun

uluslararası düzeyde geniş bir araştırma kitlesi tarafından incelendiğini ve önemli bir akademik ilgi gördüğünü göstermektedir.

Bu çalışmanın amacı doğrultusunda yapılan analizler, bu konunun akademik literatürde önemli bir yer tuttuğunu ve zaman içinde artan bir ilgi gördüğünü göstermiştir. Araştırma, 1973-2023 yılları arasında bu alanda yapılan çalışmaların yıllık büyüme oranının %2.22 olduğunu ve toplam 1368 atıf alındığını ortaya koymuştur. Bu bulgular, "duygusal şantaj" konusunun geniş bir araştırma kitlesi tarafından ele alındığını ve önemli bir akademik katkı sağladığını göstermektedir.

Bu çalışma ile duygusal şantaj konusunun Scopus veri tabanında taranan dergiler açısından literatürdeki yerini ve gelişimini kapsamlı bir şekilde ortaya konulduğu ifade edilebilir. Elde edilen bulgular doğrultusunda, bu alanda gelecekte yapılacak araştırmalar ve uygulamalar için çeşitli önerilerde bulunulabilir. İlk olarak, duygusal şantaj konusunda yapılacak gelecekteki araştırmalarda uluslararası iş birliklerine daha fazla yer verilmesi önerilmektedir. Uluslararası ortak yazarlı çalışmaların oranı %6.25 olarak belirlenmiştir. Bu oran, araştırmaların daha geniş bir perspektifle ve çeşitli kültürel bağlamlarda ele alınabileceğini göstermektedir. Uluslararası iş birlikleri, farklı ülkelerden ve kültürlerden gelen araştırmacıların katkılarıyla daha zengin ve kapsamlı bir literatür oluşturulmasına olanak sağlayacaktır. Ayrıca, nitel araştırma yöntemlerinin kullanımı da teşvik edilmelidir. Doküman incelemeleri ve betimsel analizlerin yanı sıra, görüşmeler, odak grupları ve gözlemler gibi nitel veri toplama yöntemleri, duygusal şantajın derinlemesine anlaşılmasını sağlayabilir. Bu yöntemler, bireylerin kişisel deneyimlerini ve duygusal şantaja maruz kalma süreçlerini daha ayrıntılı bir şekilde ortaya koyarak literatüre önemli katkılar sunacaktır. Bu çalışmada Scopus veri tabanındaki makaleler ele alınmıştır. İlerideki çalışmalarda diğer veri tabanları taranarak yeni çalışmalar yapılabilir. Ayrıca bu konuda yapılan lisansüstü çalışmalar da araştırılabilir.

Duygusal şantajın etkilerini azaltmak amacıyla, eğitim ve farkındalık programları düzenlenmesi önemlidir. Bu programlar, bireylerin duygusal şantajı tanımalarına, bu tür manipülasyonlara karşı direnç geliştirmelerine ve sağlıklı ilişkiler kurmalarına yardımcı olabilir. Eğitim programları hem bireyler hem de profesyoneller için tasarlanarak geniş kitlelere ulaşabilir. Özellikle aile içi ilişkilerde ve iş yerlerinde duygusal şantajın nasıl ortaya çıkabileceği ve bu durumlarla başa çıkma stratejileri hakkında bilinçlendirme çalışmaları

yapılmalıdır. Ayrıca, duygusal şantaja maruz kalan bireyler için psikolojik destek ve danışmanlık hizmetleri sunulması gerekmektedir. Bu hizmetler, bireylerin duygusal şantajın etkilerinden kurtulmalarına, kendilerini daha güçlü hissetmelerine ve sağlıklı ilişkiler kurmalarına yardımcı olabilir. Psikologlar ve terapistler, duygusal şantajın tanınması ve yönetilmesi konusunda uzmanlaşarak bu alanda profesyonel destek sunabilirler.

Politika yapıcılar, duygusal şantajın önlenmesi ve bu tür davranışların cezalandırılması için yasal düzenlemeler yapmalıdır. Bu düzenlemeler, duygusal şantaja maruz kalan bireylerin haklarını koruyabilir ve bu tür manipülatif davranışların önlenmesine yardımcı olabilir. Yasal düzenlemeler, özellikle aile içi şiddet ve psikolojik istismar konularında daha etkin koruma mekanizmaları oluşturabilir. Ayrıca, duygusal şantaj konusundaki araştırmaların desteklenmesi için fonların artırılması önemlidir. Araştırma fonlarının artırılması, bu alandaki bilimsel bilgi birikiminin genişlemesine ve daha fazla araştırmanın yapılmasına olanak tanıyacaktır. Fon desteği, özellikle genç araştırmacıların ve doktoraların bu alanda çalışmalar yapmasını teşvik edebilir. Ayrıca, üniversiteler ve araştırma kurumları, duygusal şantaj konusuna özel araştırma merkezleri kurarak bu alandaki çalışmaların koordinasyonunu ve yaygınlaştırılmasını sağlayabilirler.

Bilgilendirme

Bu çalışmada insan veya hayvan deneklerinden veri toplanmamıştır. Bu nedenle çalışma, etik kurul onayı gerektiren çalışmalar kapsamında yer almadığından etik kurul onayı alınmamıştır.

Yazar Katkı Beyanı

Mehmet BİÇER: *Alanyazın taraması, kavramsallaştırma, metodoloji, verilerin toplanması, işlenmesi, analizi, yorumlanması, denetim, inceleme-yazma ve düzenleme.*

Fatıma Firdevs ADAM: *Alanyazın taraması, denetim, inceleme-yazma ve düzenleme.*

Kaynaklar

- Alaminos, D., Guillén-Pujadas, M., Vizuete-Luciano, E., & Merigó, J. M. (2024). What is going on with studies on financial speculation? Evidence from a bibliometric analysis. *International Review of Economics & Finance*, 89, 429-445. <https://doi.org/10.1016/j.iref.2023.10.040>
- Besemeres, M. (2007). *Between żal and emotional blackmail: Ways of being in Polish and English*. *Translating lives: Living with two languages and cultures*, 128-138.
- Blohm, F. S., Jacobsen, M. H., Villadsen, S. F., & Sandholdt, C. T. (2024). Qualitative systematic literature review: Participatory visual methods in community health interventions with migrants. *Qualitative Health Research*, 34(5), 424-443.

- Büyükkıdık, S. (2022). A bibliometric analysis: A tutorial for the bibliometrix package in R using IRT literature. *Journal of Measurement and Evaluation in Education and Psychology*, 13(3), 164-193. <https://doi.org/10.21031/epod.1069307>
- da Silva, R. F., & de Souza, G. F. M. (2021). Mapping the literature on asset management: A bibliometric analysis. *Journal of Scientometric Research*, 10(1), 27-36.
- Chen, Y. Y., Hu, C., Huang, J. C., & Chen, Y. F. (2023). Development of the workplace emotional Blackmail scale (WEBS). *Journal of Human Resource Management*, 23, 1–26. https://doi.org/10.6147/JHRM.202306_23 (in Chinese).
- Chen, Y. Y., & Hsieh, P. S. (2018). The study of emotional blackmail in the workplace affect organizational political behavior: Using emotional carrying capacity as moderator. *Journal of National Taipei College of Business*, 34, 59–78. (in Chinese).
- Chen, Y. Y., Pham, M., Hu, C., & Zhang, S. (2024). Validation of the workplace emotional blackmail scale (WEBS). *Current Psychology*, 1-16.
- Chen, Y. Y., & Wang, C. L. (2017). The study of emotional blackmail in the workplace affect service sabotage behavior of frst-line staf. *Journal of National Taipei College of Business*, 32, 45–71. (in Chinese).
- Forward, S., & Frazier, D. (1997). *Emotional blackmail*. HarperCollins.
- García-León, R. A., Martínez-Trinidad, J., & Campos-Silva, I. (2021). Historical review on the boriding process using bibliometric analysis. *Transactions of the Indian Institute of Metals*, 74, 541-557. <https://doi.org/10.1007/s12666-020-02174-6>
- Kao, F. H. (2024). Workplace emotional blackmail: Conceptual clarification and development. *Current Psychology*, 1-14.
- Karnani, S. R., & Zelman, D. C. (2019). Measurement of emotional backmail in couple relationships in Hong Kong. *Couple and Family Psychology: Research and Practice*, 8(3), 166–180. <https://doi.org/10.1037/cfp0000126>
- Leung, A. S. (2005). Emotional intelligence or emotional blackmail: A study of a Chinese professional-service firm. *International Journal of Cross Cultural Management*, 5(2), 181-196.
- Liu, H. M. (2019). *Deconstructing emotional blackmail in the workplace: Strategy clarification, development of diferent source scales and review impact mechanisms* [Unpublished master's thesis]. Sun Yat-sen University. (in Chinese).
- Li, Y., He, G., Wang, D., Chen, Y., & Li, Z. (2023). What is the impact of digital transformation? A bibliometric analysis. In *E3S Web of Conferences* (Vol. 409, p. 05001). EDP Sciences. <https://doi.org/10.1051/e3sconf/202340905001>
- Maulana, I. (2022). Bibliometric analysis on internal corporate governance: What is the next research?. *Research In Management and Accounting (RIMA)*, 5(2), 55-67. <https://doi.org/10.33508/rima.v5i2.3998>
- Miller, G. (2004). How Scottish was RD Laing?. *History of Psychiatry*, 20(2), 226-232.
- Morgan, H. (2022). Conducting a qualitative document analysis. *The Qualitative Report*, 27(1), 64-77. <https://doi.org/10.46743/2160-3715/2022.5044>

- Pahrudin, P., Liu, L. W., & Li, S. Y. (2022). What is the role of tourism management and marketing toward sustainable tourism? A bibliometric analysis approach. *Sustainability*, 14 (7), 4226. <https://doi.org/10.3390/su14074226>
- Phelps, S., & Austin, N. (1987). *The assertive woman: A new look*. Impact Publishers.
- Rapport, N. (2002). A room with a view. *British subjects: An anthropology of Britain*, 299.
- Sharma, V., & Nimawat, D. (2023). Cellular manufacturing system: A descriptive bibliometric analysis, framework, implementation steps and future research direction. *Benchmarking: An International Journal*. 31(6), 1976-2001.
- Sun, Y., Blewitt, C., Edwards, S., Fraser, A., Newman, S., Cornelius, J., & Skouteris, H. (2023). Methods and ethics in qualitative research exploring young children's voice: A systematic review. *International Journal of Qualitative Methods*, 22,
- Thi, T. D. P., & Duong, N. T. (2024). Explore how perception of emotional blackmail affects users to withdraw from online communities: A role of psychological stress. *International Journal of Learning Technology*, 19(2), 158-181.

Copyright © JCER

JCER's Publication Ethics and Publication Malpractice Statement are based, in large part, on the guidelines and standards developed by the Committee on Publication Ethics (COPE). This article is available under Creative Commons CC-BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>)

Teaching Practice/Öğretim Uygulaması

Investigation of the Materials Used by Teachers for Early Literacy Skills of Hearing Impaired Children in Preschool Period

İsmail KÖSE¹  Aleyna AKSOY²  Selva TOPAL³  Necmiye Hilal EKMEKÇİ⁴ 
Özlem ASLAN BAĞCI^{5*} 

¹ Dokuz Eylül University, Faculty of Education, İzmir, Turkey, 46koseismail@gmail.com

² Medipol University, Faculty of Education, İstanbul, Turkey, aleynaaksoy4848@gmail.com

³ Sakarya University, Faculty of Education, Sakarya, Turkey, selvatopal5@gmail.com

⁴ Sakarya University, Faculty of Education, Sakarya, Turkey, h.ekmekci.94@gmail.com

⁵ Sakarya University, Faculty of Education, Sakarya, Turkey, obagci@sakarya.edu.tr


* Corresponding Author: obagci@sakarya.edu.tr

Article Info

Received: 09 August 2024

Accepted: 27 September 2024

Keywords: Hearing impairment, early literacy skills, preschool education, material, document review

 10.18009/jcer.1530667

Publication Language: Turkish



Abstract

This study aims to evaluate the materials used by special education and preschool teachers in supporting the early literacy skills of children with hearing impairment in preschool period. The research was designed as qualitative research and document analysis method was used. The data of the study consisted of the materials used by 5 special education and 5 preschool teachers in early literacy studies and activities. Within the scope of this study, a total of 24 materials were analyzed, including 4 sorting cards, 1 single card, 3 books, 5 worksheets and 11 other materials. The data were analyzed using a checklist prepared by the researchers. Based on the research findings, it was concluded that although the materials used by teachers contribute to early literacy skills in various aspects, they are limited in terms of type, variety and richness.

To cite this article: Köse, İ., Aksoy, A., Topal, S., Ekmekçi, N.H. & Aslan-Bağcı, Ö. (2024). Okul öncesi dönemde işitme yetersizliği olan çocukların erken okuryazarlık becerilerinin geliştirilmesinde kullanılan materyallerin incelenmesi. *Journal of Computer and Education Research*, 12 (24), 823-848 <https://doi.org/10.18009/jcer.1530667>

Okul Öncesi Dönemde İşitme Yetersizliği Olan Çocukların Erken Okuryazarlık Becerilerinin Geliştirilmesinde Kullanılan Materyallerin İncelenmesi

Makale Bilgisi

Geliş: 09 Ağustos 2024

Kabul: 27 Eylül 2024

Anahtar kelimeler: İşitme yetersizliği, erken okuryazarlık becerileri, okul öncesi eğitim, materyal, doküman incelemesi

 10.18009/jcer.1530667

Yayın Dili: Türkçe

Öz

Bu çalışmada okul öncesi dönemde işitme yetersizliği olan çocukların erken okuryazarlık becerilerinin desteklenmesinde özel eğitim ve okul öncesi öğretmenlerinin kullandıkları materyallerin değerlendirilmesi amaçlanmaktadır. Araştırma nitel araştırma olarak desenlenmiş ve doküman incelemesi yöntemi kullanılmıştır. Araştırmanın verilerini 5 özel eğitim, 5 okulöncesi öğretmenin erken okuryazarlık çalışma ve etkinliklerinde kullandıkları materyaller oluşturmaktadır. Bu araştırma kapsamında 4 sıralama kartı, 1 tek kart, 3 kitap, 5 çalışma kâğıdı ve 11 diğer materyal olmak üzere toplam 24 materyal incelenmiştir. Verilerin analizi araştırmacılar tarafından hazırlanan kontrol listesiyle yapılmıştır. Araştırma bulgularına dayalı olarak öğretmenlerin kullandıkları materyallerin çeşitli açılardan erken okuryazarlık becerilerine katkı sağlasalar da tür, çeşitlilik ve zenginlik açısından sınırlı olduğu sonucuna ulaşılmıştır.

Summary

Investigation of the Materials Used by Teachers for Early Literacy Skills of Hearing Impaired Children in Preschool Period

İsmail KÖSE ¹  Aleyna AKSOY ²  Selva TOPAL ³  Necmiye Hilal EKMEKÇİ ⁴ 
Özlem ASLAN BAĞCI ^{5*} 

¹ Dokuz Eylül University, Faculty of Education, İzmir, Turkey, 46koseismail@gmail.com

² Medipol University, Faculty of Education, İstanbul, Turkey, aleynaaksoy4848@gmail.com

³ Sakarya University, Faculty of Education, Sakarya, Turkey, selvatopal5@gmail.com

⁴ Sakarya University, Faculty of Education, Sakarya, Turkey, h.ekmekci.94@gmail.com

⁵ Sakarya University, Faculty of Education, Sakarya, Turkey & Ohio State University, aslanbagci.1@osu.edu

* Corresponding Author: obagci@sakarya.edu.tr; aslanbagci.1@osu.edu

Introduction

To being literate is a skill that has been considered important throughout human history. For people to become literate, it is important for them to acquire the prerequisite skills for reading and writing early in their lives. The skills that are prerequisites for reading and writing are called early literacy. Early literacy skills are categorized as phonological awareness, print awareness, letter and alphabet knowledge, listening comprehension and vocabulary knowledge. Early literacy is sometimes confused with literacy education, but it is not literacy instruction. As all developmental areas affect each other, language skills and early literacy skills mutually affect each other. When children's language skills are considered, it can be said that children with normal development are in a more advantageous position than children with hearing impairment because they can reach the verbal dimension of language (Sánchez & Alonso-Cortés, 2012; Strickland & Riley-Ayers, 2006). It is known that children with hearing impairment have less language input than their peers with normal development due to the hearing loss they experience. In this case, there may be problems in the development of early literacy skills of children with hearing impairment (Atlar & Uzuner, 2018). It is very important that children with hearing impairment are diagnosed at an early age and equipped with cochlear implants or hearing aids according to their needs (Piştav-Akmeşe & Sezgin-Küçük, 2022).

There are some studies showing that even if children with hearing impairment are diagnosed and equipped at an early age, they are still negatively affected in language skills and early literacy skills (Atlar, et al., 2022; Atlar & Uzuner, 2018; Karasu, 2020; Piştav-Akmeşe & Sezgin-Küçük, 2022). Children who acquire early literacy skills can show good

development in academic, behavioral, etc. areas throughout their lives. However, children who do not acquire early literacy skills at critical stages of life are less likely to develop academic skills in accordance with their age and developmental levels (Kargın et al., 2023).

Method

This study aims to evaluate the materials used by both special education teachers and preschool teachers in supporting the early literacy skills of children with hearing impairment in preschool period. The study was designed as qualitative research. Document analysis method was used in the study. The data of the study consisted of the materials used by teachers in early literacy studies and activities. The materials used in early literacy activities by special education and preschool teachers working with preschool children with I/DD in two different cities of Turkey (one from Central Anatolia and the other from Marmara region) constitute the documents included in the scope of this research. Within the scope of the research, materials were collected from 10 teachers. Five of these teachers were special education teachers and the other five were preschool teachers. Within the scope of this study, a total of 24 materials were analyzed, including 4 sorting cards, 1 single card, 3 books, 5 worksheets and 11 other materials. A checklist was prepared by the researchers for data analysis. An item pool consisting of 15 items was created for the checklist by reviewing the literature and obtaining expert opinions. This item pool was presented to two faculty members, one of whom is an expert in qualitative research in education and the other in educational technologies. Necessary arrangements were made in line with the feedback from the experts and a draft checklist consisting of 10 items was created. Together with an academic in the field of special education and the fifth researcher of the study, conflicting and inclusive items were eliminated. Finally, the final version of the checklist consisting of the 7-item evaluation criteria agreed upon by the two academics was created.

Results

According to the findings of the study, the materials used by the teachers are as follows: Sorting/sequence card, single card, story book, work/activity paper, animal bingo, calendar, story cardboard, puppet, play dough and apparatus, number cards. These materials used by teachers contribute to early literacy skills in various aspects when they are presented in a rich living environment. However, there are limitations in terms of type,

quality and variety of materials. In this study, the use of materials such as books, calendars, sorting/sequence cards, single cards, etc. provides language routines for children with hearing impairment. Books were found to be the most frequently used materials by teachers in the development of early literacy skills.

Discussion and Conclusion

Play and interactive educational activities make the acquisition of early literacy skills fun and more meaningful (Roskos et al., 2003). However, teachers generally conduct desk-based activities while supporting early literacy skills (Uluğ & Tekmen, 2023). In this study, it is seen that teachers used worksheets that can be used in desk-based activities. Using these worksheets on the development of early literacy skills in preschool education can be effective, but using such worksheets frequently can harm the early literacy education process. For this reason, even if worksheets are used, they should be supported with playful content before or after the worksheets. In studies with children with hearing impairment, visual input should be taken into consideration and written and labeled materials should be preferred (Briggle, 2005). It is seen that the materials examined in this study have these characteristics.

Since children's interaction with letter shapes entertains them, it is important for them to interact with materials for recognizing letters (Uluğ & Tekmen, 2023). In this study, letter apparatuses were used for letter recognition. With the help of the letter apparatus, children can remove the shapes of letters from play dough and interact with them. The home environment provides important experiences for early literacy development. It is useful to conduct early literacy activities at home like school activities (Karaahmetoğlu & Turan, 2020).

Giriş

Okuma yazma bireylerin ilkokulda edinmeleri beklenen ve yaşam boyu bilgi edinmede, öğrenmede ve temel gereksinimlerini karşılamada ihtiyaç duydukları temel bir beceridir. Okuma yazma becerilerini kazanmak ayrıca bireylerin bağımsız bir yaşam sürmesinin de temel gereksinimlerinden bir tanesidir. Okuma yazma bireylerin zihinlerinde birden çok faaliyetin aynı anda gerçekleştiği karmaşık bir süreçtir (Aşıcı, 2004). Sözlü dil, okuma yazma gelişiminin temelidir (Strickland & Riley-Ayers, 2006) ve bu karmaşık süreçte bireyler sözlü dil becerilerine de ihtiyaç duymaktadır (Roskos vd., 2003). Dolayısıyla okuma yazma ve sözlü dil becerileri birbirleri ile ilişkilidir (Sánchez & Alonso-CortÉS, 2012). Okuma yazma edinimi sürecinin öncesinde çocuklar okuma yazmaya ilişkin öğrenme ve deneyimleri okul öncesi dönemde yaşarlar (Deretarla-Gül & Bal, 2006; Whitehurst & Lonigan, 1998). Bu öğrenmeler erken okuryazarlık becerileri olarak ele alınmaktadır.

Okul öncesi eğitiminin önemi arttıkça erken okuryazarlığa da daha çok önem vermeye başlanmıştır (Strickland & Riley-Ayers, 2006). Türkiye’de de son zamanlarda erken okuryazarlığa yönelik yapılan faaliyetler öne çıkmakta ve erken okuryazarlık becerilerinin önemi anlaşılmaktadır. Erken okuryazarlık, okul öncesi dönemde okuma yazma öğretimi anlamına gelmemekte, bu dönemde kazanılması beklenen bazı bilgi, beceri ve tutumları ifade etmektedir (Satı-Çalış & Feyman-Gök, 2020). Başka bir ifadeyle erken okuryazarlık, çocukların okul öncesi dönemde kazanması beklenen ve ilkokulda okuma yazma öğrenimini kolaylaştıran birtakım önkoşul becerilerden oluşmaktadır (Ergül vd., 2016). Bu beceriler birbirleri ile iç içe geçmiş durumdadır (Yazıcı & Kandır, 2018).

Erken okuryazarlık becerilerinin; fonolojik/ses bilgisel farkındalık, yazı farkındalığı, alfabe ve harf bilgisi, sözcük bilgisi ve dinlediğini anlama olduğu bilinmektedir (Kargın vd., 2023; Piştav-Akmeşe & Sezgin-Küçük, 2022; Sánchez & Alonso-CortÉS, 2012). Ses bilgisel farkındalık, harf ses arasındaki ilişkinin sözcüklerdeki yapısal durumunu anlamlandırabilmekle birlikte uyak, hece, sesleri ayırt etme ve manüple etme gibi becerileri de içerdiği görülmektedir (Kargın vd., 2023). Yazı farkındalığı ise yazının bir işlevinin olduğunu, yazının yazılış ve okunuş yönünü, harflerden sözcüklerin ve sözcüklerden de cümlelerin oluştuğunu, kitabın tutuluşu, sayfaların çevrilişi gibi becerilerden oluşmaktadır (Kargın vd., 2023). Alfabe ve harf bilgisi ise, harflerden kelimelerin oluşturduğunu, kelimelerin de okunuşu sırasında harflerin seslerinin kullanıldığının bilinmesidir

(Yazıcıoğlu, 2023). Sözcük bilgisi ise temel olarak anlamı çocuklar tarafından bilinen ve kullanılan sözcüklerdir (Kargın vd., 2023). Dinlediğini anlama ise sözlü dilden anlamsal çıkarımlar yapmaktır (Kargın vd., 2023).

Erken okuryazarlık becerileri ile akademik başarı arasında bir ilişki bulunmaktadır (Kargın vd., 2015). Erken okuryazarlık becerilerinin, gelişimin hızlı ilerlediği okul öncesi yıllarında yaşantı ve deneyimlerle edinilmiş olması çocukların ilkokulda ve ilerleyen eğitim dönemlerindeki akademik başarısını olumlu olarak etkilemektedir (Aslışen & Hakkoymaz, 2020; Lonigan vd., 2011). Ancak okul öncesi dönemde erken okuryazarlık becerilerinde geride kalan çocukların başarıları ilerleyen dönemlerde olumsuz olarak etkilenmektedir (Karaahmetoğlu & Turan, 2020; Strickland & Riley-Ayers, 2006). Bu bakımdan çocukların okul öncesi dönemde erken okuryazarlık becerilerinin desteklenmesi gerekmekte (Coşkun, 2023) ve çocukların ilkokula bu becerileri edinerek başlamaları önemli görülmektedir (Kargın vd., 2017).

Okul öncesi dönemde erken okuryazarlık becerileri ile gelişim alanları birbirleri ile ilişki içerisinde olarak ilerlemektedir. Bu dönemde çocukların bilişsel, fiziksel, sosyal, duygusal, dil gelişimi erken okuryazarlık becerilerinin gelişimini etkilemektedir (Strickland & Riley-Ayers, 2006). Özellikle dil becerilerinin gelişimi erken okuryazarlık becerileri ile sıkı bir bağ içerisindedir. Dil becerileri gelişen çocukların erken okuryazarlık becerilerinin de gelişeceğinden söz edilebilir (Zupan & Dempsey, 2013). Ancak işitme yetersizliği (İY) olan çocuklar gerekli ses uyarılarını alamadıklarından dolayı dil becerileri gerilemektedir (Aşıcı, 2004). İşitme kaybı çocukların dil becerilerinde gecikmeye sebep olduğundan (Nassrallah vd., 2020) İY olan çocuklar erken okuryazarlık becerilerini edinmekte zorlanmaktadırlar (Karasu, 2020; Zupan & Dempsey, 2013). İY olan çocukların cihazlandırılması ve yapılan erken müdahaleler sayesinde İY olan çocuklar akranlarına yakın bir dil ve erken okuryazarlık becerisi geliştirme fırsatı bulmaktadırlar (Svirsky vd., 2000; Zupan & Dempsey, 2013). İY olan çocuklara gerekli tıbbi müdahale yapıldığında, erken okuryazarlık becerilerini zengin yaşantı ortamlarında edinebildikleri görülmektedir (Atlas & Uzuner, 2018).

İşitme kaybı çocukların dil ve erken okuryazarlık becerilerinin gelişimini riske soktuğundan İY olan çocuklar için önleyici müdahaleler takip edilmelidir (Strickland & Riley-Ayers, 2006). Yapılacak olan müdahalelerin başarıya ulaşabilmesi için İY olan çocukların okul öncesi dönemde zengin bir çevrede bulunmaları önemlidir. İY olan

çocukların zengin bir çevrede bulunması erken okuryazarlık beceri gelişimini desteklemekle birlikte (Atlas, 2022) erken okuryazarlık açısından zengin bir çevre de dil becerilerini desteklemektedir (Karaahmetoğlu & Turan, 2020). Bu zengin çevrede öncelikle aile/ ev ortamı ve daha sonra okul öncesi sınıfları bulunmaktadır. Okul öncesi dönemde İY olan çocukların bulunduğu bu ortamlarda erken okuryazarlık becerileri etkili uygulamalarla desteklenmelidir (Satı-Çalış & Feyman-Gök, 2020). Etkili uygulamaların niteliği kullanılan araç-gereç ve materyallere de bağlı olarak değişir. Bu nedenle okul öncesi sınıflarında öğretmenlerin kullandıkları materyallerin çeşitliliği ve uygunluğu çevre ortamını zenginleştiren araçlar olarak ele alınabilir. Okul öncesi dönemde bulunan İY olan çocukların erken okuryazarlık becerilerinin desteklenmesinde öğretmenler tarafından kullanılan materyallerin incelenmesi gerekmektedir (Uluğ & Tekmen, 2023). Bu konuda kullanılan materyallerin ortaya çıkarılması alanda çalışan araştırmacılara ve İY olan çocuklarla çalışan öğretmenlere ışık tutacaktır. Ayrıca bu konuda farkındalığın artacağı ve İY olan çocukların erken okuryazarlık becerilerinin geliştirilmesinde eğitim çıktılarının artacağı düşünülmektedir. Ayrıca Türkiye’de İY olan çocukların erken okuryazarlık becerileri ile ilgili yapılmış olan çalışmaların sınırlı olduğu görülmüştür (Atlas & Uzuner, 2018). Bu nedenle erken okuryazarlık konusunda daha fazla çeşitlilikte araştırmalara ihtiyaç duyulmaktadır (Satı-Çalış & Feyman-Gök, 2020). Bu doğrultuda bu araştırmanın amacı, okul öncesi dönemde İY olan çocuklarla çalışan hem özel eğitim hem de okul öncesi öğretmenlerinin erken okuryazarlık becerilerini desteklerken kullandıkları materyallerin incelenmesidir. Bu amaç doğrultusunda aşağıdaki sorulara cevap aranacaktır:

1. Okul öncesi dönemde İY olan çocukların erken okuryazarlık becerilerinin geliştirilmesinde öğretmenler tarafından kullanılan materyaller nelerdir?
2. Okul öncesi dönemde İY olan çocukların erken okuryazarlık becerilerinin geliştirilmesinde öğretmenler tarafından kullanılan materyaller erken okuryazarlık becerilerini desteklemekte midir?

Yöntem

Araştırmanın Modeli

Bu araştırma nitel araştırma olarak tasarlanmış ve nitel araştırma yöntemlerinden doküman inceleme yöntemi kullanılmıştır. Doküman inceleme yöntemi; mektuplar, görsel materyaller, fiziksel materyaller, günlükler, yazılı belgeler vb. dokümanların toplanarak

incelenmesi, sorgulanması ve analizinin yapılması olarak tanımlanan bilimsel bir yöntemdir (Merriam, 2009). Doküman inceleme yöntemi, nitel araştırmanın gözlem ve görüşme yöntemlerini desteklemek için kullanılabileceği gibi tek başına bir yöntem olarak da kullanılabilir (O'Leary, 2017). Bu çalışmada okul öncesi dönemde İY olan çocuklarla çalışan özel eğitim ve okul öncesi öğretmenlerinin erken okuryazarlık geliştirme çalışmalarında kullandıkları materyallerin erken okuryazarlık açısından incelenmesi ve değerlendirilmesi amaçlanmıştır. Bu noktada araştırmacılar materyalleri araştırmanın ana veri kaynağı olarak benimsemişlerdir. Bu nedenle araştırmacılar öğretmenlerin kullandıkları basılı, elektronik, görsel, işitsel tüm materyalleri araştırma kapsamına dahil etmeye çalışmışlardır.

Çalışma Grubu

Bu çalışmada belirlenen kriterler dahilinde çalışma grubu oluşturulmuştur. Bu kriterler a. Okul öncesi dönemde çalışan öğretmenlerin kullandığı materyaller, b. İY olan öğrencilerle kullanılması, c. Okul öncesi veya özel eğitim öğretmenlerinin erken okuryazarlık etkinlik ve çalışmalarında kullanılan materyaller olması. Bu doğrultuda kolay ulaşılabilir olması nedeni ile Türkiye'nin iki farklı şehrinde (biri, İç Anadolu, diğeri Marmara bölgesinden) görev yapan okul öncesi dönemde İY olan çocuklar ile çalışan özel eğitim ve okul öncesi öğretmenlerinin erken okuryazarlık etkinliklerinde kullandıkları materyaller bu araştırma kapsamına dahil edilen dokümanları oluşturmaktadır. Bu öğretmenlere yüz yüze ve telefon görüşmeleri aracılığı ile ulaşılmış ve işitme yetersizliği olan öğrencileriyle erken okuryazarlık becerilerinin geliştirilmesinde kullandıkları materyaller talep edilmiştir. Araştırmaya materyalleri ile gönüllü olarak katılmayı kabul eden 10 öğretmenin toplam 47 materyali araştırmaya dahil edilmiş ve seçilen 24 materyalin detaylı incelemeleri ve analizleri gerçekleştirilmiştir.

Veri Toplama Araçları

Araştırmaya dahil edilen materyaller araştırmacılar tarafından geliştirilen kontrol listesi ile analiz edilmiştir. Literatür taraması yapılarak ve uzman görüşü alınarak kontrol listesi için 15 maddeden oluşan bir madde havuzu oluşturulmuştur. Bu madde havuzu biri eğitimde nitel araştırma konusunda diğeri ise eğitim teknolojileri alanında uzman iki öğretim üyesinin görüşüne sunulmuştur. Uzmanlardan gelen dönütler doğrultusunda gerekli düzenlemeler yapılarak 10 maddelik taslak kontrol listesi ortaya çıkmıştır. Özel

eğitim alanında bir akademisyen ve araştırmacının beşinci araştırmacısı olan öğretim üyesiyle birlikte çelişen ve kapsayan maddelerin elemesi yapılmıştır. Son olarak iki akademisyenin üzerinde uzlaşa sağladıkları 7 maddelik değerlendirme kriterlerinden oluşan kontrol listesinin son hali oluşturulmuştur. Kontrol listesindeki değerlendirme kriterleri aşağıdaki gibidir:

1. Materyalin türü (kitap, sıralama kart, tek kart, çalışma kâğıdı, diğer).
2. Materyalin kullanım amacı (oyun, izleyen etkinlik, ders materyali, değerlendirme aracı, diğer).
3. Materyalin fiziksel özellikleri (öğretmen yapımı, dijital, basılı, iki boyutlu, üç boyutlu, diğer).
4. Materyalin erken okuryazarlık aşamalarına uygunluğu (fonolojik farkındalık, yazı farkındalığı, harf ve alfabe bilgisi, dinlediğini anlama).
5. Materyalin fonolojik farkındalık becerileri açısından değerlendirilmesi (sözcük, uyak, hece, sesbirim farkındalığı).
6. Materyalin görsel tasarım ilkelerine göre değerlendirilmesi (bütünlük, denge, vurgu, hizalama, yakınlık).
7. Materyalin diğer özellikler açısından değerlendirilmesi (yazılı öğelerin sade ve anlaşılabilirliği, renk uyumu, güvenlik, kullanılabilirlik ve ulaşılabilirlik, hedeflenen kazanıma uygunluğu, işlevselliği, birden çok duyuya hitap etme durumu).

Verilerin Analizi

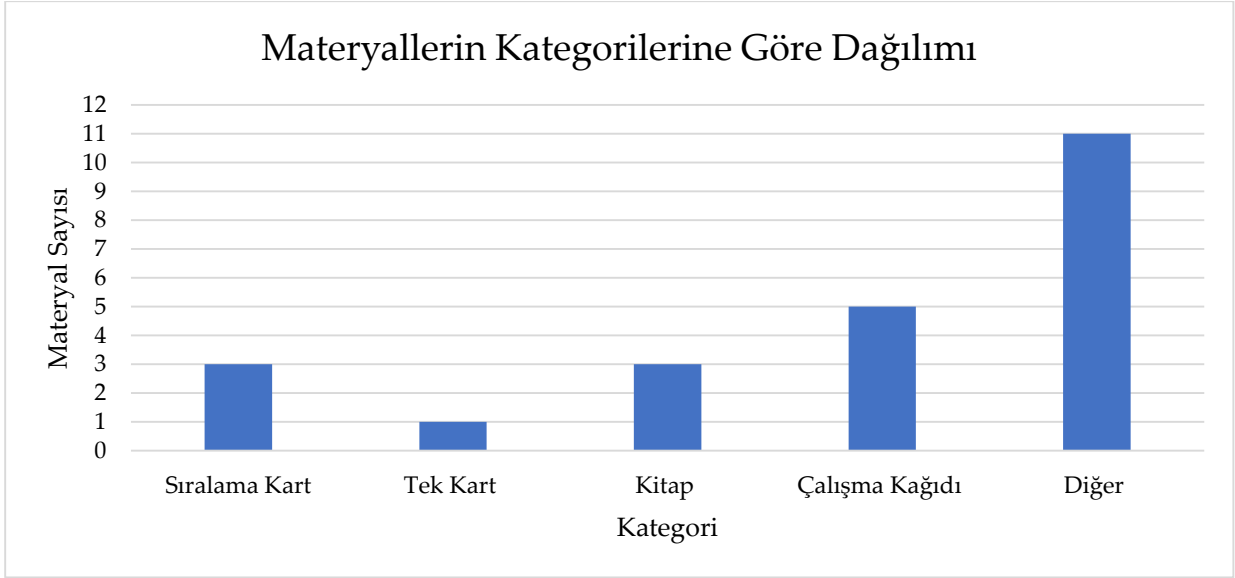
Merriam (2009) da doküman analizi için 4 aşamalı yol önerilmiştir. Bunlar; 1. araştırma konusuna uygun dokümanlara ulaşılması, 2. ulaşılan dokümanların orijinalliğinin kontrol edilmesi, 3. kodlama ve kataloglama için bir sistematığın oluşturulması ve 4. veri analizinin yapılması. Merriam (2009) tarafından önerilen 4 aşamalı yol bu çalışmada şu şekilde yürütülmüştür: 1. öncelikle araştırmacılar tarafından belirlenen araştırma konusuna uygun materyaller bulunmuştur. 2. araştırmacılar tarafından birinci, üçüncü ve beşinci araştırmacı tarafından materyallerin orijinalliğini kontrol edilmiştir. Bu aşamada araştırmaya dahil edilen 47 adet materyal, birinci ve üçüncü araştırmacılar tarafından her biri materyal kontrol listesi ile bağımsız olarak değerlendirilmiştir. Elde edilen sonuçlar tekrarlı sonuçlar vermiştir. Bu nedenle birinci, üçüncü ve beşinci araştırmacı bir araya gelerek materyallerin benzer türlerinden araştırma kapsamını temsil eden bir seçimle 47 materyalden 24

materyalin detaylı değerlendirme ve analizlerini gerçekleştirmiştir. 3. Araştırmacılar, kodlama ve kategorileme konusunda bir sistematik oluşturmak adına analiz için seçilen tüm materyallere “M” harfi ve bir sayı vererek M1, M2, ... şeklinde adlandırmıştır. Bu süreçte materyalleri değerlendiren araştırmacılar tamamen birbirinden bağımsız olarak materyalleri değerlendirmiş ve daha sonra değerlendirme sonuçlarını karşılaştırarak uyuşmayan kodlar konusunda uzlaşmaya varılmaya çalışılmış ve ortak kodlar ve kategoriler oluşturulmuştur. Kategoriler sıralama kartı materyalleri, tek kart materyalleri, kitaplar, çalışma kağıtları, diğer materyaller olarak benimsenmiştir. Kategoriler işitme engelli öğrencilerle çalışılırken kullanılan materyallerin türüne göre belirlenmiştir. 4. Veriler içerik analizi yoluyla analiz edilmiştir.

Bu süreçte araştırmacılar etik kurul izinlerini almış, araştırmada materyalleri talep edilen her öğretmene araştırma ile ilgili bilgi verilmiş. Materyallerin bilimsel amaçla kullanılacağı ve öğretmenlerin kişisel bilgilerinin tamamının korunacağı açıklanmıştır. Herhangi bir teşvik olmaksızın gönüllü olarak araştırmaya materyalleri ile katkı sağlamak isteyen öğretmenlerin materyalleri araştırma kapsamına dahil edilmiştir. Araştırmada araştırmacı yanlılığını ortadan kaldırmak için kodlamalar araştırmacılar tarafından bağımsız olarak incelenmiş ve kodlanmıştır. Araştırmada kullanılan veri toplama aracının kapsam geçerliliğini sağlamak adına literatür taranmış ve alan uzmanlarından görüş alınmıştır. Araştırma süreci şeffaf bir şekilde raporlanmıştır. Analiz edilen materyallerin görsellerinden örneklerine makalede yer verilerek okuyucular ile paylaşılmıştır.

Bulgular

Okul öncesi dönemde İY olan çocukların erken okuryazarlık becerilerinin desteklenmesinde kullanılan materyaller, materyallerin türüne göre beş kategori altında incelenmiştir. Bunlar “1. Sıralama kartı materyalleri, 2. Tek kart materyalleri, 3. Kitaplar, 4. Çalışma kağıtları, 5. Diğer materyaller” olarak sıralanmıştır. Tüm bu başlıklar altında incelenen materyaller işitme yetersizliği olan çocuklarla okul öncesi dönemde çalışan özel eğitim ve okul öncesi öğretmenlerinin kullandığı materyallerdir. Bu başlıklar altında toplamda 24 adet materyal incelenmiştir. İncelenen bu materyallerden 8 tanesi öğretmen yapımı, 12 tanesi basılı, 3 tanesi dijital ve 1 tanesi de üç boyutlu bir materyaldir. İncelenen materyallerin ve kategorilerine göre dağılımı Şekil 1.’de gösterilmiştir.



Şekil 1. Analiz edilen materyallerin kategorilere göre dağılımı

Şekil 1 incelendiğinde 3 sıralama kartı, 1 tek kart, 3 kitap, 5 çalışma kâğıdı ve 11 diğer materyal değerlendirmeye alınmıştır. Diğer materyaller kategorisi altında öğretmen yapımı materyallerin daha fazla olduğu görülmektedir. Materyaller incelenirken, incelenen materyallerin türü, kullanım amacı, fiziksel özellikleri, erken okuryazarlık becerilerine uygunluğu, görsel tasarım ilkelerine uygunluğu ve diğer özellikler (yazılı öğelerin sade ve anlaşılır olması, renk uyumu, güvenlik, kullanışlılık, kazanıma uygunluğu, işlevsellik, birden çok duyuya hitap etme) açısından bir değerlendirme yapılmıştır.

1. Sıralama Kartı Materyalleri



Resim 1. (M1, 1.)



Resim 2. (M1, 2.)



Resim 3. (M1, 3.)



Resim 4. (M1, 4.)



Resim 5. (M1, 5.)

Sıralama kartları belirli bir olay ya da durumun resmedildiği, kartlar arasında bir olay bağlantısının kurulduğu ve etkileşimli olarak sunulan bir materyal türüdür. Yukarıda görselleri verilen materyal M1'dir. Sıralama kartı materyalleri olarak M1, M2, M3 ve M9 materyallerinin değerlendirilmesi yapılmıştır. Yapılan değerlendirme sonucunda öğretmenlerin erken okuryazarlık becerilerinin geliştirilmesinde sıralama kartlarını kendilerinin yaptığı ve ders materyali olarak kullandıkları görülmektedir. Araştırma kapsamında incelenen sıralama kartların erken okuryazarlık aşamalarından, fonolojik farkındalığın sözcük farkındalığı aşamasına katkı sağlarken yazıya ilgi duyma ve dinlediğini anlama aşamalarına da fayda sağlamaktadır. Materyalin görsel tasarım ilkelerinin tamamına (bütünlük, denge, vurgu, hizalama, yakınlık) uygun olduğu, materyalde yazıların kullanılmadığı, renklerin dikkat dağıtmayacak şekilde uyumlu ve abartısız olduğu, kullanımın güvenlik açısından tehlike arz etmediği, kullanımın ve ulaşılabilirliğin kolay olduğu gözlemlenmiştir. Materyalin hedef davranışın kazanımı için fayda sağlayacağı görülmüş aynı zamanda Resim 1,2,3,4 ve 5 hem görsel hem dokunsal materyallerdir. Bu

nedenle işitme engelli öğrenciler ile çalışırken birden fazla duyuya hitap eden materyallerin işlevsel oldukları da görülmüştür.

2. Tek Kart Materyalleri



Resim 6. (M4)

Araştırma kapsamında incelenen materyaller arasında tek kart türünde olan yalnızca bir materyal bulunmaktadır. Tek kart, belirli bir ebatla hazırlanan üzerinde hedeflenen amaca ulaşmak için bir resim bulunan materyallerdir. Burada amaç tek kartta yer alan görseldeki olay ile ilgili paylaşımı öğrenci ile yapabilmektir. Bu paylaşımı öğretmen görsele ilişkin hazırladığı farklı ve öğrenci düzeyindeki sorularla yapabilmektedir. Bu araştırmada tek kart türünde değerlendirmeye alınan materyal M4' tür. Bu materyal, ders materyali olarak kullanılan basılı bir materyaldir. Tek kart türünde olan bu materyalin erken okuryazarlık becerilerinden fonolojik farkındalığı, sözcük farkındalığını, dinlediğini anlamayı desteklediği söylenebilir. Ayrıca sözel dili de desteklediği yapılan değerlendirmede görülmüştür. Resimli kart şeklinde bir materyal olduğundan dolayı öğretmenin uygulaması önem arz etmektedir. Öğretmenin materyalden nasıl faydalanacağını planlaması önemli bir durumdur. Materyalin görsel tasarım ilkelerine uygun bir şekilde düzenlendiği görülmektedir. Materyal üzerinde bir yazı bulunmamaktadır. Materyalin çocukların düzeyine uygun olduğu, kullanışlı ve ulaşılabilir olduğu, kullanım açısından güvenli olduğu, işlevsel olduğu ve kullanımında çocuğun görsel olarak görmesi, öğretmenin sözlü olarak ifade etmesi, karta dokunması gibi birden çok

duyuya hitap ettiği söylenebilir. Ancak bu tek kartın erken okuryazarlığın yazı farkındalığı, harf ve alfabe bilgisi boyutlarını desteklemediği görülmektedir.

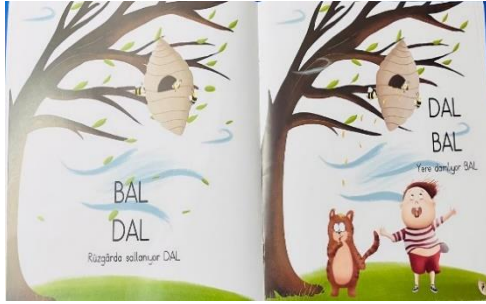
3. Kitaplar



Resim 7. (M8)



Resim 8. (M11)



Resim 9 (M24)

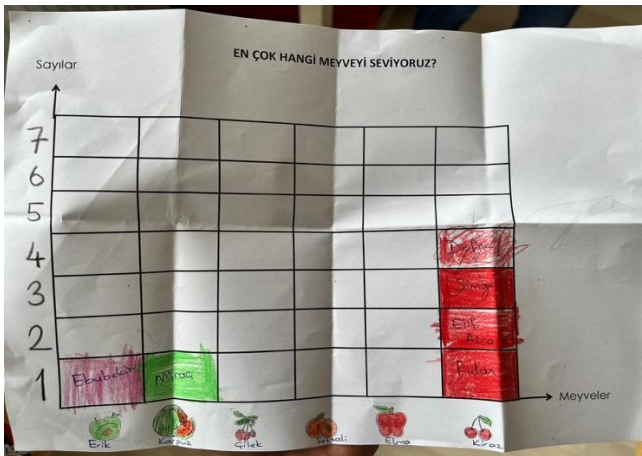


Resim 10 (M24)

İncelemesi yapılan materyaller arasında kitap türünde materyaller de bulunmaktadır. Bu türde olan materyaller M8, M11 ve M24'tür. Yapılan değerlendirme sonucunda öğretmenlerin erken okuryazarlık becerilerinin geliştirilmesinde kitapları basılı özellikte ders materyali olarak kullandıkları görülmektedir. Kullanılan kitaplar erken okuryazarlık aşamalarından, fonolojik farkındalığın sözcük farkındalığı aşamasına katkı sağlarken yazı farkındalığı, harf ve alfabe bilgisi, sözel dil, yazıya ilgi duyma ve dinlediğini anlama aşamalarına da fayda sağlamaktadır. M8 ve M11 materyallerinin içeriğinde yazı olması çocukların yazıya karşı bir farkındalık kazanmasını sağlayacaktır. Yazılı olarak sözcüklerin bulunması ve bunların sözlü olarak tekrarlanması çocukların sözcük farkındalığına katkı

sağlayacaktır. M8' in etkileşimli bir şekilde okunması çocukların sözel dil, dinlediğini anlama becerilerini destekleyecektir. M11' de çocuğun konuşması amacıyla hazırlanan içerikler çocukların konuşarak sözlü dil becerilerini geliştirmesine katkı sağlar. M24 ise fonolojik farkındalığın alt boyutlarından ilk ses değişimi ve son ses değişimine odaklanan bir kitaptır. Bu farkındalık Türkçe 'de özellikle çocukların fonolojik manipülasyonunu öğrenmesine dolaylı olarak da morfolojik bilginin alt yapısını oluşturmaya yardımcı olmaktadır. Materyallerin görsel tasarımın ilkelerinin tamamına (bütünlük, denge, vurgu, hizalama, yakınlık) uygun olduğu, materyalde yazıların kullanılmadığı, kullanımın güvenlik açısından tehlike arz etmediği, kullanımın ve ulaşılabilirliğin kolay olduğu görülmekle birlikte M8'de tercih edilen görsellerin büyüklüğünün dikkat dağıtabilecek seviyede olduğu gözlemlenmiştir. Materyalin hedef davranışın kazanımı için fayda sağlayacaktır.

4. Çalışma Kağıtları



Resim 11. (M10)



Resim 12. (M13)

Araştırma kapsamında incelenen materyaller arasında çalışma kâğıdı türünde öğretmen yapımı materyaller de bulunmaktadır. Bu materyaller M10, M12, M13, M14, M15' tir. Yapılan inceleme sonucunda öğretmenlerin erken okuryazarlık becerilerinin geliştirilmesinde çalışma kağıtlarını basılı özellikte ders materyali olarak kullanmayı tercih ettikleri görülmektedir. Araştırmada elde edilen veriler neticesinde çalışma kâğıdı materyallerinin erken okuryazarlık aşamalarına uygunluğu çeşitlilik göstermektedir. M15 ve M14'te erken okuryazarlık aşamalarından, fonolojik farkındalığın sözcük farkındalığı aşamasına katkı sağlamadığı görülürken M10, M12, M13 sözcük farkındalığı aşamasına katkı sağlamaktadır.



Resim 14. (M12)

M13 yazı farkındalığı, harf ve alfabe bilgisi, sözel dil, yazıya ilgi duymak, dinlediğini anlama aşamalarının hepsine uygunken M10 dinlediğini anlama, M12 sözel dil aşamasına uygun bulunmamıştır. M15 ise dinlediğini anlama ve sözel dil aşamalarının her ikisine de uygun bulunmamıştır. M14'te öğrencinin isminin yazılı olması sebebiyle yazı farkındalığı ve yazıya ilgi duyma aşamalarına uygun olabileceği, yönergenin olması nedeniyle de dinlediğini anlama aşamasına uygun olduğu gözlemlenmiştir. Materyallerin görsel tasarımın bütünlük, denge, hizalama, yakınlık ilkelerine uygun olduğu ancak materyallerde yalnızca siyah renginin kullanımından dolayı vurgu ilkesine uygun olmadığı görülmüştür. Diğer materyallerdeki yazıların anlaşılabilir seviyede olduğu gözlemlenirken M13'te yazının sade ve anlaşılabilirlikten uzak, süslü bir dil kullanıldığı gözlemlenmiştir. Materyallerin kullanımının güvenlik açısından tehlike arz etmediği, kullanımın ve ulaşılabilirliğin kolay olduğu görülmüştür. M12, M13, M14, M15'te tercih edilen renklerin siyah-beyaz oluşu renklerin dikkat dağıtmasından ziyade dikkat çekici olmadığı gözlemlenmiştir.

5. Diğer Materyaller

Araştırmada incelenen sıralama kartı, tek kart, kitap ve çalışma kâğıdı türü dışında, diğer olarak genel bir şekilde toplanan materyaller de bulunmaktadır. Bu materyaller; hayvan tombalası, takvim, hikâye kartonu, Kukla ve metni, kukla, iç organlar sistemi materyali, oyun hamuru ve aparatları, sayı kartları ve dijital olarak hazırlanmış olan materyallerdir. Bu başlık altında değerlendirilmesi yapılan materyaller; M5, M6, M7, M16, M17, M19, M20, M21, M22, M23 kodlu materyallerdir.



Resim 15. Hayvan tombalası (M5)

Bu materyaller içerisinde M5, öğretmen yapımı olan ve oyun amacıyla kullanılan bir materyaldir. Bu materyal hayvan tombalası olarak adlandırılmaktadır. Hayvan tombalası materyali incelendiğinde erken okuryazarlık becerilerinden fonolojik farkındalık, sözcük farkındalığı, sesbirim farkındalığı, yazı farkındalığı, harf ve alfabe bilgisi, sözel dil, yazıya ilgi duymak ve dinlediğini anlama becerilerini desteklediği görülürken uyak ve hece farkındalığı becerilerini desteklemediği görülmektedir. Materyal görsel tasarım ilkelerine uygun olarak hazırlandığı görülmektedir.



Resim 16. Takvim (M6)

Diğer bir materyal olan M6 öğretmen yapımı bir takvimdir. Bu takvim materyali izleyen etkinlik şeklinde kullanılmaktadır. Bu materyalin ise erken okuryazarlık becerilerinden fonolojik farkındalık, sözcük farkındalığı, yazı farkındalığı, sözel dil ve yazıya ilgi duymayı desteklediği görülmekte iken uyak, hece, sesbirim, harf ve alfabe bilgisi ve dinlediğini anlama becerilerini desteklediği görülmemektedir. Diğer bir materyal olan M7

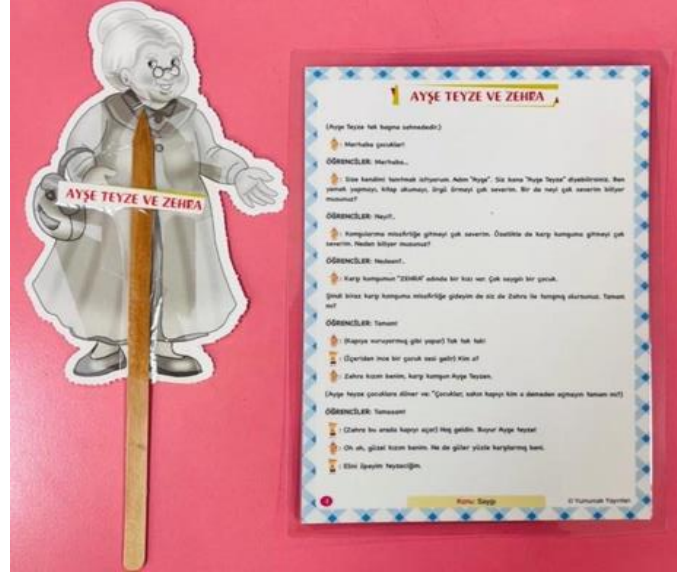
öğretmen yapımı olan, ders materyali olarak kullanılan ve hikâye kartonu olarak adlandırılan bir materyaldir. Bu materyal bir fon karton üzerine hikâyenin görsellerinin yerleştirildiği, yazısının el yazısı ile yazıldığı ve değerlendirme sorularının olduğu bir materyaldir. Bu materyalin erken okuryazarlık becerilerinden fonolojik farkındalık, sözcük farkındalığı, yazı farkındalığı, alfabe ve harf bilgisi, sözel dil, yazıya ilgi duymak ve dinlediğini anlama becerilerini desteklediği görülmekte iken uyak, hece ve sesbirim farkındalıklarını desteklemediği görülmektedir. Bu materyalde görsel tasarım ilkelerinden, vurgu ilkesine dikkat edilmediği görülmektedir. Onun dışında kalan görsel tasarım ilkelerine uygundur. Değerlendirilen bir başka materyal M16 olarak kodlanan kukla ve metni olan materyaldir. Bu materyal ders materyali olarak kullanılmaktadır ve iki boyutlu, basılı bir materyaldir. Bu materyalin erken okuryazarlık becerilerinden fonolojik farkındalık, sözcük farkındalığı, yazı farkındalığı, harf ve alfabe bilgisi, sözel dil ve dinlediğini anlama becerilerini desteklediği görülmekte iken uyak, hece, sesbirim farkındalığı ve yazıya ilgi duyma becerilerini desteklemediği görülmektedir. İncelenen bir başka materyal, M17 olarak kodlanan, öğretmen yapımı ve ders materyali olarak kullanılan iç organlar sistemi giyilebilir maketi olarak adlandırılan materyaldir. Bu materyal erken okuryazarlık becerilerinden; fonolojik farkındalık, sözcük farkındalığı, yazı farkındalığı, sözel dil ve yazıya ilgi duymayı desteklemektedir ancak uyak, hece, sesbirim, harf/alfabe bilgisi, dinlediğini anlama becerisini desteklemediği görülmüştür. İncelenen bir diğer materyal M18 olarak kodlanan, öğretmen yapımı ve iki boyutlu olan kukladır. Bu materyal erken okuryazarlık becerilerinden sözel dili ve dinlediğini anlama becerilerini desteklemektedir. Diğer erken okuryazarlık becerilerine doğrudan bir katkı sağladığı görülmemiştir. Görsel tasarım ilkelerine uygun bir şekilde hazırlanmıştır.



Resim 17. Oyun hamuru ve harf aparatı (M19)

Değerlendirilen bir başka materyal M19 olarak kodlanan, üç boyutlu ve oyun amacıyla kullanılan oyun hamuru ve harf çıkarma şekilleridir. Bu materyal erken

okuryazarlık becerilerinden yazı farkındalığı, harf ve alfabe bilgisi ve yazıya ilgi duyma becerilerini desteklediği görülmektedir. Değerlendirilen bir diğer materyal M20 olarak kodlanan, ders materyali olarak kullanılan, basılı olan sayı kartlarıdır. Bu materyal erken okuryazarlık becerilerinden fonolojik farkındalık, sözcük farkındalığı, yazı farkındalığı, sözel dil becerilerini desteklemektedir ancak diğer becerileri doğrudan desteklediği görülmemiştir.



Resim 18. Kukla ve metni (M16)

İncelenen diğer materyaller dijital olarak var olan Word Wall programında hazırlanan materyallerdir. Bu materyaller M21, M22 ve M23'tür. M21'in erken okuryazarlık becerilerinden fonolojik farkındalık, sözcük farkındalığı, yazı farkındalığı, sözel dil, yazıya ilgi duymak ve dinlediğini anlama becerilerini desteklemektedir. M22 ise erken okuryazarlık becerilerinden fonolojik farkındalık, sözcük farkındalığı, hece farkındalığı, yazı farkındalığı, sözel dil, yazıya ilgi duyma ve dinlediğini anlama becerilerini desteklemektedir. M23 ise erken okuryazarlık becerilerinden hece, harf ve alfabe bilgisi becerilerini desteklemezken diğer tüm erken okuryazarlık becerilerine katkı sağladığı görülmektedir. Son olarak M6, M7, M16, M17, M20, M21, M22 ve M23 görsel tasarım ilkelerine ve diğer özellikler bakımından da uygun olduğu görülmüştür.

Tartışma ve Sonuç

Bu araştırmada ilk olarak okul öncesi dönemde İY olan çocuklarla çalışan öğretmenlerin erken okuryazarlık becerilerinin geliştirilmesinde kullandıkları materyallerin neler olduğu belirlenmeye çalışılmış daha sonra bu materyaller erken okuryazarlık ve görsel

tasarım ilkelerine göre incelenmiştir. Araştırmanın bulgularına göre öğretmenlerin kullandıkları materyaller; sıralama/dizi kartı, tek kart, hikâye kitabı, çalışma/etkinlik kâğıdı, hayvan tombalası, takvim, hikâye kartonu, kukla, oyun hamuru ve aparatları, sayı kartlarıdır. Öğretmenler tarafından kullanılan bu materyaller zengin bir yaşantı ortamında sunulduğunda çeşitli açılardan erken okuryazarlık becerilerine katkı sağlamaktadırlar. Ancak materyallerin tür, nitelik ve çeşitlilik konusunda sınırlılıkları bulunmaktadır.

İY olan çocukların erken okuryazarlık becerilerinin desteklenmesinde kullanılan materyaller çocukların dil becerilerini de destekleyecek nitelikteki etkinlikler, uygulamalar içerisinde kullanılması gerekmektedir. Karasu (2020) yaptığı araştırmasında çocukların dil becerilerine yönelik hikâye anlatma, çeşitli dil rutinleri sağlayacak olan etkinliklerin erken okuryazarlık becerilerine anlamlı düzeyde katkılar yaptığı sonucuna ulaşmıştır. Bu araştırmada da ulaşılan sonuçlardan biri öğretmenlerin erken okuryazarlık becerilerini geliştirme çalışmalarında kitap, takvim, sıralama/dizi kartı, tek kart vb. materyalleri kullandığıdır. Bu sonuç Karasu'nun (2020) çalışması ile paralellik göstermektedir. Kullanılan bu materyaller İY olan çocuklara dil rutinleri sağlamaktadır. Örneğin, Karasu'nun (2020) çalışmasında her gün takvim üzerinden gün, ay, yıl, mevsim, hava durumu üzerine konuşulmasının dil rutinleri oluşturduğundan ve bu dil rutinlerinin erken okuryazarlık becerilerinin gelişimi için anlamlı deneyimler sağladığından bahsedilmektedir. Dili teşvik edici çalışmalar erken okuryazarlık becerilerinin gelişimi ile ilişkili olmakla birlikte (Norling, 2014) İY olan çocuklara sözlü iletişim ortamları yaratır ve bu ortamlar çocukların dil ve erken okuryazarlık becerilerine katkı sunar (Zupan & Dempsey, 2013). Bu nedenle öğretmenlerin her gün zengin sözlü iletişim ortamları sağlamaları gerekmektedir (Beaty, 2018). Eğitim materyalleri kullanılarak sözlü iletişim ortamlarında çocukların deneyimler edinmesini sağlamanın dil ve erken okuryazarlık için gerekli olduğu düşünülmektedir.

Kitaplar, erken okuryazarlık becerilerinin geliştirilmesinde öğretmenler tarafından sıklıkla kullanılan materyallerdir (Deretarla-Gül & Bal, 2006; Karasu, 2020; Uluğ & Tekmen, 2023). Bu araştırmada da kitapların kullanıldığı görülmüş ve erken okuryazarlık becerilerine olan katkısı ortaya çıkmıştır. Kitapların da etkileşimli deneyimler oluşturacak bir şekilde kullanılması önemlidir. Etkileşimli kitap okumak İY olan çocuklar için önemli bir etkinliktir (Zupan & Dempsey, 2013). Etkileşimli kitap okumak okul öncesi dönem çocuklarının dil becerilerine, yazı farkındalığına (Işıtan & Biber, 2020), sözcük bilgisi (Whitehurst & Lonigan

1998), gibi diğer erken okuryazarlık becerilerine katkı sağlamaktadır (Aslışen & Hakkoymaz, 2020; Bracken & Fischel, 2008; Ergül vd., 2016; Strickland & Riley-Ayers, 2006) ve okumaya ilişkin çocukların ilgilerini uyandırmaktadır (Bracken & Fischel, 2008). Etkileşimli kitap okuma erken okuryazarlık becerilerinin geliştirilmesinde sık kullanılan bir müdahale yöntemidir (Ergül vd., 2016). Etkileşimli kitap okuma esnasında; kitabın resimlerine yorum yapılmalı, sorular sorulmalı ve çocuğun yorum ve sorularının yanıtlanması gerekmektedir (Zupan & Dempsey, 2013). İY olan çocuklarla birlikte etkileşimli kitap okuma etkinlikleri yapılması onlar için doğal işitsel bir eğitim ortamı yaratmakla birlikte erken okuryazarlık becerilerini de destekler ve gelişimleri açısından da anlamlı deneyimler yaşamalarını sağlar.

İY olan çocuklarla gerçekleştirilen çalışmalarda dikkat edilmesi gereken önemli hususlar vardır. Bu çocuklarla olan çalışmalarda görsel girdi dikkate alınmalı ve yazılı, işaretli araç gereçler tercih edilmelidir (Briggle, 2005). Bu çalışmada incelenen materyallerin bu özellikleri taşıy nitelikte oldukları görülmektedir. İncelenen materyaller arasında bulunan kartlar, yazılı materyaller ve kuklaların, McKenney ve Bradley' in (2016) çalışmalarında da öğretmenler tarafından kullanıldığı ifade edilmiştir. Bu materyaller çocuklara görsel ve yazı olarak uyarılar sağlamak ve sözel-işitsel bir eğitim ortamında kullanıldıklarında erken okuryazarlık becerilerinin destekleneceği söz konusudur.

Okul öncesi dönemde erken okuryazarlık becerilerinin gelişiminde etkileşimli ve doğal ortamlarda oyunsal içerikli sürdürülen eğitim çalışmaları önemlidir. Oyun ve etkileşimli eğitim çalışmaları erken okuryazarlık becerilerinin edinimini eğlenceli ve daha anlamlı hale getirmektedir (Roskos vd., 2003). Ancak öğretmenler genellikle erken okuryazarlık becerilerini desteklerken masa başı etkinlikler yapmaktadırlar (Uluğ & Tekmen, 2023). Bu çalışmada da öğretmenlerin masa başında sürdürülen etkinliklerde kullanılabilecek çalışma kağıtları kullandıkları görülmektedir. Bu çalışma kağıtlarının okul öncesi eğitimde erken okuryazarlık becerilerinin gelişimi üzerinde kullanılması etkili olabilir ancak fazlaca bu gibi çalışma kağıtlarını kullanmak erken okuryazarlık eğitimi sürecine zarar verebilir. Bu nedenle çalışma kağıtları kullanılrsa bile devamında veya öncesinde mutlaka oyunsal içeriklerle desteklenmesi gereklidir.

Erken okuryazarlık becerilerinin desteklenmesinde çeşitli materyaller kullanılmaktadır. Çocukların harf şekilleri ile etkileşime girmesi onları eğlendirmekte olduğundan harfleri tanımaya yönelik materyallerle etkileşime girmeleri önemli

görülmektedir (Uluğ & Tekmen, 2023). Bu bakımdan ABC kitapları, plastik harfler, alfabe blokları, bulmaca, bilgisayar klavyesi, alfabe kartları ve manyetik tahta gibi materyallerin kullanıldığı görülmektedir (Uluğ & Tekmen, 2023). Bu araştırmada da harf tanımaya yönelik olarak harf aparatlarının kullanıldığı görülmektedir. Çocuklar harf aparatları yardımı ile oyun hamurundan harflerin şekillerini çıkarabilmekte ve bunlarla etkileşime girebilmektedir. Bu materyalin çocuklara daha somut bir deneyim yaşattığından söz edilebilir.

Okul öncesi sınıflarında İY olan çocukların erken okuryazarlık becerilerinin desteklenmesi önemliken çocukların ev ortamı da ihmal edilmemelidir. Ev ortamı erken okuryazarlık gelişimi için önemli yaşantılar sağlamaktadır. Bu yapılan araştırmalarda görülen bir durumdur (Atlar & Uzuner, 2018). Bu nedenle okul-ev iş birliğinin sağlanması erken okuryazarlık becerilerini de destekler (Işıtan & Biber, 2020). Evde okul çalışmalarına benzer şekilde erken okuryazarlık etkinlikleri yapılması faydalıdır (Karaahmetoğlu & Turan, 2020). Bu çalışmalarda sunulan fırsat ve kaynaklar erken okuryazarlık becerilerini destekler (Coşkun, 2023). Aileler eve gönderilecek olan yazılı materyalleri önemsemekte ve dil desteği konusunda bilgiye ihtiyaç duymaktadırlar (Harmandar & Arıkan, 2020). Bu nedenle öğretmenlerin erken okuryazarlık becerilerini nasıl destekleyecekleri konusunda aileleri bilgilendirmelidirler (Coşkun, 2023). Ayrıca öğretmenler sınıflarında kullandıkları materyallerden ailelere gönderip, onlarla nasıl zaman geçirmeleri gerektiğini ailelere aktarmaları hem çocuklarda erken okuryazarlık becerilerinin desteklenmesini hem çocuk ebeveyn ilişkisinin olumlu etkilenmesini hem de okul-ev iş birliğinin sağlanmasını güçlendirebilir.

Sonuç olarak bu araştırmada İY olan çocukların erken okuryazarlık becerilerinin geliştirilmesinde kullanılan materyallerin neler olduğu ortaya çıkarılmıştır. Kullanılan materyaller çeşitli açılardan erken okuryazarlık becerilerine katkı sağlasalar da tür, çeşitlilik ve zenginlik açısından sınırlı oldukları söylenebilir. Diğer yandan erken okuryazarlık farkındalığı olan öğretmenlerin branşları fark etmeksizin eğitim ortamlarında erken okuryazarlığı destekleyici materyaller kullandıkları sonucuna da ulaşılmıştır. Benzer bir sonuç da Deretarla-Gül ve Bal'ın (2006) çalışmalarında ortaya çıkmıştır. Deretarla-Gül ve Bal (2006) çalışmalarında, erken okuryazarlık farkındalığı olan öğretmenlerin sınıflarındaki materyallerin nitelik ve niceliğini arttırmaya çalışmakta oldukları ancak şartların bu durum

için elverişli olmadığından söz etmektedir. Bu sonuca bakıldığında elverişsiz olan noktalarda yaşanan sorunların giderilmesi ve okul öncesi dönemde hem gelişimsel yetersizlik gösteren hem de tipik gelişen çocukların erken okuryazarlık ortamlarının niteliğinin artırılması için zengin içerikli materyallerin bulundurulması gereklidir. Kullanılan zengin içerikli materyallerin eğitim niteliğini arttıracakı düşünülmektedir. Bu konuda zengin içerikleri olan hem geleneksel hem de dijital materyallerin kullanımı eğitim niteliğine katkı sağlayacak ve erken okuryazarlık gelişimine de olumlu etkilerde bulunacağı düşünülmektedir. Bu araştırmanın sonuçları alana bu konuda ışık tutabilecek niteliktedir. Bu çalışmada İY olan çocuklarla çalışan hem okul öncesi hem de özel eğitim öğretmenlerinin erken okuryazarlık becerilerinin desteklenmesinde kullandıkları materyalleri incelemek araştırmanın güçlü bir tarafını oluştururken, sınırlı sayıda öğretmenden materyal toplanması araştırmanın sınırlılığını oluşturmaktadır.

Öneriler

Araştırmadan elde edilen sonuçlar doğrultusunda ileri araştırmalara yönelik ve uygulamaya yönelik bazı öneriler de bulunulmuştur.

Uygulamaya Yönelik

1. Etkileşimli kitap okumalarda kullanılmak üzere İY olan çocukların niteliğine dikkat edilerek seçilmiş kitaplar kullanılmalı örneğin bu çalışmalarda sesli kitaplar gibi kitaplar kullanılabilir.
2. Öğretmen ve aileler, İY olan çocukların erken okuryazarlık becerilerinin geliştirilmesi için kullanacakları materyalleri görsel nitelikleri yüksek olan materyallerden seçilmelidir. Bu noktada teknolojik materyallerden faydalanılabilir.
3. Erken okuryazarlık becerilerinin geliştirilmesinde materyaller hazırlanması, nitelikli materyal seçimi ve dikkat edilmesi gereken noktalar ile ilgili bilgiler öğretmenlere hizmet içi eğitimlerde sunulabilir.

İleri Araştırmalara Yönelik

1. Okul öncesi dönemde işitme yetersizliği olan çocuklarla çalışan daha fazla öğretmen ve daha fazla materyalin araştırma sürecine dahil edilmesi ve böylece materyal çeşitliliğinin ve deneyim paylaşımının artırılması önerilebilir.

2. Materyallerin hazırlanması ve nitelikli materyal seçiminde öğretmenlerin bilgi ve tutumları önemlidir. İY olan okul öncesi dönemdeki çocuklarla çalışan öğretmenlerin tutum ve görüşleri incelenebilir.
3. Özel eğitim ve okul öncesi öğretmenlerinin kullandıkları materyaller karşılaştırmalı olarak incelenebileceği araştırmalar planlanabilir.

Farklı gelişimsel yetersizliği bulunan çocukların erken okuryazarlık becerilerinin desteklenmesinde kullanılan materyallerin inceleneceği araştırmalar planlanabilir.

Bilgilendirme

Bu araştırma TÜBİTAK 2209-A Üniversite Öğrencileri Araştırma Projeleri Destekleme Programı 2023/1. Dönem Kapsamında 1919B012302646 başvuru numaralı proje olarak desteklenmiş ve çalışmanın özeti 25-27 Ekim 33. Ulusal Özel Eğitim Kongresinde sözlü bildiri olarak sunulmuştur.

Etik Kurul Belgesi

Etik Kurul Komisyon Adı: Sakarya Üniversitesi Eğitim Araştırmaları ve Yayın Etik Kurulu

Etik Kurul Belge Tarihi ve Protokol No: 23/11/2023- E-61923333-050.99-308501

Yazar Katkı Beyanı

İsmail KÖSE: Alan yazın taraması, veri toplama ve verilerin analizi

Aleyna AKSOY: Veri toplama süreci

Selva TOPAL: Alan yazın taraması ve verilerin analizi

Necmiye Hilal EKMEKÇİ: Veri toplama ve verilerin analizi

Özlem ASLAN BAĞCI: Çalışmanın konusunun belirlenmesi, kavramsallaştırma, araştırma deseninin belirlenmesi ve veri analizi

Kaynaklar

- AŞICI, M. (2004). *Ailede dil etkinlikleri "çocuğum okuryazar oluyor"*. Morpa Kültür Yayınları.
- Atlar, H. & Uzuner, Y. (2018). Okul öncesi dönemdeki işitme kayıplı bir çocuğın gelişen okuryazarlık yaşantılarının incelenmesi. *Eğitimde Nitel Araştırmalar Dergisi*, 6(1), 54-89.
- Atlar, H., Çavuşoğlu, T. & Gürgür, H. (2022). *İşitme kayıplı çocukların erken okuryazarlık gelişimlerini destekleyici sınıf ortamının özellikleri*. 4.Uluslararası Eğitim Araştırmaları Kongresi, 68-77.
- Beaty, J. J. (2018). *Erken çocuklukta 50 okuryazarlık stratejisi*. (Çevirenler: F. Alisinanoğlu ve S. Demir-Kaya). Pegem Akademi.
- Bracken, S. S. & Fischel, J. E. (2008). Family reading behavior and early literacy skills in preschool children from low-income backgrounds. *Early Education and Development*, 19(1), 45-67. <https://psycnet.apa.org/doi/10.1080/10409280701838835>
- Briggle, S. J. (2005). Language and literacy development in children who are deaf or hearing impaired 68. *Kappa Delta Pi Record*, 41(2), 68-71. <https://doi.org/10.1080/00228958.2005.10532047>

- Coşkun, L. (2023). Çocuğu okul öncesi eğitime devam eden annelerin okuma inancı ve ev erken okuryazarlık ortamlarının demografik değişkenler açısından incelenmesi. *TEBD*, 21(1), 425-452. <https://doi.org/10.37217/tebd.1189625>
- Çalış, E. S. & Feyman Gök, N. (2020). 2010-2019 yılları arasında erken okuryazarlık alanında yapılan lisansüstü tezlerin incelenmesi. *Okuma Yazma Eğitimi Araştırmaları*, 8(2), 152-167. <https://doi.org/10.35233/oyea.765181>
- Deretarla Gül, E. & Bal, S. (2006). Anasınıfı öğretmenlerinin okuma yazmaya hazırlık çalışmalarına ilişkin bakış açıları, sınıf içi kullanılan materyal ve etkinlikler ile çocukların okuma yazmaya ilgilerinin incelenmesi. *Çocuk Gelişimi ve Eğitimi Dergisi*, 1(2), 33-51.
- Ergül, C., Dolunay Sarıca, A. & Akoğlu, G. (2016). Etkileşimli kitap okuma: dil ve erken okuryazarlık becerilerinin geliştirilmesinde etkili bir yöntem. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, 17(2), 193-204.
- Harmandar, D. & Arıkan, A. (2020). Erken okuryazarlık becerilerine yönelik dil destek çalışmalarında ailelerin tercihleri. *Ana Dili Eğitimi Dergisi*, 8(4), 1183-1203. <https://doi.org/10.16916/aded.774896>
- Işıkoğlu Erdoğan, N. (2016). Erken çocukluk döneminde çocuk-ebeveyn birlikte okuma etkinliklerinin incelenmesi. *Kastamonu Eğitim Dergisi*, 24(3), 1071-1086.
- Işıtan, S., Saçkes, M. & Biber, K. (2020). Erken okuryazarlık becerilerinin ev ortamında desteklenmesi. *Yaşadıkça Eğitim*, 34(2), 284-298.
- Karahaşmetoğlu, B., & Turan, F. F., (2020). Gelişimsel yetersizliği olan ve normal gelişen çocukların ailelerinin erken okuryazarlığa ilişkin inançları ile erken okuryazarlık ev ortamının incelenmesi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 35(2), 243-253.
- Karademir Coşkun, T., & Alper, A. (2019). Usage of digital learning material in special education. *Ankara University Faculty of Educational Sciences Journal of Special Education*, 20(1), 119-142.
- Karasu H. P. (2020). Development of emergent literacy skills of a child with hearing loss: a longitudinal case study. *Educational Studies*, 46(5), 513-531.
- Kargın, T., Ergül, C., Büyüköztürk, Ş. & Güldenoğlu, B. (2015). Anasınıfı çocuklarına yönelik erken okuryazarlık testi (EROT) geliştirme çalışması. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, 16(3), 237-268.
- Kargın, T., Güldenoğlu, B. & Ergül, C. (2017). Anasınıfı çocuklarının erken okuryazarlık beceri profili: Ankara örneklemini. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, 18(1), 61-87.
- Kargın, T., Güldenoğlu, B. & Gengeç, H. (2023). Erken okuryazarlık ve okuma ilişkisi. Kargın vd. (Ed.), *Değerlendirmeden uygulamaya tüm yönleriyle erken okuryazarlık* (ss. 2-23). Pegem Akademi.
- Lonigan, C. J., Allan, N. P., & Lerner, M. D. (2011). Assessment of preschool early literacy skills: Linking children's educational needs with empirically supported instructional activities. *Psychology in the schools*, 48(5), 488-501. <https://doi.org/10.1002/pits.20569>
- McKenney, S. & Bradley, B. (2016). Assessing teacher beliefs about early literacy curriculum implementation, *Early Child Development and Care*, 186(9), 1415-1428.
- Merriam, S.B. (2009). *Nitel araştırma* (Çeviren S. Turan). Nobel Akademi.

- Nassrallah, F., Fitzpatrick, E. M., Whittingham, J., Sun, H., Na, E. & Grandpierre, V. (2020). A descriptive study of language and literacy skills of early school-aged children with unilateral and mild to moderate bilateral hearing loss. *Deafness & Education International*, 22(1), 74-92. <https://doi.org/10.1080/14643154.2018.1555119>
- Norling, M. (2014). Preschool staff's view of emergent literacy approaches in Swedish preschools, *Early Child Development and Care*, 184(4), 571-588.
- O'Leary, Z. (2017). The essential guide to doing your research project. SAGE Publications Inc.
- Roskos, K. A., Christie, J. F., & Richgels, D. J. (2003). The essentials of early literacy instruction. *Young Children*, 58(2), 52-60.
- Sánchez, S. & Alonso-Cortés, M. D. (2012). Aprendizaje inicial de la lengua escrita: prácticas docentes y conocimientos de los alumnos. *Cultura y Educación*, 24(4), 387-400. <https://doi.org/10.1174/113564012803998820>
- Shamir, A. & Korat, O. (2007). Developing an educational e-book for fostering kindergarten children's emergent literacy. *Computers in the Schools*, 24(1-2), 125-143. https://doi.org/10.1300/J025v24n01_09
- Strickland, D. S., & Riley-Ayers, S. (2006). Early literacy: Policy and practice in the preschool years. *Preschool Policy Brief*, 10(4), 1-12.
- Svirsky, M. A., Robbins, A. M., Kirk, K. I., Pisoni, D. B., & Miyamoto, R. T. (2000). Language development in profoundly deaf children with cochlear implants. *Psychological science*, 11(2), 153-158. <https://doi.org/10.1111/1467-9280.00231>
- Şilbir, L. (2011). *İşitme engelli öğrencilerin Türkçe okuma yazma becerilerinin geliştirilmesine yönelik görsel yardım paketi: GÖRYAP*. (Yayımlanmamış yüksek lisans tezi). Karadeniz Teknik Üniversitesi, Trabzon.
- Tanju Aşlışen, E. H. & Hakkoymaz, S. (2020). Erken okuryazarlık alanında gerçekleştirilmiş lisansüstü tez çalışmalarının incelenmesi: Bir içerik analizi. *Ana Dili Eğitimi Dergisi*, 8(4), 1483-1498. <https://doi.org/10.16916/aded.763492>
- Uluğ, E. E. & Tekmen, B. (2023). A study on exploring preschool teacher practices and preferences in using early literacy activities. *Karadeniz Uluslararası Bilimsel Dergi*, (58), 100-116. <https://doi.org/10.17498/kdeniz.1310035>
- Whitehurst, G. J. ve Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development*, 69(3), 848-872. <https://doi.org/10.1111/j.1467-8624.1998.tb06247.x>
- Yazıcı, E. & Kandır, A. (2018). Erken okuryazarlık becerilerinin ev ortamında desteklenmesine ilişkin çalışmaların incelenmesi. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 38(1), 101-135.
- Yazıcıoğlu, T. (2023). Harf bilgisi. Kargın ve ark. (Ed.), *Değerlendirmeden uygulamaya tüm yönleriyle erken okuryazarlık* (ss. 98-115). Pegem Akademi.
- Zupan B. & Dempsey L. (2013). Facilitating Emergent Literacy Skills in Children with Hearing Loss. *Deafness & Education International*, 15(3), 130-148. <https://doi.org/10.1179/1557069X12Y.0000000018>