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Osmangazi Journal of Educational Research (OJER) is published by the Institute of Education of Eskisehir Osmangazi University, Türkiye.

OJER is an online, open-access, international, scholarly, peer-reviewed journal offering scholarly research articles on various topics in all areas of educational sciences.

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"All progress is the product of human ideas. Our first job should be to put ideas into action.."

(Mustafa Kemal ATATÜRK)

Dear Readers,

The Great Leader Mustafa Kemal Atatürk emphasized the importance of the human being's power of thinking and producing ideas with his laconic: "*All progress is the product of human ideas. Our first job should be to put ideas into action. It is enough for the nation to control its ego and think! Even if it thinks wrongly at the beginning, it can correct this mistake after a short time. Once an idea starts working, everything gradually gets in order and gets better.*" Every kind of progress made towards the future is a result of human's intellectual activity. Being able to put ideas into action, that is, enabling people to think, is the first step of this progress. When an individual starts thinking, she/he sees that ideas can be forwarded to the right direction in time, even if they are wrong at the beginning. Because thinking is the process of learning from mistakes and finding the right. Atatürk also emphasized this in his laconic: "*The real guide for everything in the world, for life, for success is science. Looking for a guide other than science is carelessness, ignorance, and deviating from the right path. However, it is a must to understand the development of science and the stages of science in every minute we live and to follow their progress. Trying to apply the general rules drawn by the language of science and science from one thousand two thousand years ago in the same way today is certainly not being in science and science.*"

In these days when we have left the year 2024 behind, many researchers and scientists worldwide have continued to contribute to educational research with their studies. These studies enlighten everyone from researchers to practitioners; those who make policies, design, implement, learn and teach. C. Coleridge says in his saying that "*the first thing that catches the eye in an educated person is the methodical work of their mind*. The approach of working with methods, methods and systems is reflected not only in the academic research of researchers but also in their daily lives. With its structure that thinks, investigates and questions in accordance with the purpose of education; it contributes to individuals and production in terms of being a part of the solution, not the problem. In our age of information, technology and education in every sense, and in reality, education means preparing children for the conditions in which they will continue their existence,

first in the world and then in their own environments (W. Van Goethe). One of the basic purposes of education is to make children aware of their own abilities. In this context, it can be said that education should be a guide for individuals to comprehend the art of living. Indeed, just as knowing something is a skill, teaching it is also a skill. In educational research, many studies are carried out aiming to update and improve education; what, how and in what way to learn. Indeed, educational research covers an important area that plays a fundamental role in the development of individuals and societies. Studies in this field aim to ensure that educational systems become more effective, accessible and sustainable. Educational research directly or indirectly contributes to the solution of problems in education by addressing many issues such as teaching methods, learning processes, student achievements and educational policies. At the same time, it helps to develop strategies supported by scientific data for the success of innovations made in educational systems. Thus, educational research is not only an academic field, but also a fundamental building block that shapes the future of society.

OJER (Osmangazi Journal of Educational Research), which brings together researchers and readers in the field of educational research, aims to contribute to educational research and facilitate the sharing of educational knowledge. OJER is published twice a year in English by Eskişehir Osmangazi University Institute of Educational Sciences. It is an online, open accessed, international, peer-reviewed journal that offers scientific research articles in all fields of educational sciences. Qualitative, quantitative, mixed method and compilation type studies in many fields whose subject is education and training; research results from theory to practice are included. Our goal is to promote researches that are novel, creative, enlightening, guiding and thus that help shape the future of education with emphasis on ethical values.

In this issue of **OJER**, there are important studies that will contribute to the field. We would like to express our gratitude to the researchers, the reviewer referees, the editorial board, the journal secretariat and our readers who examined our journal and reached us via e-mail. In this issue of **OJER** of Fall 2024, 9 studies are presented, as introduced below:

The 1st article of this issue is entitled "What the Distance Education Themed Master's Theses and Dissertations in Türkiye Examined Prior to Covid-19 Pandemic" written by Emrah ORAKÇIOĞLU and Cavide DEMİRCİ. This research aims to evaluate and compare the research tendencies of the theses and dissertations published in Türkiye prior to the Covid-19 pandemic between 2013 and 2018 in the field of distance education in terms of thematic research fields, methodological preferences and the components that scientific researches should include. The results suggest the most popular theme among researches is web-based distance learning, most preferred designs are quantitative and qualitative, respectively. Top universities publishing doctoral dissertations in the field are the Universities of Anadolu and Ankara while Gazi University ranks first in master's theses. It was found out dissertations and theses generally have the basic components of a scientific research. The quantitative studies were designed in survey model while qualitative studies focused on case studies. The most commonly used sampling method is purposeful sampling in the case of both research models. It is recommended that more doctoral dissertations could be carried out in the field of distance education and future studies may include not only the studies that the term of distance education exists in the title but also others carried out in the field.

The 2nd article of this issue is entitled "The Relationship between Conflict Management Styles of School Principals and Teachers' Cynicism Levels" written by Merve YILMAZ and Ali İlker GÜMÜŞELİ. This research aims is to determine the relationship between the conflict management styles of school principals and the organizational cynicism levels of teachers according to the perceptions of teachers. Relational screening model was used in the research. The universe of the study consists of 1150 teachers working in Maltepe district of Istanbul in the 2021-2022 academic year. The sample was composed of 288 teachers. It was determined that the organizational cynicism levels of the teachers were at the "intermediate level". As a result, a weak negative significant correlation was revealed between the conflict management styles of school principals and the organizational cynicism levels of teachers. In the context of conflict management styles, a moderately negative significant relationship emerged between integrating style and organizational cynicism, a moderately positive relationship with dominating style, and a weakly negative relationship with compromising style and compromising style. There was no statistically significant correlation between avoidance style and organizational cynicism.

The 3rd article of this issue is entitled "The Role of Learning Organization and Talent Management in the Effect of The Transformational Leadership Styles of School Principals in Innovation Management in their Schools" written by Yasin HİÇYILMAZ and Semiha ŞAHİN. This research aims to examine the mediating role of learning organization and talent management in the impact of transformational leadership levels of school principals on innovation management according to the perceptions of teachers working in vocational and technical anatolian high schools. The sample consisted of 30 official vocational and technical anatolian high school principals and 562 teachers. The data were collected with The Scale of Leadership Styles of School Principals, The Scale of Talent Management in Education, The Scale of Learning Organization in Schools and The Scale of Innovation Management in Schools. The findings showed that there is a significant relationship between the transformational leadership styles of school principals and innovation management according to teacher perceptions, and that there is a partial mediating role of learning organization and talent management in this relationship. It can be concluded that school principals with a high level of transformational leadership will exhibit a higher level of innovation management characteristics in their schools with teachers with a high level of learning organization and talent management.

The 4th article of this issue is entitled "Depiction of the Relationship between Man and Nature In the 9th Grade Geography Textbook" written by Aysun HAJİBAYLİ and Leyla DÖNMEZ. This research aims to investigate how the relationship between human and nature is handled in the 9th grade geography textbook, which was used for 5 years starting from the 2019-2020 academic year. The data obtained through document analysis were subjected to descriptive analysis. As a result of the research, it was found that while the effects of nature on human beings in the textbook were generally described with negative expressions, the effects of human beings on nature were described both positively and negatively.

The 5th article of this issue is entitled "The Relationship between 9th Grade Students' Symbol Sense Behaviors, Algebraic Thinking Skills and Academic Achievement: A Case Study" written by Tuğba TAT and Pınar ANAPA SABAN. This research aims to investigate the relationship between 9th grade students' symbol sense behaviors, algebraic thinking skills and academic achievement. A total of 3 students from a high school constituted the study group. Considering the opinions of the mathematics teacher and the academic

achievement levels of the students in the mathematics course, one student from each achievement level was selected as low, medium and high academic achievement level. The data were acquired from five research inquiries in the literature and adapted in line accordance with expert perspectives. As a result, students' algebraic thinking skills and symbol sense behaviors were found to be compatible with their academic achievement levels. In addition, it was concluded that there was a positive relationship between algebraic thinking skills and symbol sense behaviors.

The 6th article of this issue is entitled “Adaptation Study of the Ecological Literacy Scale for Middle School Students” written by Kevser ARSLAN and Aslı GÖRGÜLÜ ARI. This research aims to adapt the Ecological Literacy Scale developed by Ha, Huang, Zhang, and Dong (2021) into Turkish and conduct validity and reliability analyses. The scale, after a pilot application, was administered to 515 middle school students from different grade levels who were identified as the study group. As a result of the study, a 5-point likert type "Ecological Literacy Scale" consisting of 5 factors and 30 items was adapted into Turkish. The adapted Ecological Literacy Scale was found to be a valid and reliable tool suitable for middle school students. A measurement tool that researchers and educators can benefit from has been added to the literature.

The 7th article of this issue is entitled “Teachers' Opinions on the Teaching Skills of Primary Teacher Candidates” written by İpek YILMAZ and Hilmi DEMİRAL. This research aims to determine the opinions of primary school teachers regarding the teaching skills of teacher candidates taking the teaching practice course. The opinions of 3 primary teachers working in a primary school were examined. The primary teachers who participated in the research were educators with at least 25 years of experience in their profession. The interviews lasted 1 hour and 50 minutes in total. According to the research findings, the problems of primary teachers working in a primary school were gathered under the themes of “subject field knowledge, field education knowledge, planning, classroom management and communication”.

The 8th article of this issue is entitled “Implementing Mathematical Modelling with Calculus of Variations to Design a Disaster Tent” written by Fatma ASLAN TUTAK and Ozan GÜVEN. This research aims to share results from a mathematical modelling project developed by a mathematics educator and a high school student to solve a real-life problem; durable disaster tents. The authors worked together to first design a tent, CaTent, by

implementing biomimicry with design thinking. Through the process of mathematical modelling, the authors mathematise the problem with catenary which can be obtained by solving a calculus of variations problem. Then, reaching the equation for catenary curve modelling the poles of CaTent, the length of a pole is obtained, approximately 7.2834 meters. The total length of three poles necessary for a CaTent would be 21.8503 meters approximately, while the total amount of poles needed for a common disaster tent would be approximately 40.32 meters.

The 9th article of this issue is entitled "Art Education in Türkiye During the Republican Period (1938-1950)" written by Mehmet KARAOĞLU and Nadir YURTOĞLU. This research aims to investigate the studies carried out on art education in Türkiye during the period from 1938 to 1950 when İsmet İnönü was the President. Under the main title of Art Education in the I. İnönü Period (1938-1950), this article focuses on decisions on art education in National Education Councils (1928-1949), Art Education in Curricula (1938-1950), Art Education in Primary School Curricula, Art Education in Secondary School Curricula, Village Institutes Curricula and Art Education. During the Presidency of İsmet İnönü (1938-1950), the reforms and structures implemented in education, the national education councils conducted, and the reports prepared by foreign experts who were invited to Türkiye by the Ministry of National Education for their recommendations on art education formed the basis of this research. In addition, the curriculum programs of primary and secondary schools and Village Institutes are also included in the article's subject. Related documents from the Presidential Archive of the Republic, Official Gazette, minutes and law journals of the Grand National Assembly of Türkiye, various magazines, newspapers, books, and articles from periodical publications were used to collect data which were analyzed using the document analysis method.

See you in the next year and next issue…

"Stay with science, stay with us"

M. Zafer BALBAĞ, Ph.D.
Editor In Chief
Director of Institute of Education
Eskişehir Osmangazi University, Türkiye

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What the Distance Education Themed Master's Theses and Dissertations in Türkiye Examined Prior to Covid-19 Pandemic

*** Emrah Orakcıoğlu, **Cavide Demirci**

Abstract. The purpose of this study is to evaluate and compare the research tendencies of the theses and dissertations published in Türkiye prior to the Covid-19 pandemic between 2013 and 2018 in the field of distance education in terms of thematic research fields, methodological preferences and the components that scientific researches should include. In accordance with this purpose, theses and dissertations were analysed with regard to such sections as introduction, method, findings, result and recommendations. This qualitative study was carried out through document (content) analysis method and was made use of purposeful sampling. The results suggest the most popular theme among researches is web-based distance learning, most preferred designs are quantitative, qualitative, respectively. Top universities publishing doctoral dissertations in the field are the Universities of Anadolu and Ankara while Gazi University ranks first in master's theses. The years of 2013 and 2014 outnumber other years in terms of doctoral dissertations while 2018 was found as the year when most master's theses was carried out. It was found out dissertations and theses generally have the basic components of a scientific research. The quantitative studies were designed in survey model while qualitative studies focused on case studies. The most commonly used sampling method is purposeful sampling in the case of both research models. It is recommended that more doctoral dissertations could be carried out in the field of distance education in Türkiye and future studies may include not only the studies that the term of distance education exists in the title but also others carried out in the field.

Keywords. Distance education, remote education, covid-19, content analysis.

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Note: This article is derived from the first author's master's thesis.

The COVID-19 pandemic has had a profound and far-reaching impact on education worldwide. These effects have been both immediate and longer-term, and they have affected all levels of education, from early childhood education to higher education. The Covid-19 pandemic, which emerged in early 2020, suddenly affected the whole world and countries closed their borders, international travels were stopped, curfews were imposed, people were confined to their homes, the service sector had to stop their activities, and people suffered from the disease they had never encountered before. They started to face with the danger of death. This situation has started to have a serious impact also in Türkiye since March 2020. One of the sectors that had to stop its activities in Türkiye, as in the rest of the world, was undoubtedly the education sector. All educational institutions, from pre-school to higher education level, stopped their activities and were in a waiting position until the second instruction from health authorities. After the first shock of the pandemic was overcome, educational institutions began to switch to distance education in order to continue their activities, and from this moment on, the concept of distance education became an important issue than ever before and had to be preferred by almost all educational institutions in Türkiye. Distance education has now become an important part of our lives and has also influenced the academic world. Many studies have begun to be conducted on distance education, and more studies and research have begun to be conducted in the field than ever before. The starting point of this research is to investigate and set forth the main tendencies of the theses and dissertations carried out in a specified timeline before the pandemic in Türkiye and reveal what these studies has focused on without the presence of an issue that shocked the world.

The concept of distance education or distance learning was essentially born out of a need, which is valid for all innovations and inventions in the world. When the instructor and the learner could not come together due to time and space constraints or personal reasons, it was understood that teaching and learning activities could actually be carried out remotely, and thus, the concept of distance education, which arose from a need, has become a service and a scientific field of study offered using the most up-to-date possibilities of technology. Although the transition from traditional, face-to-face education to distance education was a painful process at first for both instructors and students, today distance education services have begun to be offered as a default service by educational institutions. Thanks to digital transformation studies and rapid developments in technology, which have started to make their impact felt in every field, the fields of educational sciences and distance education have started to keep up with the times, and the distance education service, which was initially provided through letters, can now be followed through mobile applications and devices. Thanks to the

developments in digital technologies, distance education applications are used both in formal education and as certificate programs, complementing the philosophy of lifelong education. Distance education programs, which especially meet the educational needs of the working class, are preferred and used by many people around the world day by day.

It is seen that there are many definitions of distance education in the literature and that these definitions are changing gradually in the context of the historical development process and technological developments. Bruder (1989, p. 2) stated that the American Bureau of Educational Research defines distance education as telecommunication systems and electronic devices that enable students and learners to take courses on any subject without location restrictions. Garrison and Shale (1987, p. 28) mentioned three characteristic features of the distance education process:

1. Distance education is generally a learning activity carried out without the teacher and student being together.

2. In order to support the learning process, distance education should allow communication between the teacher and the student.

3. There should be use of technology in distance education activities in order to ensure interaction between the two parties.

The common feature of these definitions made by different researchers is that they state that the most basic feature of distance education is that the obligation for teachers and students to be in the same environment is eliminated. However, some definitions show distance education as a learning method, while others see it as a teaching tool. Regardless of which researcher made it, the common feature of the first definitions about distance education is that, as mentioned above, they state that the instructor and the learner do not have to be physically in the same environment and that it involves the use of technology. However, in historical development and with the advancement of technology, the definition of distance education has also changed. Kaya (2002, p. 12) explains one of the definitions with changing focus as "it is a form of education that uses electronic media or personalised learning tools", but in order to emphasise the change in the definition, it is necessary to express the definition that is widely accepted in the literature. Schlosser and Simonson (2009, p. 1) emphasised that distance education is a type of formal education provided in an institutional sense, in which the learner group communicates with each other, resources and instructors through interactive telecommunication systems without being in the learning environment. As can be seen from this statement, both the definition and form of distance education have evolved over the years and its focus has changed. While the emphasis in the initial definitions was always on the presence of learner

and instructor groups in separate environments, terms such as interactive and telecommunication systems have been included in the definitions made in recent years.

Although there are many alternative definitions defining distance education in the literature, each definition essentially emphasises four important features related to the field (Kambutu, 2002, p. 342). These are respectively;

1. Providing educational services outside the campus with the help of technology,
2. Accessing educational opportunities with the help of many tools without being dependent on the physical environment,
3. Teachers' and students' being in separate environments in terms of time and space, and
4. Accessing educational resources outside the educational environment.

In summary, distance education is a form of education and training in which the teacher and the learner do not need to be in the same environment, allowing them to access educational services through technological devices and opportunities without the concept of time, and in which the communication and interaction between the two parties is also provided through technological opportunities.

The effectiveness of distance education has been constantly debated because the instructor and the learners are not together. Based on these discussions, some of the researchers tried to reveal the differences between distance education and traditional education and tried to find out which type of education is more beneficial to the success of students. In addition to this type of research, studies aimed at establishing theory in distance education and studies examining the methodological features of distance education studies have also been conducted. In some of the studies examining distance education studies according to their methodological characteristics, the samples are articles written in the field of distance education, and in some others, the samples are dissertations and theses written in the field of distance education. In their study, which is one of the studies conducted to reveal methodological trends in distance education research and examined the dissertations and master's theses conducted in the field of distance education in North America between 1998 and 2007, Davies, Howell and Petrie (2010, p. 52) found out that the majority of the studies were descriptive studies and they stated that they used samples with more experience in the field of distance education as the study group and that they examined the perception, anxiety and satisfaction levels of these people about distance education, and they concluded that these studies conducted with surveys were generally conducted with descriptive statistical methods. An interesting result of their study is that they

concluded that the existence of quality descriptive studies are valuable in the literature, but the subject should also be examined with other research methods. In their study of 890 articles, Berge and Mrozowski (2001, p. 5) concluded that the most preferred research model was descriptive research, and they also stated that the research conducted largely lacked a specific research topic and future vision. In their study examining the literature, Bryant, Kahle, and Schafer (2005, p. 269) concluded that research on distance education has four common features. They listed these features as (1) communication tools and environment in distance education, (2) educational organisation, (3) instructor or teacher and (4) student or learner. They also stated that prominent researchers in the field could not reach a consensus on how to measure quality in distance education.

In another research conducted in the field and examining 515 articles published between 1980 and 2014, the 35-year period within the scope of the study was divided into 7 parts and it was concluded that the focus of each period was different. According to the findings, the thematic issues that the articles in the field of distance education focus on are specialisation and institutional reinforcement in the period between 1980 and 1984; educational design and educational technologies in the period between 1985-1989; quality assurance in distance education in the period between 1990 and 1994; the first examples of student support and web-based applications in the period between 1995 and 1999; the concept of virtual university in the period between 2000-2004; collaborative learning and web-based communication methods in the period between 2005-2009, and finally interactive learning, MOOC (Massive Open Online Courses) and OER (Open Educational Resources) in the period between 2010-2014 (Zawacki-Richter and Naidu, 2016, p. 245). In their study, Bozkurt et al. (2015, p. 355) where they examined 861 articles published in international journals between 2009 and 2013 found that the most preferred research methods were qualitative, quantitative and mixed methods, respectively, and they concluded that in most of the qualitative studies, case study was the most used method while most of the quantitative studies were surveys and most of the mixed-design studies were exploratory and explanatory. They also determined that interview techniques, document review and observation methods were largely used in qualitative research as data collection methods, while surveys and scales were used in quantitative research. They stated that students attending higher education were selected as the study group, but some studies selected the sample group from the primary education level. In addition, it has been stated that since the field of distance education is an interdisciplinary field, deeper information about the field can be obtained by using multiple research designs instead of certain research designs (Bozkurt et al., 2015, p. 356). In another study on the field, 35 articles published in Türkiye between 2005 and 2011 were examined (Horzum,

Özkaya, Demirci, & Alpaslan, 2013, p. 79). In this context, it was concluded that the number of studies conducted in the field of distance education in Türkiye is quite low compared to those of other countries, that the studies generally consist of quantitative research conducted for the evaluation of the literature, and as a result, studies conducted in distance education in Türkiye should be carried out by following the current trends used in the world literature. In another study examining the studies conducted in Türkiye in the field of distance education, 380 dissertations and master's theses published between 2005 and 2014 were examined. According to the results of this study, more than half of the theses completed between the specified dates were done with quantitative methods while the rest were carried out with qualitative and mixed methods, respectively. It was also found out that survey method was preferred in quantitative research and case study method was preferred in qualitative and mixed research. In terms of sampling methods, it was concluded that while the method was not mentioned in most quantitative studies, purposeful sampling methods were mostly preferred in qualitative studies (Gökmen, et al., 2017, p. 1).

According to a study analysing the focus of studies in the field, it was noted that research in the field of distance education stopped comparing distance education with traditional education, and it was stated that this was a good development for the field (Davies et al., 2010, p. 53). In summary, the studies examining the articles and theses in the field of distance education has focused on the complementary elements and structure of distance education, the methods used in research, and preferred research topics. In an ever-changing and increasingly digital world, digital culture manifests itself in every aspect of daily life. This reality is also valid in education systems. Digital technologies are used intensively at all levels of education, from pre-school education to the end of higher education, and this shifts the expectations from educational institutions to other areas than pure education.

The fact that people begin to encounter new realities every day reflects one of the normal situations of today's world. New realities make it necessary for education systems to equip and train students with different and new competencies. In addition, students can use new developing technologies faster and adapt to these technologies faster. The fact that the ability to adapt to change is also valid for educational institutions in the face of this situation revealed by the change process, guides the reshaping of education policies today.

Within the scope of this study, which aims to reveal the status of studies in the field of distance education before the Covid-19 pandemic, the thematic distribution of master's theses and dissertations

written in the 5 years before the pandemic was discussed in terms of whether they contain the basic elements that should be in a scientific research. As a result of the examination of dissertations and master's theses published in the field of distance education in Türkiye, no review study has been found since 2014. Based on this result, the theses and dissertations covered by the study have been discussed since 2013 in order to be compatible with other studies in the literature. In today's world where technology is rapidly advancing, this study was designed considering the need to examine the latest trends before the pandemic within master's theses and dissertations in order to keep up with the developments in the field and, more importantly, to direct these developments in a scientific context.

The purpose of this research is to evaluate the dissertations and master's theses published between 2013 and 2018, which were themed on distance education in Türkiye and before the Covid-19 outbreak, in the context of their thematic distribution and methodological features and the basic elements that should be present in a scientific research with the purpose of revealing the research tendencies prior the pandemic and In line with this main purpose, the studies were examined under the headings of distribution by universities, distribution by thematic fields, methods, and data collection tools. The theses included in the scope of the study were published between 2013 and 2018, are accessible at the National Thesis Centre of Council of Higher Education (YÖK), and contain the term "distance education" in the title.

In line with the purpose of the study, the following sub-problems have been tried to be answered.

1. What is the distribution of theses according to university and year?
2. What is the thematic distribution of theses?
3. What is the distribution of theses in terms of the basic elements that should be present in scientific research?
   3.1. What is the distribution of theses in terms of method?
   3.2. What is the distribution of theses in terms of data collection tools?

Before working in any scientific field, it is necessary to know the general status of the studies in the literature, which topics are being researched in the field, and which topics need to be researched. This also applies to the field of distance education. Research on the distance education system, which allows learners or distance education participants to study on their own and participate in learning activities at times and places convenient to them and without face-to-face contact with the instructor, is more limited in Türkiye compared to other areas of educational sciences. Therefore, it has been thought that there is a need for a literature review that would provide general and accurate information

about the studies carried out in the field. It is thought that this study will contribute to the field by examining the master's theses and dissertations conducted in the field of distance education in the last 6 years before the Covid-19 outbreak, describing the current situation and revealing the deficiencies, and will help in the selection of topics for future studies. In addition, during the literature review conducted within the scope of the study, since there were no articles or theses examining the studies carried out in the field of distance education since 2014, it was thought that this study would fill this gap in the field and provide complementary and supportive results to other similar studies. Figure 1.1, prepared to show the importance of the study and its place in the literature compared to other studies conducted in the field, is presented below.

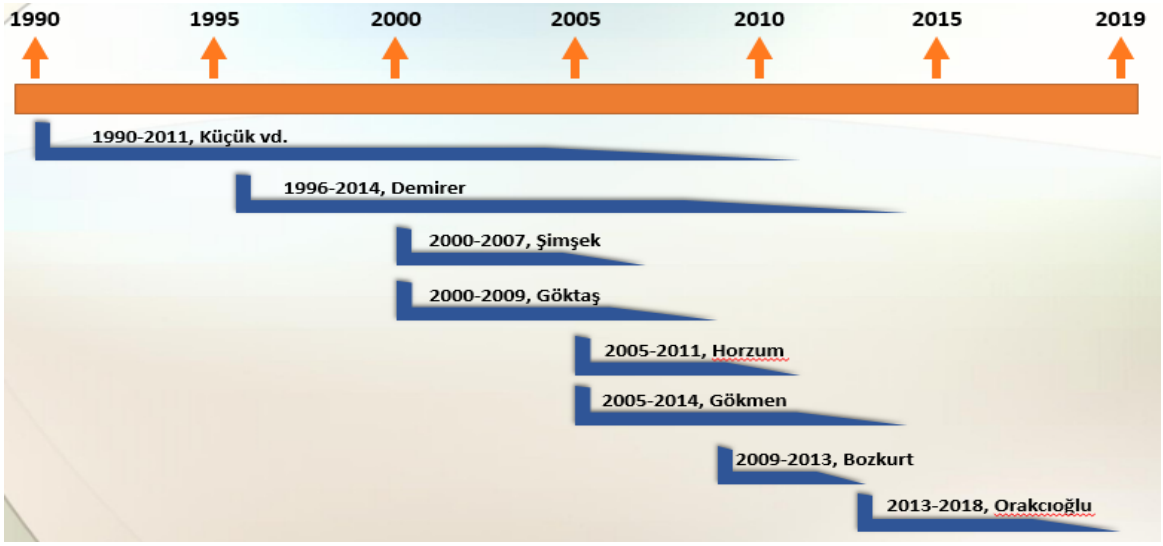

Figure 1. The place of the study within the literature.

Method

Research Model

Qualitative research method was used in this study, which was designed to examine master's theses and doctoral dissertations published in the field of distance education between 2013 and 2018. Document (content) analysis method was used as a qualitative research method. As Bowen (2009, p. 27) defines, document analysis method is an organised way of investigating documents whether on paper or in a digital medium. Analogous to other analytical techniques in qualitative research, document analysis necessitates the scrutiny and interpretation of data to extract significance, enhance comprehension, and build empirical knowledge (Corbin, Strauss, 2008, p. 47). The theses examined in this study were evaluated by the document review method according to the criteria of the data collection tool developed by Demirci, Arıkan and Onuk in 2018 (Eldeleklioğlu Onuk, 2019).

Documents are sources that provide information about the situation or facts to be analysed. Karppinen and Moe (2012, p. 2) stated that, thanks to developing technologies, researchers have the luxury of immediately accessing the information they want, but document review, which is a research method in itself, is not explained sufficiently in textbooks or scientific research, and also stated that the document review method is not only used to reach the necessary resources but also to access real information.

Study Group

The population of the research is the theses and dissertations made in the field of distance education in Türkiye, and the documents are the doctoral studies and master's theses made in the field of distance education in Türkiye between 2013 and 2018 and accessible in the database of the National Thesis Centre of YÖK. Purposive sampling method was used in sample selection. After the research in the database, a total of 35 dissertations and 76 master's theses were found in the field of distance education in Türkiye between 2013 and 2018, with the phrase "distance education" in their titles. Of the 35 dissertations found, 9 were excluded because they did not have access permission or were unfinished, and therefore 24 dissertations were included in the scope of the study. Likewise, 9 of the 76 master's theses scanned were excluded since they did not have access permission or were in the preparation phase, and a total of 65 master's theses were included in the scope of the study, thus 89 documents was reached and included in the study.

Data Collection Tool

In this study, where the document analysis method has been adopted, the 'Academic Publication Evaluation Form', developed by Demirci, Arıtan and Onuk in 2018 (Eldeleklioğlu Onuk, 2019), was used as the data collection tool. This evaluation form, consisting of ten different headings, allows studies to be examined from 52 different perspectives and facilitates in-depth analysis to reveal whether the studies, either thesis or article, have the basic features that a scientific study should have. 10 main headings that make up the Academic Publication Evaluation Form are; 1. Imprint 2. Summary 3. Introduction 4. Method 5. Data collection tool 6. Data analysis 7. Findings 8. Discussion and interpretation 9. Suggestions, and 10. Bibliography.

Data Analysis

Descriptive analysis technique, one of the qualitative analysis techniques, was used to analyse the data obtained. Descriptive analysis is a qualitative data analysis method that allows data collected

using alternative data collection methods to be separated according to pre-designed topics, summarised and then commented on based on this summary information (Özdemir, 2010, p. 336). The 'Academic Publication Evaluation Form' developed by Demirci, Arıtan and Onuk in 2018 (Eldeleklioğlu Onuk, 2019). was used as a criterion, and the data obtained from the studies were recorded in the Microsoft Office Professional Plus Excel 2013 program and examined with the descriptive analysis method, and frequency and percentage information were extracted.

Results

Findings Related to the Distribution of Studies by Universities and Years

After the findings obtained within the study have been analysed, the results are as follows:

Table 1.

Distribution of Dissertations by Universities and Years

Universities	2013		2014		2015		2016		2017		2018		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Anadolu	-	-	2	28.5	-	-	1	100	-	-	-	-	3	12.48
Ankara	2	28.6	-	-	-	-	-	-	1	50	-	-	3	12.48
Atatürk	-	-	1	14.3	1	33.3	-	-	-	-	-	-	2	8.32
Beykent	-	-	-	-	-	-	-	-	-	-	1	25	1	4.16
Çanakkale 18 Mart	-	-	-	-	-	-	-	-	-	-	1	25	1	4.16
Dicle	-	-	-	-	1	33.3	-	-	-	-	-	-	1	4.16
Gazi	1	14.3	-	-	-	-	-	-	1	50	-	-	2	8.32
Hacettepe	-	-	1	14.3	-	-	-	-	-	-	1	25	2	8.32
İnönü	-	-	1	14.3	1	33.3	-	-	-	-	-	-	2	8.32
İstanbul	-	-	1	14.3	-	-	-	-	-	-	-	-	1	4.16
Karadeniz Teknik	1	14.3	-	-	-	-	-	-	-	-	-	-	1	4.16
Marmara	1	14.3	-	-	-	-	-	-	-	-	1	25	2	8.32
Mersin	1	14.3	-	-	-	-	-	-	-	-	-	-	1	4.16
Sakarya	-	-	1	14.3	-	-	-	-	-	-	-	-	1	4.16
Selçuk	1	14.3	-	-	-	-	-	-	-	-	-	-	1	4.16
Total	7	100	7	100	3	100	1	100	2	100	4	100	24	100

When Table 1, which constitutes the first sample of the study and shows the distribution of doctoral dissertations completed between 2013 and 2018 by university and year, is examined, it is seen that the studies on the field of distance education were made in 15 universities and 24 dissertations were made from 2013 to the end of 2018. Again, looking at the data in Table 1, it is understood that the years in which the most dissertations were made in the field of distance education on a yearly basis were 2013 and 2014, with 7. There was a decrease in the number of studies in the following years, but in later years, the number has started to trend slightly upward. When we look at the universities where the highest number of dissertations were conducted between 2013 and 2018, Anadolu University and Ankara University are in the first place with three studies each. These two universities are followed by Atatürk, Gazi, Hacettepe, İnönü and Marmara Universities with two studies each. Again, according to Table 1, the years in which the fewest studies were carried out in the field since 2013 were 2016 and 2017. While 2 dissertations were made in 2017, only 1 doctoral thesis was made in 2016. The distribution of 65 master's theses, which constitute the other sample group of the study by university and years is given in Table 2.

When Table 2 is examined, which shows the distribution of master's theses made in the field of distance education between 2013 and 2018, which constitute the other sample group of the study, by university and year, it is seen that a total of 65 theses were made in 35 universities in the specified date range. Looking at the data given in Table 2, it could be observed that the year in which the most theses were prepared in the field of distance education on a yearly basis was 2018, with 14, and the year in which the least theses were made was 2017, with 5. At the time of this study, a master's thesis from 2019 was found and the relevant data belongs to April 2019. Since there is a possibility that master's theses related to the field will be made by the end of the year, 2019 is not mentioned as the year in which the fewest theses were made, although the number of theses seems to be 1.

Again, when the data in Table 2 is examined, it is seen that the university with the highest number of master's theses in the field of distance education since 2013 is Gazi University with 8 theses, followed by Hacettepe University with 5 theses and Kırıkkale University with 4 theses.

The findings related to the distribution of the studies have been provided below.

Table 2.

Distribution of Master's Theses by Universities and Years

Universities	2013		2014		2015		2016		2017		2018		2019		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Abant İzzet Baysal	-	-	-	-	-	-	1	11.11	-	-	1	7.14	-	-	2	3.07
Afyon Kocatepe	-	-	-	-	-	-	1	11.11	-	-	2	14.28	-	-	3	4.61
Anadolu	2	16.66	-	-	-	-	-	-	1	20	-	-	-	-	3	4.61
Atatürk	-	-	-	-	1	9.09	-	-	-	-	-	-	-	-	1	1.54
Beykent	-	-	-	-	-	-	-	-	1	20	-	-	-	-	1	1.54
Boğaziçi	-	-	-	-	-	-	-	-	-	-	1	7.14	-	-	1	1.54
Bülent Ecevit	1	8.33	-	-	-	-	-	-	-	-	-	-	-	-	1	1.54
Çukurova	-	-	-	-	1	9.09	-	-	-	-	-	-	-	-	1	1.54
Dokuz Eylül	-	-	-	-	-	-	-	-	1	20	1	7.14	-	-	2	3.07
Düzce	-	-	-	-	-	-	1	11.11	-	-	-	-	-	-	1	1.54
Ege	2	16.66	-	-	-	-	-	-	-	-	-	-	-	-	2	3.07
Eskişehir Osmangazi	-	-	1	7.69	-	-	-	-	-	-	-	-	-	-	1	1.54
Fırat	1	8.33	-	-	-	-	-	-	-	-	-	-	1	100	2	3.07
Gazi	-	-	6	46.15	1	9.09	-	-	-	-	1	7.14	-	-	8	12.32
Hacettepe	-	-	-	-	2	18.18	-	-	-	-	3	21.42	-	-	5	7.7
İnönü	-	-	-	-	-	-	-	-	-	-	1	7.14	-	-	1	1.54
İstanbul	-	-	1	7.69	1	9.09	-	-	-	-	-	-	-	-	2	3.07
İstanbul Aydın	-	-	-	-	-	-	1	11.11	-	-	-	-	-	-	1	1.54
İstanbul Kültür	1	8.33	-	-	-	-	1	11.11	-	-	-	-	-	-	2	3.07

Table 2. (Continued)

Distribution of Master's Theses by Universities and Years

Universities	2013		2014		2015		2016		2017		2018		2019		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Kahramanmaraş Sütçü İmam	-	-	1	7.69	-	-	-	-	-	-	-	-	-	-	1	1.54
Karabük	-	-	1	7.69	-	-	-	-	-	-	-	-	-	-	1	1.54
Karadeniz Teknik	-	-	2	15.38	1	9.09	-	-	-	-	-	-	-	-	3	4.61
Kırıkkale	1	8.33	-	-	1	9.09	1	11.11	-	-	1	7.14	-		4	6.16
Maltepe	1	8.33	-	-	-	-	-	-	-	-	-	-	-	-	1	1.54
Marmara	-	-	-	-	-	-	-	-	2	40	-	-	-	-	2	3.07
Muğla Sıtkı Koçman	-	-	-	-	-	-	-	-	-	-	1	7.14	-	-	1	1.54
Ondokuz Mayıs	-	-	-	-	-	-	2	22.23	-	-	-	-	-	-	2	3.07
Ortadoğu Teknik	-	-	1	7.69	-	-	-	-	-	-	-	-	-	-	1	1.54
Sakarya	2	16.66	-	-	-	-	-	-	-	-	1	7.14	-	-	3	4.61
Selçuk	-	-	-	-	-	-	-	-	-	-	1	7.14	-	-	1	1.54
Trakya	1	8.33	-	-	-	-	-	-	-	-	-	-	-	-	1	1.54
Turgut Özal	-	-	-	-	1	9.09	-	-	-	-	-	-	-	-	1	1.54
Yaşar	-	-	-	-	-	-	1	11.11	-	-	-	-	-	-	1	1.54
Yıldız Teknik	-	-	-	-	1	9.09	-	-	-	-	-	-	-	-	1	1.54
Yüzüncü Yıl	-	-	-	-	1	9.09	-	-	-	-	-	-	-	-	1	1.54
Total	12	100	13	100	11	100	9	100	5	100	14	100	1	100	65	100

Findings Related to the Thematic Distribution of Studies

The data related to the thematic distribution of dissertations within the research are as follows:

Table 3

Findings Related to the Thematic Distribution of Dissertations

Thematic Fields	**n**	**%**
Evaluation of distance education centres and programs	2	8.33
Using distance education methods in in-service training	1	4.17
Quality standards and marketing strategies in distance education	2	8.33
Factors affecting student success in distance education	8	33.33
Adaptation processes to distance education	1	4.17
Management of distance education	1	4.17
Web-based distance education applications	9	37.5
Total	24	100.00

When Table 3, which lists the study areas of dissertations written in the field of distance education from 2013 to 2019, is examined, it could be observed that the studies mostly examined web-based distance education applications with 37.50% (n = 9). Following this, factors affecting student success in distance education were chosen as the study area with 33.33% (n=8). There are quite large differences in the thematic distribution of other doctoral studies written during the years covered by the study, with 8.33% (n=2) evaluating distance education centres and programs and 8.33% (n=2) evaluating distance education centres and programmes and focusing on quality standards and marketing strategies in education. The remaining studies were planned on the use of distance education methods in in-service training, adaptation processes to distance education and management of distance education, each with a share of 4.17% (n = 1).

The thematic distribution of master's theses has been provided in the table below.

Table 4

Findings Related to the Thematic Distribution of Master's Theses

Thematic Fields	**n**	**%**
Opinions of students and faculty members about distance education	1	1.54
Students' opinions about distance education	13	20
Opinions of teachers or instructors about distance education	6	9.23
Comparison of distance education and other teaching methods	3	4.61
Using distance education methods in in-service training	2	3.07
Factors affecting student success in distance education	10	15.39
Development of new applications and software in distance education	14	21.54
Reasons for leaving distance education	1	1.54
Adaptation processes to distance education	1	1.54
Management of distance education	5	7.69
Web-based distance education applications	9	13.85
Total	65	100.00

When Table 4, which shows the thematic distribution of master's theses, is examined, studies carried out for the development of new applications and software in distance education have a share of 21.54% (n = 14) in all studies. 20% (n=13) of the studies have examined students' opinions about distance education, 15.39% (n=10) have examined factors affecting student success in distance education, and 13.85% (n=9) have examined web-based distance education applications. While 9.23% (n=6) have examined the opinions of teachers or faculty members about distance education, 7.69% (n=5) have examined the methods on the management of distance education. In the remaining studies, 4.61% (n=3) have compared distance education with other teaching methods while 3.07% (n=2) have conducted research on the use of distance education methods in in-service training. Last 3 studies which each has 1.54% among the group have been conducted on the opinions of students and faculty members about distance education (n=1), the reasons for leaving distance education (n=1), and the adaptation processes to distance education (n=1). Accordingly, the thematic area on which master's theses in the field of distance education has been most concentrated since 2013 has been the development of new applications and software in distance education with 21.54% (n = 14).

Findings Related to the Method of the Studies

The findings related to the method of the dissertations included in the study have been provided in the Table 5.

Table 5

Findings Related to the Method of Dissertations

Method		**n**	**%**
Sample Selection Technique	Purposeful	20	83.33
	Simple Random	1	4.17
	Stratified	1	4.17
	Tried to reach all	2	8.33
	Unspecified	-	-
	Total	24	100
Method is specified.	Yes	21	87.5
	No	3	12.5
	Total	24	100
If the model is specified, the study is…	Qualitative	6	25
	Quantitative	8	33,33
	Mixed	7	29.17
	Unspecified	3	12.5
	Total	24	100
Qualitative Research Design	Case Study	5	83.33
	Ethnography	1	16.67
	Total	6	100
Quantitative Research Design	Descriptive	1	12.5
	Relational	3	37.5
	Field Test	4	50
	Total	8	100
Mixed Research Design	Explanatory Sequential	1	14.29
	Multistage	1	14.29
	Embedded	2	28,57
	Exploratory Sequential	2	28,57
	Convergent Parallel	1	14,29
	Total	7	100

When we look at the sample selection technique used in theses, it is seen that the studies using purposeful sampling have a rate of 83.33% (n = 20). While an attempt was made to reach the entire population in 8.33% of the studies (n=2), simple random (n=1) and stratified sampling (n=1) methods were also preferred in 4.17%. Accordingly, it is seen that the most preferred sampling method in the

dissertations within the scope of the study is purposeful sampling. It is seen that the research method is clearly stated in 87.5% (n=21) of the doctoral studies examined within the scope of the research. Of these studies with clearly stated methods, 33.33% (n=8) were conducted using quantitative, 29.17% (n=7) mixed, and 25% (n=6) qualitative research methods. Studies where the research method is not specified have a rate of 12.5% (n = 3). Considering the distribution of qualitative research designs, which have a rate of 25% (n = 6) among the doctoral studies included in the study, case studies have a rate of 83.33% (n = 5), while one ethnography study has a rate of 16,67% (n = 6). In the distribution of quantitative research designs, field tests have a preference rate of 50% (n = 5), while 37.5% (n = 3) of the studies are in the relational survey model and 12.5% (n = 1) are descriptive. Among the mixed research designs that constitute 29.17% (n=7) of the studies within the scope of the research, embedded (n=2) and exploratory sequential (n=2) research models are the two most preferred methods with 28.57% each. While exploratory sequential (n=1), multistage (n=1) and convergent parallel (n=1) models are the other preferred methods with rates of 14.29% each. The findings related to the method of the master's theses included in the study have been provided in the Table 6.

Table 6

Findings Related to the Method of Master's Theses

Method		**n**	**%**
Sample Selection Technique	Purposeful	40	61.54
	Random	1	1.54
	Stratified	2	3.08
	Tried to reach all	10	15.38
	Unspecified	12	18.46
	Total	65	100
Method is specified..	Yes	43	66.15
	No	22	33.85
	Total	65	100
If the model is specified, the study is…	Qualitative	10	15.38
	Quantitative	25	38.46
	Mixed	8	12.31
	Unspecified	22	33.85
	Total	65	100

Qualitative Research Design	Case Study	8	80
	Phenomenology	1	10
	Action	1	10
	Total	10	100
Quantitative Research Design	Descriptive	9	36
	Secondary Data	1	4
	Relational	8	32
	Internet Experiments	3	12
	Laboratory Tests	2	8
	Field Tests	2	8
	Total	25	100
Mixed Research Design	Explanatory Sequental	2	25
	Embedded	1	12.5
	Convergent Parallel	2	25
	Unspecified	3	37.5
	Total	8	100

In terms of sample selection techniques, it is understood that while purposeful sampling method was used in 61.54% (n=40) of the studies, an attempt was made to reach the entire population in 15.38% (n=10). While stratified and random sampling methods were preferred in 3.08% (n=2) and 1.54% (n=1) of the studies, respectively, the rate of studies without a sample selection technique was found as 18.46% (n=12).

While the research model adopted was stated in 66.15% (n=43) of the theses analysed within the scope of the study, it is seen that the proportion of studies in which the research model was not specified was 33.85% (n=22). Among the research models adopted, quantitative research has a share of 38.46% (n = 25) while qualitative research has a share of 15.38% (n=10) and mixed research models has a share of 12.31% (n = 8).

Among the adopted qualitative research models, the case study design has a rate of 80% (n = 8), while other preferred qualitative research designs are phenomenology (n = 1) and action research (n = 1) with a share of 10%.

While 36% (n=9) of the quantitative studies were designed in the descriptive survey model, relational survey models have a preference rate of 32% (n=8). While internet experiments constituted 12% (n=3) of quantitative research, laboratory (n=2) and field tests (n=2) were also preferred with

2% each. Studies that use the secondary data approach in their analysis have a rate of 1% (n = 4) among quantitative studies.

In studies designed in the mixed research model, which constituted 12.31% (n = 8) of the theses within the scope of the study, exploratory sequential (n = 2) and convergent parallel (n = 2) methods were the most preferred designs with a rate of 25% each, while 12.5% (n=1) of the mixed method studies were conducted using the embedded method. In 37.5% (n=3) of the mixed model studies within the scope of the study, the adopted research model was not mentioned.

Findings Related to the Data Collection Tools of Studies

The data obtained as regards the data collection tool of the dissertations have been provided in Table 7 below.

Table 7

Findings Related to the Data Collection Tools of Dissertations

Method		**n**	**%**
Data Collection Tool	Survey	10	41.67
	Archive Research	1	4.17
	Interview	1	4.17
	Document	6	25
	Focus Group	2	8.33
	Scale	7	29.17
	Audio-Visual	2	8.33
	Tests	5	20.83
	Semi Structured Interview	7	29.17
	Structured Interview	1	4.17
Validity and reliability specified?	Yes	17	70.83
	No	7	29.17
	Total	24	100

When we look at the data in Table 7, which shows the findings of the data collection tools used in the doctoral dissertations examined within the scope of the study, it could be observed that the survey method (n=10) was mostly used as a data collection tool with a rate of 41.67%, followed by scale (n=7) and semi-structured interviews (n=7) with a rate of 29.17% for each.

While the document review method was used in 25% of the studies (n = 6), data collection by testing was used in 20.83% (n = 5) of the studies. Focus group interviews and examination of audio (n=2) and visual materials (n=2) were preferred as a method in 8.33% of the studies. As data collection tools, archive research (n=1), direct interview (n=1) and structured interview (n=1) techniques are seen to be preferred in a small number with a rate of 4.17% for each.

It was observed that the validity and reliability levels of the data collected were stated in 70.83% (n=17) of the studies within the scope of the study, but in 7 studies corresponding to 29.17%, the validity and reliability of the data were not mentioned.

The data collection tools of master's theses examined within the study has been presented in Table 8 below.

Table 8

Findings Related to the Data Collection Tools of Master's Theses

Method		**n**	**%**
Data Collection Tool	Survey	21	32.31
	Archive Research	2	3.08
	Interview	1	1.54
	Document	6	9.23
	Focus Group	1	1.54
	Scale	16	24.61
	Audio-Visual	3	4.62
	Tests	4	6.15
	Semi Structured Interview	10	15.38
	Non-structured Interview	1	1.54
	Structured Interview	3	4.62
	Unspecified	8	12.31
Validity and reliability specified?	Yes	32	49.23
	No	33	50.77
	Total	65	100

According to Table 8, where the findings regarding the data collection tools of the master's theses within the scope of the study are given, while researchers preferred to use surveys as a data collection tool in 32.31% (n=21) of the master's theses conducted in the field of distance education

between 2013 and 2019, this was followed by a rate of 24.61% (n=16) of scale use. The scales are followed by semi-structured interviews with a rate of 15.38% (n = 10).

Document analysis method was used by 9.23% (n=6) of the studies as a data collection tool, while tests, respectively, with a preference rate of 6.15% (n=4) and 4.62% (n=3). Audio and visual materials and structured interviews were used at a rate of 4.62% (n=3). While archive research method was preferred as a data collection tool in 3.08% (n=2) of the studies, interview (n=1), focus group interview (n=1) and non-structured interviews were the last methods preferred with a ratio of 1.54% (n=1) for each. In addition to all these, it was not explained which type of data collection tool was used in 12.31% (n = 8) of the studies.

When we look at the rates of specifying the validity and reliability of the data collected within the scope of the studies, it is noticeable that no validity and reliability studies are mentioned in 50.77 of the theses (n = 33).

Discussion and Conclusion

Within the scope of the study, 24 dissertations and 65 master's theses in the field of distance education between 2013 and 2018 were examined, and it was seen that the theses generally included the basic elements of scientific research, with a few exceptions.

When looking at the thematic distribution of theses, it has been concluded that there were two popular topics. It could be stated that this situation is directly proportional to technology, which is advancing day by day, and digital transformation studies that have begun to be implemented almost everywhere in the world, including the field of educational sciences. It has been observed that another popular topic is related to distance education students. Since the target audience of distance education applications is directly students, this result shows that the studies are carried out for the right purpose.

Within the scope of the study, the basic scientific elements that should be included in the studies have also been investigated using the ‘Academic Publication Evaluation Form’. It has been observed that the studies, whether dissertations or master's theses, generally contain the basic elements of scientific studies. The situations revealed as a result of the analysis are given on the following pages.

According to the research results, 24 (26.97%) of the 89 theses made at 15 universities in the field of distance education from 2013 to April 2019 are dissertations, and the remaining 65 (73.03%) are master's theses. While the doctoral studies examined within the scope of the study were made in 15 universities, the master's theses were made in 35 universities. While the most productive years in

terms of dissertations were found as 2013 and 2014 with 7 theses each, the most productive year in terms of master's theses was 2018 with 18 theses. It could be stated that the reason for this increase in master's theses during the specified period is the increasing awareness about the concept and programs of distance education as a necessity of the age. When we look at the universities where theses on the field of distance education were published, Anadolu University and Ankara University were the universities with the most theses published in the field, with 3 theses each for dissertations, and Gazi University with 8 theses for master's theses.

It was determined that the most discussed topic in the thematic distribution of dissertations written in the field of distance education between 2013 and 2018 was web-based distance education applications. Digital transformation, which is the holistic transformation carried out by organisations in human, business processes and technology elements in order to provide more effective and efficient service and ensure beneficiary satisfaction, in line with the opportunities offered by rapidly developing information and communication technologies and changing social needs, which countries have started to do in macro and micro sense, has gained momentum. Today, the fact that doctoral studies about distance education applications, which essentially means digital transformation in education in itself, have mostly focused on this thematic area in recent years, means that the studies follow the innovations and developments brought by the age and use web-based versions, which are the latest evolved form of distance education today.

It has been determined that the second most frequently discussed topic after web-based distance education applications is the factors affecting student success in distance education. The reason why identifying the factors affecting the success of students or learners who constitute the direct target audience of distance education, or in other words, the customer portfolio, may be to find out how effective distance education applications, which are very different in structure from traditional education applications, are in achieving success.

The subject that was most examined and thematically emphasised in the master's theses within the scope of the study was the development of new applications and software in distance education. The fact that master's theses mostly deal with this subject, which is a choice that overlaps with digital transformation activities, proves that distance education applications can be delivered to students in many alternative ways, different from traditional education methods. The second most frequently discussed topic in master's theses is to reveal students' opinions about distance education, and in

choosing this theme, it may be aimed to reveal the thoughts of students or learners in the target audience about distance education, which is a different educational practice in itself.

According to the Academic Publication Evaluation Form used as the analysis tool of the study, the main elements expected to be expressed from scientific research in the method sections are the research method, study population, sample and model, and the explanation of the sub-headings of these headings.

It was observed that the method sections of the dissertations examined within the scope of the study contained the basic elements that should be in the method section of a scientific research, with a general average of 95.83%. As a result of the analysis, it was concluded that the most preferred sample selection technique in doctoral studies is purposeful sampling. According to Patton (1990, p. 169), the logic and power of purposeful sampling comes from the fact that it allows the selection of the sample group that is richest in terms of information in research. Information-rich sample groups also allow obtaining in-depth information about the issues underlying the research purpose. This wealth of information provided by purposeful sampling has enabled the theses within the scope of the study to benefit most from this technique.

According to the analysis made in terms of research models, it was concluded that qualitative, quantitative and mixed methods were preferred with very close percentages. However, when looking at the types of research models, it was observed that some models outweighed others. Case studies in qualitative research models, field experiments in quantitative research models, and embedded and exploratory sequential designs in mixed models have come to the fore as the most preferred research models.

When the method sections of master's theses were examined, it was concluded that they had the characteristics that should be in a scientific research, with a general average of 76.53%. However, the striking result here is that the research model was not mentioned at all in 33.85% of the master's theses within the scope of the study. It is an interesting result that the research model is not mentioned in scientific studies that aim to reveal existing or existing events or situations from a scientific perspective.

Among the studies with specified models, quantitative research models predominate in master's theses, in contrast to the almost equal distribution in dissertations. This was followed by qualitative models and then mixed models. Among the adopted qualitative models, the case study stands out as

the most preferred model while in quantitative research, the descriptive model, followed closely by the relational model, and were found as the most used research designs. In mixed research designs, exploratory sequential and convergent parallel designs were the designs frequently used by researchers.

As the data collection tool, researchers preferred the survey method in both dissertations and master's theses. Surveys, which aim to obtain opinions on various research topics from participants of a pre-defined group, have become effortless today as they are mostly conducted via the internet or e-mails, and thus have become the most preferred data collection tool by researchers. Other data collection tools preferred by researchers are scales, document review and semi-structured interviews, respectively.

While the validity and reliability of the data collected within the scope of dissertations are generally stated in the studies, these levels were not mentioned in more than half of the master's theses.

According to the research results, 24 (26.97%) of the 89 theses made at 15 universities in the field of distance education between 2013 and 2018 are dissertations, and the remaining 65 (73.03%) are master's theses. Davies, Howell and Petrie (2010; pp. 42-56) and Gökmen et al. (2017, p. 1-25) concluded in their research that master's theses are more numerous in the field of distance education. The reasons for this situation can be described as the low number of doctoral programs opened, the admission requirements for the program being more stringent than those for master's programs, and the shorter duration of master's programs, according to Gökmen et al. (2017, pp. 1-25). It could be stated that this result obtained within the scope of the study overlaps with the results in the literature. When we look at the distribution of theses by years, it is seen that dissertations in the field of distance education have entered a downward trend since 2014, the same is true for master's theses; however, master's theses then entered an increasing trend and reached their largest volume in 2018. As the reason for this decrease since 2014 was determined by Gökmen et al. (2017, p. 1-25), new focal points have emerged in the field of distance education and educational technologies, and as the possibilities of providing distance education with mobile devices have been discussed, studies have focused on developing new programs or software.

When we look at the distribution of the universities where the studies were carried out, it is seen that Anadolu University and Ankara University take the lead in dissertations. Anadolu University is the institution that initiated distance education activities in Türkiye with its Open Education Faculty,

which has been operating since 1982, and therefore it is understandable that its name comes first in doctoral studies. Ankara University, on the other hand, provides distance education services in many areas needed by students, from associate degree programs to bachelor's degree completion, from non-thesis master's programs to certificate services, through the Distance Education Centre (Ankara University, 2019). When we look at the situation in master's theses, it is seen that Gazi University is clearly leading. The reason for this situation is that the theses published in the field of distance education at this university are published within both the education institute and the informatics institute, and as stated by Gökmen et al. (2017, p. 1-25), there are many program alternatives for doctoral and master's studies.

In their study where they examined 308 doctoral studies and master's theses published in the United States in the field of distance education between 1998 and 2007, Davies et al. (2010; p.42-56) concluded that the number of theses investigating the use of new technology is decreasing; however, although the field of distance education is a relatively new field in Türkiye compared to other countries, the number of studies investigating the use of new technologies in education is quite high.

When looking at the distribution of theses in terms of research methods, it was seen that quantitative research was preferred, qualitative research came second, and mixed research was preferred last. The same conclusion was reached in other studies in the literature (Berge & Mrozowski 2001, p. 9; Davies et al. 2010, p. 50; Gökmen et al. 2017, p. 18), which are similar to this study in terms of method and content, emphasising the validity of the research results. The reasons why theses on distance education are designed in the quantitative research model are that the quantitative research methodology can be applied in a shorter time compared to qualitative research, activities such as observation or document review that need to be done in qualitative research are time-consuming, and data collection tools such as the scale or survey used in quantitative research methods are able to provide greater convenience to the researcher in terms of application and being able to be filled out via e-mail or websites. As Gökmen et al. (2017, p. 18) indicated, since the most preferred research method in scientific research in our country is quantitative research, it was an expected result that the mostly preferred research method in the theses within the scope of the study was the quantitative method.

The result that the most preferred design in the context of research methods is scanning in quantitative research and case study in qualitative research is in line with the results of the literature (Berge & Mrozowski 2001, p. 9; Davies et al. 2010, p. 50-51; Gökmen). et al. 2017, p. 19).

Quantitative survey designs, which enable the analysis of the current situation at any time and condition in line with a designed research method, are easier to carry out in the context of application compared to experimental designs, and therefore their preference rates are high. Among the possible reasons why the case study is the most preferred design in qualitative research is that it consists of only interpreting and analysing an existing situation. In the work titled "Qualitative research through case studies" written by Travers (Act. Yin, 2008, p.59), case study is defined as the method used to deeply examine and comprehensively analyse new, unknown or previously unexamined phenomena or situations. It can be said that the theses within the scope of the study preferred the case study design as a result of their efforts to examine a feature of distance education that has not been studied before. In addition to all these, the rate of studies that do not mention the research designs adopted within the scope of the studies is close to half. On the other hand, when mixed design studies were examined, it was seen that embedded, exploratory sequential and explanatory sequential research designs are used. However, these mixed research designs were generally not explained by the author of the research, and as a result of the analysis, it was found out what kind of design it actually was. Most researchers using mixed research designs used both quantitative and qualitative data in their studies but presented both data as results without specifying the adopted design. Based on this result, more emphasis should be given to the scientific research methods course in which research designs are explained within the curriculum the institutes have and as Gökmen et al. (2017, p. 19) indicated, it could be said that mixed designs should also be explained separately.

It was observed that the studies examined within the scope of the study used purposeful sampling as the sample selection technique, regardless of qualitative or quantitative model, with a big difference compared to other techniques. The main purpose of this selection is in the nature of the purposeful sample selection technique. Büyüköztürk et al. (2016, p. 100) stated that purposeful sampling is used to examine in detail the situations that constitute a rich source of information. Based on this definition, the generally preferred sample group within the scope of the studies was distance education students or instructors teaching distance education courses, as they were seen as a quite sufficient source of information. Similarly, the fact that purposeful sampling is the generally preferred technique in studies in the field of distance education (Gökmen et al. 2017, p. 19) supports the result of the study.

The fact that the theses and dissertations analysed within the study mostly used surveys and then scales as the data collection tools coincides with the results of other studies (Davies et al. 2010, p. 50, Bozkurt et al. 2015, p. 347; Gökmen et al. 2017, p. 19). The rates of stating the validity and

reliability of the data collected within the scope of the studies were measured as 70.83% for doctoral theses and 49.23% for master's theses. In the study of Şimşek et al. (2009, p. 948) in which 259 master's theses published in the field of educational technology in Türkiye between 2000 and 2007 were examined, although it was concluded that the theses had significant deficiencies, especially in terms of internal and external validity, the validity and reliability degrees were mentioned in more than half of the dissertations and in approximately half of the master's theses, and the fact that Gökmen et al. (2017, p.21) reached similar results is an indication that these deficiencies in the studies have begun to be eliminated in recent years.

Recommendations

According to the results of this research, in which 89 dissertations and master's theses, which were conducted in the field of distance education in Türkiye between 2013 and 2018, were open to access and had the word distance education in their titles, were examined in terms of their demographic and methodological characteristics and the basic features that should be present in a scientific research, it was concluded that the studies were mostly conducted for the analysis of the current situation in the quantitative scanning model, and students were largely selected with the purposeful sampling method who were subject to distance education. While 24 doctoral dissertations have been written in the field of distance education since 2013 until the end of 2018, this number increases to 65 in master's theses. Nowadays, when digital transformation studies are gaining momentum and all barriers in education are being eliminated, it may be recommended to increase the number of doctoral theses that can be considered more scientifically qualified in the field of distance education and to encourage doctoral students to work in this field. The fact that the studies are mostly quantitative and that surveys and scales are used as data collection tools and that these surveys are generally sent to the participants via e-mail or websites poses the risk of not fully reflecting the opinions of the participants. Since filling out survey e-mails is an undesirable activity for anyone to do, it may be necessary to focus on qualitative studies. The theses included in the scope of the study were master's theses and dissertations published in the Thesis Centre of the Council of Higher Education (YÖK), open to access and containing the phrase ‘distance education’ in their title. Future studies may include other studies related to the field of distance education, even if the term distance education is not included in the title. It is also recommended to carry out such kind of research on the post Covid era to fully understand how the research tendencies have evaluated and MA and PhD students may also carry out their studies on topics that has not fully investigated yet.

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The Relationship between Conflict Management Styles of School Principals and Teachers' Cynicism Levels

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Abstract. The aim of this research is to determine the relationship between the conflict management styles of school principals and the organizational cynicism levels of teachers according to the perceptions of teachers. Relational screening model was used in the study. The universe of the study consists of 1150 teachers working in Maltepe district of Istanbul in the 2021-2022 academic year. The sample selected by random sampling was composed of 288 teachers. In the study, as data collection tools, the Conflict Management Styles Scale was used to determine the conflict management styles of school principals and the Organizational Cynicism Scale for Teachers was used to determine the organizational cynicism levels of teachers. The research revealed that, according to the perceptions of the teachers, the school principals used the highest level of integrating style as the conflict management style, then the compromising, avoiding, obliging styles respectively and the lowest level of dominating style. It was determined that the organizational cynicism levels of the teachers were at the "intermediate level". As a result of the research, a weak negative significant correlation was revealed between the conflict management styles of school principals and the organizational cynicism levels of teachers. When looked at in the context of conflict management styles, a moderately negative significant relationship emerged between integrating style and organizational cynicism, a moderately positive relationship with dominating style, and a weakly negative relationship with compromising style and compromising style. There was no statistically significant correlation between avoiding style and organizational cynicism.

Keywords: Conflict, conflict management styles, cynicism, organizational cynicism.

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The success of the organization largely depends on the attitudes of the e organization members towards their organizations. The existence of problems in the organization may cause organization members to have some negative attitudes towards their organizations. The concept of organizational cynicism consists of the negative attitudes that organization members develop towards the organization (Kalağan & Güzeller, 2017, p.83). Although the concept of cynicism was introduced by Socrates' student Antisthenes (444-365 BC), this concept became known to Antisthenes' student Diogenes of Sinop. It is thought that the concept of cynicism may have come from Cynosarges, a town near Athens where the schools of the cynics were located, or from the Greek word "kyon", which means dog. Although the concept of cynicm has been referred to by different terms such as "cynic" and "cynical" for centuries, it has generally been used as "cynicism" in English and foreign literature (Dean et al., 1998, p.342). In the Oxford English Dictionary, the concept of cynicism is defined as "a person who tends not to believe in the sincerity or goodness of the motives and actions of individuals and expresses this tendency in a sarcastic and acrimonious way, a faultfinder". In professional life, cynical individuals use humor a lot to criticize their organizations that they despise and to attract people's attention. Cynical individuals behave in various manners such as resentment, sarcastic gestures, secret comments, insults, insinuations. (Dean t al., 1998, p.342; Mathur et al., 2013, p.63).

According to Mathur et al. (2013, p.63), organizational cynicism is a negative attitude that involves individuals moving away from the organization as a result of believing that it is not honest and will always try to deceive its organization members. Organizational cynicism emerges when organization members do not trust their organization and feel that the organization cannot be trusted. Definitions of organizational cynicism are often associated with emotions such as disappointment and anger (Durrah et al., 2019, p. 4). Abraham (2000, p. 269-270) states that in organizational cynicism, the principles of honesty, justice and sincerity are sacrificed for the sake of the managers' own interests, which leads to hidden motives and deceptive behaviors. Cynicism in the organization can be intended for all targets in the organization, including organizational culture, superiors, subordinates, and the role of the individual, external parties such as suppliers or customers, and colleagues. Researchers have noted that in modern workplaces cynicism is prevalent. It is seen that there have been many studies on organizational cynicism in recent year’s studies. This situation may be an indicator for the cynical attitudes of the workers in the organization have reached an important level. In addition, it can be said that it is important for organizations to identify and eliminate

organizational cynicism attitudes and elements that cause organizational cynicism in their organizations in order to have efficient and motivated organization members.

Cynical organization members think that the management of the organization that they work for is not honest, that other organization members want to make use of them and that they are not treated fairly. It is known that the cynical organization member is pessimistic about the success of the changes made in the organization. In addition, it is believed that cynical workers will tend to think that the possibility of failure of change attempts may be due to the inadequacy and laziness of those who propose change (Eaton, 2000, p.3). Such beliefs and feelings can harm organizations and become a limiting factor for organizations in achieving their goals. Cynical workers are often frustrated, despair, and do not believe in their organization (Abraham, 2000, p.270). In addition, it is thought that the unsuccessful change efforts in the past in organizations, the inadequate information about the change to be made, and the belief that the change efforts will be waste of effort cause cynicism to rise (Khan, et al., 2016, p. 142).

Organizational cynicism has three dimensions: cognitive, emotional, and behavioral. The cognitive dimension defines the belief that organization members are individuals who are dishonest, untrusted, lazy, and think only of their own interests (Cook & Medley, 1954, act. Camgöz et al., 2017, p.42); the emotional dimension defines the emotional reactions towards the organization (psychological reactions such as tension, anxiety) (Durrah et al., 2019, p.4); the behavioral dimension defines the critical discourses and negative behaviors in the organization (Abraham, 2000, p.270). In addition, five main conceptualizations characterize the literature on cynicism. These are personality (general) cynicism, social (institutional) cynicism, employee (worker) cynicism, organizational change cynicism and professional (business) cynicism (Dean et al., 1998, pp. 342-343). Personality cynicism, also called general cynicism, is defined as the common characteristic of emotionally exhausted people who have a very weak relationship with other people and who exhibit a cruel and cynical attitude towards other people. Individuals with cynical personality believe that there is no one left in the world who is trustworthy and has strong value judgments, and that the world is dishonest, scheming, selfish and indifferent (Chiaburu et al., 2013, p.5; Matteson & Miller, 2013, p.55). Communal, institutional, or social cynicism states the fact that individuals do not trust the governments and institutions of their own state. Social cynicism generally means having negative feelings towards society (Durrah et al., 2019, p.4). Employee cynicism states the results of individuals' behaviours and negative attitudes of employees. Employee cynicism often targets organizations, managers of organizations, and other elements in the organization, and involves the

employee's negative feelings such as underestimation, despair and frustration with the elements they are targeting. (Durrah et al., 2019, p.4; Dean et al., 1998, p.344). Stanley et al. (2013, p.435) define organizational change cynicism as employee's disbelief in the stated motives of his or her management for any organizational change. Professional cynicism or business cynicism means the loss of faith in the individuals in the organization, the happiness of serving the organization and the pride felt for the work done (Qian, 2007, p.7).

Cynical individuals who believe that people are insecure and liars, who perceive many things negatively, are expected to be in constant conflict with others (Boz, 2016 p.63). However, although cynical attitudes are the source of conflict, the way individuals approach conflicts with others are also a factor in the development of cynical attitudes. Particularly in conflicts between the manager and the people managed, managers' conflict management styles can positively or negatively affect the development of cynical employees' cynical attitudes (Gökçe et al., 2017; Chiaburu et al., 2013; Yılmaz and Şencan, 2018). This makes it important to focus on the impact of the manager's conflict management style or strategies on employee cynicism.

"Conflict is a social phenomenon that has been identified in all social communities; that has arisen within and/or between individuals, groups, organizations or nations" (Rubin, 1994, act. Öztaş & Akın, 2009, p.10). Therefore, since the concept of conflict means different things to different people, it is considerably difficult to make a single definition of this concept that is acceptable for everyone (Gümüşeli, 1994: 24). According to Burandas (2001, act. Papoutsi, 2020, p.207), conflict is a situation in which the behavior of one individual or group deliberately tries to prevent another individual or group from achieving its goals. Humans and all other living things have the obliging to survive, to struggle with their environment constantly and to conflict when necessary. Conflict is a state of tension that occurs as a result of situations that prevent the satisfaction of physiological and socio-psychological needs. When individuals or groups have to work together in an organization, it brings some problems and this may cause normal activities in the organization to stop or become complicated. Conflicts can occur when two or more people or groups disagree on various issues or are upset because of different points of view. Conflict is one of the inevitable outputs of individual and group differences. (Eren, 2000, p.527; Agrawal, 2021, p.57). It is possible to say that there will be conflicts at various levels in organizations, because wherever there is any community, the members of the community will be in communication and interaction, and conflict will be inevitable. Since the personalities, values and attitudes of the individuals in the same organization are different, disagreements are experienced and conflicts emerge in the organization. At this point, we can state

that it is important to manage all levels of conflict that may arise in organizations effectively. Conflict management is a fact that takes the time and energy of the members of the organization. A study shows that approximately 20% of managers' time is spent on conflict management (Levent, 2005, p.17; Thomas and Schmidt, 1976, act. Rahim, Garrett & Buntzman, 1992, p.423). For this reason, we can say that effective conflict management is important in terms of organizational efficiency, cost and organizational peace.

In modern approaches, it is accepted that organizational conflicts can be functional. But in neoclassical and especially in classical approaches, all conflicts are considered negative in all cases. According to the classical approach, conflict harms the organization and is therefore undesirable. Here, conflict arises as a result of disobedience and must be prevented and avoided. This approach has lost its validity today because of the belief that it neglects change and creativity. The neo-classical approach states that conflicts can exist naturally and still need to be eliminated. According to the modern approach, organizational conflict is inevitable and this approach sees organizational conflict as a favorable indicator of productivity, effectiveness, and creativity (Robbins and Judge, 2011, act. Yılmaz & Şencan, 2018, p.119; Agrawal, 2021, p. 58). In modern approach, organizations are social systems that are in constant interaction. In this system, provided that it can be managed in a balanced manner, sometimes creating conflicts will increase the dynamism of the organization (Donat, 2019: 18). Some researches even show that conflict leads individuals to increase their knowledge (Akhlaghimofrad & Farmamanesh, 2021, p.2082). Today, it is generally accepted that organizational conflict must be managed rather than resolved in order to increase individual, group and system-wide effectiveness (Rahim et al., 1992, p. 424).

The concepts of conflict resolution and conflict management are semantically different. While conflict resolution means reducing or eliminating conflict, managing conflict does not necessarily require the reduction or elimination of conflict. (Rahim et al., 1992, p. 424). Rahim and Bonoma (1979) discussed conflict handling styles in two main dimensions: self-interest and concern for others. The first dimension describes the level (high or low) at which the individual attempts to satisfy his or her own interests. The second dimension describes the level (high or low) at which the individual wishes to satisfy the interests of others. The combination of the two dimensions results in five specific styles of handling conflict. The style of integrating (high interest in self and others) involves openness, exchange of information, and examination of differences to arrive at an effective solution acceptable to both parties. The integrating style is associated with problem solving, which can lead to creative solutions, and in this style, clear communication is important. The obliging (low interest in oneself

and high interest in others) style is associated with trying to ignore differences and emphasize commonalities to satisfy the interests of the other party. The style of dominating (high interest in oneself and low interest in others) is identified with winning. The individual forces behaviors to achieve his goals or gain his position and does not care about the other party. The style of avoiding (low interest in self and others) is associated with withdrawal, evasion, or avoiding. The style of compromising (moderate interest in self and others) involves giving up something in order to make a decision acceptable to both parties (Rahim and Psenicka, 2002, p.307; Gümüşeli, 1994, p.84-108).

It is thought that good management of the conflict within the organization rather than eliminating it benefits the climate of the organization and the development of the organizational culture, but the conflicts that are not well managed increase the problems (Kılıç, 2006, p.23). Conflicts are neither completely bad nor completely damaging. Conflicts can be a source of positive change. In fact, some studies state that conflict is essential for authentic participation, power distribution, and democracy. The key to effective conflict management is to encourage constructive conflict, while avoiding destructive conflicts and softening them. That is, conflict can be applied as a creative force for positive change rather than a necessary iniquity that can be controlled. In addition, conflict can be used to balance power, strengthen communication, and find the strength to manage differences (Hoy & Miskel, 2010, p.231). As a matter of fact, according to the results of the research conducted by Gökçe et al. (2017), conflict reduces the effect of cynicism on the intention to leave of employment. According to the results of this research, we can say that a well-managed conflict which is at a certain level benefits the organization. However, all unresolved conflicts increase anxiety within the organization and reduce the productivity and performance of organization members (Agrawal, 2021, p.57). The research results of Akdemir et al. (2016) show that there is a negative correlation between job performance and organizational cynicism, that the level of work performance decreases as the level of organizational cynicism increases, and that the level of organizational cynicism increases as the level of work performance decreases. Seval (2006, p.246) similarly stated that in organizations where conflict is not well managed, the motivation of organization members will decrease, and therefore productivity will decrease. Ersöz (2010) concluded in his research that, if managers cannot manage the conflict in a way that keeps the level of conflict at a low level, the level of job satisfaction in organization members will decrease, and Tink (2019) concluded in his research that cynicism will increase as the level of job satisfaction decreases. When we analyse all this information, we can say that a weakly managed conflict negatively affects motivation, job

performance and job satisfaction in the organization members of the organization and this negative effect may cause cynicism in the organization over time.

McGregor (1960, act. Aydın, 2010, p.85-86), in his X and Y theories, stated that the thoughts of managers about people are the main identifiers of their management styles. In these theories, which are classified as opposing assumptions, theory X has a pessimistic assumption about human nature, while theory Y has an optimistic assumption. According to theory X, people don't like work, they run away from work when necessary, and they need to be guided. Therefore, individuals must be dominated at work, controlled, and threatened by punishment. According to theory Y, people do not hate work, can practice self-management and self-control, and accept work responsibility. The distrustful view of people and the authoritarian management styles approach in theory X can lead to cynicism in the organization. According to the research results of Balay et al. (2013), the level of cynicism of the organization members significantly varies according to the management styles variable of the managers. The level of organizational cynicism of organization members in organizations with a democratic management style is lower than the level of organizational cynicism of organization members in organizations with an irrelevant or authoritarian management style. As a result of his research, Tink (2019) stated that organization members often complain about management style and this may cause cynicism in organization members. Mirvis & Kanter (1991, act. Uzuntarla et al., 2015, p.549) stated the characteristics of organizations with negative attitudes as follows: the organization has dominating practices; the organization has a one-way communication with organization members; the organization implements a policy that is dishonest to its organization members; the organization supports managers who mistreat their organization members. Aytürk (2010, p.315) stated that an authoritarian management style may lead to hierarchical conflicts. According to Sayeed (1990, pp. 28-42), authoritarian managers are expected to choose an authoritarian-supported conflict management style, while supportive managers are expected to choose an integrating conflict management style. In addition, the author concluded in his research that there is a strong relationship between authoritarian management style and dominating conflict management style, and a strong relationship between supportive management style and integrating conflict management style. Therefore, a positive relationship may be expected between organizational cynicism and dominating style, which is one of the conflict management styles, and a negative relationship may be expected between organizational cynicism and integrating style, which is one of the conflict management styles.

According to the research results of Tink (2019) there are factors such as hierarchical structures, disagreements, nepotism, heavy workload, negative thoughts about management, belief in injustice that can cause conflict. In addition, according to the results of the research, when conflict emerges in organization members, their work motivation decreases, reluctance begins and cynicism emerges as a result of these negative attitudes. The results of the research of Karademir (2016) and Helvacı & Çetin (2012) present that, nepotism and negative thoughts towards management emerge as factors that reveal organizational cynicism. Chiaburu et al. (2013), James (2005), Girgin and Gümüşeli (2018), Özgen & Turunç (2017), Bölükbaşı (2013) found a significant negative correlation between organizational cynicism and organizational justice. According to the researches of Çopur & Atanur Baskan (2020), it has been concluded that in order to reduce organizational cynicism, organization members should be treated fairly and their workload should be reduced. Therefore, we can see the nepotism, negative thoughts towards management, heavy workload and injustice elements that will occur in the organization as the reasons for the formation of both conflict and cynicism.

Bağrıyanık (2017) states that organization members may have negative attitudes within the organization as a result of the conflict that may occur between the values of the organization members and the values of the organization. According to the research conducted by Bond et al. (2004), social cynicism has negative effects on both cooperation and reconciliation, and therefore individuals with high levels of social cynicism often refuse cooperation and compromising in resolving conflict. Keashly & Nowell (2011, act. Yılmaz & Şencan, 2018, p.120) stated that seniority, title and status are important in the relationship between conflict management styles and cynicism. Abaslı (2018) stated that organizational injustice can be the source of the conflicts within the organization that may cause cynical attitudes in organization members. The results of the research conducted by Yılmaz & Şencan (2018) on 384 managers and organization members working in domestic and foreign insurance companies and banks in Turkey show that the high level of conflict management and low level of organizational cynicism in the organization makes it possible to successfully manage conflicts between subordinates and superiors. According to the research conducted by Gökçe et al. (2017) on health workers, interpersonal conflict increases as cynicism increases. The research results of Chiaburu et al. (2013) showed that cynicism harms performance and harms teamwork due to cynical people's unwillingness to cooperate and resolve conflicts. According to the research results of Toksoy (2017), as the level of interpersonal conflict increases, the level of organizational cynicism also increases. The results of these studies suggest that there may be a relationship between conflict management styles and cynicism.

As many organizations, educational organizations have to keep up with the changes in the world. Within the school, which is an educational organization, it is of great importance that students, teachers and school administrators unite around the school objectives, are connected to the school and feel that they belong to the school. The concept of conflict is seen as important in educational organizations as in other organizations. Because of the constant interaction of schools with students, teachers, school administrators, parents and the school environment creates a suitable environment for conflict. Therefore, we can say that one of the problems that negatively affect educational organizations is organizational conflict. The most common conflict in the school is the conflict between the teacher and the school principal. It is very important for school principals to be able to manage the conflicts well for to increase the effectiveness and efficiency of the school (Gümüşeli, 1994, p.2-16), because the positive or negative outcome of the conflict is directly related to school principal's conflict management style. If the conflict is well managed by the principal, this contributes to the development of the school. At this point, it can be said that the realization of the aims of the school is directly proportionate to the school principals' conflict management ability (Yiğit, 2015, p.27; Özgan, 2006, p.4). According to Sarpkaya (2002, p.425), based on the fact that conflict is more concrete in educational organizations that have people in their input, process and output, and conflict is inevitable in nature or society; it would be more accurate to learn the correct methods and techniques of managing conflict in educational organizations instead of avoiding or resolving it.

James (2005, p.6) states that almost all of organizations have organization members with cynical attitudes. Accordingly, in educational organizations, the presence of organization members with cynical attitudes is inevitable. Since educational organizations are open systems, they are influenced by the characteristics of students, teachers, school administrators, other school members and the school environment. Schools, as public institutions, operate in an organizational environment that is more closely tied to the political system, less flexible, less responsive and less participatory. It is thought that such situations may also lead to organizational cynicism (Mathur et al., 2013, p.63). The effective and efficient work of teachers, administrators and other organization members in educational organizations depends largely on the bond that organization members establish with the school, the level of adoption of the school's goals and values, and the level of identification with the school. Having these situations may be possible by ensuring organization members' positive attitudes about school. For this reason, it has become important to carry out studies on organizational cynicism in all educational organizations and in schools in order to identify and solve negative attitudes (Akar, 2018, p.2101). Teachers' negative thoughts, feelings or behaviors towards the school can lead to the

formation and development of organizational cynicism in schools. This will adversely affect teachers' job satisfaction (Dean et al., 1998, p.348), job performance (Kim, Bateman, Gilbreath and Andersson, 2009, p.1451) and commitment (Virtanen et al., 2021, p.7). According to Boz (2016, p.155), teachers who work under the heavy responsibility of taking care of students from many different socioeconomic levels and their families wear down over time, and as a result, conflicts may arise between them and they may develop negative attitudes towards their schools. In addition, as a result of the research, it was stated that there may be miscommunications between the teacher and the administrator over time in the school and this may lead to conflict.

When the results of the researches are examined, it is revealed that the high level of cynicism of teachers can harm their professions and that organizational cynicism has negative effects on the organization and organization members. In the same studies, it is revealed that, the greatest responsibility in preventing the emergence of cynicism attitudes in schools belongs to school principal (Kalağan ve Güzeller, 2010; Helvacı & Çetin, 2012; Balay, Kaya & Cülha, 2013; Doğan & Ugurlu, 2014; Karademir, 2016; Strong et al., 2017; Özgen & Turunç, 2017; Bağrıyanık, 2017). The conflict management styles that school principals perform in the school affect the peace and effectiveness of the school and the relationship between the principal and the teacher (Gümüşeli, 1994; Ural, 1997; Apple, 1998; Rock, 1998; Ugurlu, 2001; Yigit, 2015; Arslan, 2020; Demirtas, 2021). When the results of this research are examined, it is thought that there is a relationship between the conflict management styles of school principals and the organizational cynicism levels of teachers.

As seen above, although many studies have been conducted on conflict management style in schools and the cynicism variables to be examined in this research, no study has been found that directly addresses the relationship between school principals' conflict management styles and teachers' cynicism levels. Therefore, the problem of this research was determined as examining the relationship between school principals' conflict management styles and teachers' conflict management styles.

Research Objectives

The aim of the study is to determine the relationship between the conflict management styles of school principals and the cynicism levels of teachers according to the perceptions of secondary school teachers. For this purpose, answers to the following questions will be sought:

- What are the conflict management styles of school principals according to the perceptions of secondary school teachers?

- What is the level of cynicism perception of secondary school teachers?
- According to the perceptions of secondary school teachers, is there a significant correlation between the conflict management styles of school principals and the cynism levels of teachers?
- According to the perceptions of secondary school teachers, principals' conflict management styles serve as a significant predictor of teachers' cynicism levels?

Method

Research Model

Relational screening model was used in the study. In line with this model, it was investigated whether there was a relationship between the conflict management styles of secondary school principals and the cynicism levels of secondary school teachers.

Population and Sample

The population of the study consisted of branch teachers working in public secondary schools in Maltepe district of Istanbul in the 2021-2022 academic year. There are a total of 30 public secondary schools in the research population. The total number of teachers working in these secondary schools is 1150. Sampling was done through simple random sampling, which is "the type of sampling in which all the elements in the population have the chance to be chosen equally" (Karasar, 2020, p.151). Scales were distributed to participants serving as secondary school teachers in the Maltepe district, and incomplete or erroneous scales were excluded. The sample size for the study was determined for a population of 1,150 using the following formula;

$$n=\frac{N.t^2.p.q}{d^2.(N-1)+t^2.p.q}$$

According to the above formula calculation, the sample size was determined as n=288. According to this formula, a sample size of at least 288 is required to adequately represent the population. The sample size for this study is also 288. The sample group represents approximately 25% of the population.

Data Collection Tools

The research data were collected by using two scales. The first of these scales was the Conflict Management Styles Scale developed by M. Afzalur Rahim and adapted to Turkish by Gümüşeli (1994), and the second was the Organizational Cynicism Scale for Teachers developed by Sağır &

Oğuz (2012). The Conflict Management Styles Scale is a 5-point likert type scale consisting of 28 questions. The rating on the scale is always (5), most often (4), occasionally (3), seldom (2), and merely (1). In the reliability test conducted by Gümüşeli (1994), Cronbach's Alpha Coefficient was found between. 72 and. 77. When the reliability coefficient of the Organizational Cynicism Scale for Teachers is examined, the Cronbach Alpha Coefficient is .89. The scale is a 5-point likert type scale consisting of 25 questions. The rating on the scale is strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1). In the interpretation of the results, the degree ranges were determined as 1.00-1.79, 1.80-2.59, 2.60-3.39, 3.40-4.19 and 4.20-5.00. The Cronbach's Alpha reliability analysis results for the scales used in this study are presented in Table 1 and Table 2.

Table 1.

Reliability Levels of the Conflict Management Styles Scale and Its Sub-Dimensions

Scale and Sub-Dimension Name	**Cronbach's Alpha Value**
Integrating Style	0.942
Obliging Style	0.874
Dominating Style	0.876
Avoiding Style	0.665
Compromising Style	0.889
Conflict Management Styles Scale	0.904

Table 2.

Reliability Level of the Organizational Cynicism Scale for Teachers

Scale Name	**Cronbach's Alpha Value**
Organizational Cynicism Scale for Teachers	0.901

According to the Cronbach's Alpha value ranges specified in Alpar's study (2020, p. 582), the Conflict Management Styles Scale, as well as its sub-dimensions of Integration, Compromise, Dominating, and Accommodation Styles, exhibit a high level of reliability. The Avoidance Style sub-dimension demonstrates a moderately reliable level, while the Organizational Cynicism Scale for Teachers also shows a high level of reliability.

Process

During the data collection process of the research, participants' voluntary participation in the research was taken as basis. In this context, the scale forms were filled in after the consent form presented to the teachers was signed.

Data Analysis

A statistical analysis package program was used to analyze the data collected in the research. Techniques were used for the analysis of the data by taking into account the sub-problems of the research. Arithmetic means and standard deviation values were used to determine school principals' perceptions of conflict management styles, as well as to identify teachers' perceived levels of cynicism. Normality tests for the scales used in the study were conducted using the Kolmogorov-Smirnov test, and the results are presented in Table 3.

Table 3.

Results of the Kolmogorov-Smirnov Normality Test for the Scales

Scale and Sub-Dimensions Mean Scores	Statistic	df	Sig.
Conflict Management Scale Mean Scores	0.039	288	0.200
Conflict Management Scale Integrating Sub-Dimension Mean Scores	0.116	288	0.000*
Conflict Management Scale Obliging Sub-Dimension Mean Scores	0.100	288	0.000*
Conflict Management Scale Dominating Sub-Dimension Mean Scores	0.067	288	0.003*
Conflict Management Scale Avoiding Sub-Dimension Mean Scores	0.070	288	0.002*
Conflict Management Scale Compromising Sub-Dimension Mean Scores	0.104	288	0.200
Organizational Cynicism Scale Mean Scores	0.037	288	0.200

*Significant at $p < 0.05$

Examining Table 3 reveals that, according to the results of the Kolmogorov-Smirnov test, the mean scores of the Conflict Management Scale and the Organizational Cynicism Scale conform to a normal distribution ($p>0.05$). However, the sub-dimensions of the Conflict Management Scale do not follow a normal distribution ($p<0.05$).

Results

The first aim of the study was to determine what the conflict management styles of school principals are according to the perceptions of secondary school teachers. The findings are shown in Table 4.

Table 4**.**

Findings on School Principals' Conflict Management Styles

	$\bar{X}$	SS
The Integrating Style	3.40	1.08
The Obliging Style	3.06	0.98
The Dominating Style	3.01	0.95
The Avoiding Style	3.19	0.70
The Compromising Style	3.29	0.96

When the average results stated in Table 4 are examined, according to the perceptions of secondary school teachers, it is seen that school principals use the integrating style "most often" and "occasionally" use compromising, dominating, avoiding and compromising styles. According to the perceptions of teachers, we can say that the conflict management styles of school principals are integrating, compromising, avoiding, obliging and dominating from the highest level to the lowest level. Given the characteristics of schools, this result can be considered to be a consistent one. Because although the arithmetic mean values in the table show that according to teacher perceptions, school principals prefer the integrating style more than others; they seem to use all other conflict management styles occasionally on a case-by-case basis. Therefore, the results can be interpreted as managers using each style on a case-by-case basis in conflict management.

The second aim of the research is to determine the level of cynicism perception of secondary school teachers. The findings are shown in Table 5.

Table 5**.**

Teachers' Levels of Cynicism

	$\bar{X}$	SS
Organizational Cynicism	2.85	0.67

When Table 5 is examined, it is seen that the perception of cynicism of the teachers is at a moderate level ($\bar{X}$=2.85). This average equals to the expression "Neutral" ($\bar{X}$: 2.60-3.39) in the scale. We can think of this statement as that teachers generally have a moderate sense of cynicism and that they do not have a sense of cynicism that would disturb them.

The third aim of the study is to determine whether there is a significant correlation between the conflict management styles of school principals and the cynicism levels of teachers according to the perceptions of secondary school teachers. Since the sample distribution of the Conflict Management Styles Scale and the Organizational Cynicism Scale for Teachers was compatible with the normal distribution, the correlation coefficient between the two scales was calculated with the Pearson Correlation coefficient. The sample distribution of the Conflict Management Styles Scale was not normally distributed. For this reason, the relationship between the Conflict Management Styles Scale and the Organizational Cynicism Scale for Teachers was examined with the Spearman Correlation Coefficient.

Table 6.

Correlation Coefficient between School Principals' Level of Perception of Conflict Management Styles and Level of Perception of Teachers' Cynicism

	Öğretmenlere Yönelik Örgütsel Sinizm Ölçeği
The Integrating Style	-0.415*
The Obliging Style	-0.315*
The Dominating Style	0.474*
The Avoiding Style	-0.013
The Compromising Style	-0.346*

When evaluating the correlation table, values between 0.1 and 0.3 are generally considered to indicate a low correlation, values between 0.3 and 0.6 represent a moderate correlation, and values of 0.6 and above are considered a high correlation (Hair et al., 2009). When Table 6 is examined, it is found that, there is a moderate negative correlation between the integration style and organizational cynicism (r = -0.415), a weak negative correlation between the compromising style and organizational cynicism (r = -0.315), a weak negative correlation between the accommodating style and organizational cynicism (r = -0.346), and a moderate positive correlation between the dominating style and organizational cynicism (r = 0.474), all of which are statistically significant.

There is no significant correlation between avoiding style and organizational cynicism (p>0.05). These findings are stands with the characteristics of conflict management styles. Because the integrating style with the highest correlation and the dominating style are the styles that contain opposite behaviors and interventions in terms of their characteristics. Therefore, the finding that the level of cynicism will decrease even at a moderate level if the integrating style is used, and that it will increase moderately if the dominating style is used, stands with the results of other researches. These findings show that the results of the research are in line with the literature.

The fourth aim of the study is to determine whether, according to middle school teachers' perceptions, the conflict management styles of school principals significantly predict teachers' levels of cynicism. To examine the extent to which school principals' conflict management styles affect teachers' perceptions of organizational cynicism, the Organizational Cynicism Mean Scores were taken as the dependent variable and the Conflict Management Scale Mean Scores as the independent variable, and Regression Analysis was applied. In Regression Analysis, it is sufficient for the dependent variable to meet the assumption of normality. In this case, the Organizational Cynicism Scale Mean Scores meet the normality assumption. The scatter plot between the dependent and independent variables is shown in Figure 1.

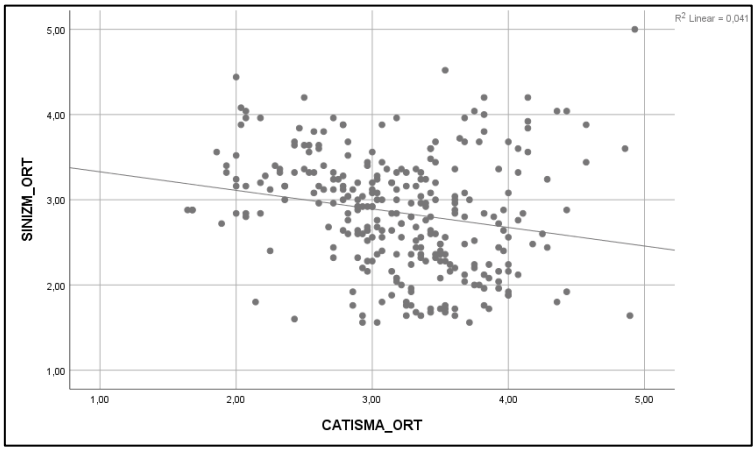

Figure 1. Scatter Plot.

Upon examining the graph, we can conclude that there is a linear relationship between the dependent and independent variables. The model applied to determine the extent to which school principals' conflict management styles affect teachers' perceptions of organizational cynicism is presented in Table 7.

Table 7.

Significance of the Model and Model Coefficients

Model	B	Std. Error	t	Sig.	F	Sig.	R^2
(Constant)	3.545	0.203	17.424	0.000*	12.179	0.001*	0.041
Conflict Management Sclae Mean Scores	-0.218	0.062	-3.490	0.001*			

*p<0.05

According to Table 7, the independent variable, Conflict Management Styles, explains 4.1% of the variance in the dependent variable, Organizational Cynicism. Additionally, the established regression model is found to be statistically significant (p<0.05). The independent variable, Conflict Management Scale Mean Scores, is also found to be statistically significant (p<0.05).

Discussion and Conclusion

This study aimed to examine the relationship between school principals' conflict management styles and teachers' organizational cynicism levels according to teachers' perceptions. For this purpose, first of all, school principals' conflict management styles were determined. It has been observed that school principals use the integrating style "most frequently" among conflict management styles, compromising, avoiding, concession and dominating styles "occasionally", and when listed from the highest level to the lowest level, they use the integrating, compromising, avoiding, concession and dominating styles dominance. According to these findings, it can be said that school principals do not use a single conflict management style in conflict situations; they use different styles according to situations or conditions. In addition, it can be said that in case of conflict, school principals generally try to define the problems clearly and to produce solutions, and they use less to try to impose the solutions they believe in by using their power and authority. It is thought that this situation may be the result of the fact that teaching is more autonomous than other professions, that is, teachers are less accountable to the school administration in their work and that they have less direct relations with the administration than other professions. According to the research of Horata (2013), it was seen that school principals use integrating and compromising styles "most often",

avoiding and obliging styles "occasionally" and dominating style "seldom". The order of conflict management styles from the highest level to the lowest level is integrating, compromising, avoiding, obliging, and dominating. The order of conflict management styles from the highest level to the lowest level is similar to the current study. From this perspective, the findings of this study support the findings of the current research. Ilğan (2020) conducted a study in which it was seen that school principals used the integrating style "always", the compromising style "most often", the obliging and avoiding styles "occasionally", and the dominating style "seldom". The order of conflict management styles from the highest level to the lowest level is integrating, compromising, obliging, avoiding and dominating. In the research of Şanlı Güneş (2019), it was seen that school principals used integrating and compromising styles "most often", used obliging styles "occasionally", and used avoiding and dominating styles "seldom". The order of conflict management styles from the highest level to the lowest level is integrating, compromising, obliging, avoiding, and dominating.

In Demir (2019)'s research, it was seen that school principals used integrating and compromising styles "most often", obliging and avoiding styles "occasionally", and dominating styles "seldom". The order of conflict management styles from the highest level to the lowest level is integrating, compromising, obliging, avoiding and dominating. In the results of these researches, it is seen that school principals use the highest level of integrating style, the lowest level of dominating style, and the results are similar to the current research. In the study of Kabakli Çimen and Bağdatlı Sarıboğa (2021), it was seen that school principals used the integrating style "always", the compromising and obliging styles "most often", and the avoiding and dominating styles "occasionally". The order of conflict management styles from the highest level to the lowest level is integrating, compromising, obliging, dominating and avoiding. In the research of Çelik and Tosun (2019), it was seen that school principals use the compromising style "most often", the obliging style "most often", the avoiding and integrating styles "occasionally", and the dominating style "seldom". The order of conflict management styles from the highest level to the lowest level is compromising, obliging, avoiding, integrating, and dominating. In the research of Çobanoğlu and Yüksel (2020), it was seen that school principals used integrating and compromising styles "most often", and avoiding, obliging and dominating styles "occasionally". The order of conflict management styles from the highest level to lowest level is integrating, compromising, avoiding dominating, obliging these studies do not support the results of current research.

It has been observed that the degree range of teachers' perceptions of organizational cynicism corresponds to the expression "neutral" on the scale. When we analyse the results of researches of Öztop (2021), Ergen and İnce (2017), it is seen that teachers' perceptions of cynicism are at the level of "neutral". The findings of these studies support the findings of the current research. According to the findings of this research, it can be said that teachers sometimes face with situations that may cause cynicism in school, but there is no cynicism attitude that disturbs teachers. It is also thought that teachers' neutral attitude about organizational cynicism may be due to their inadequate knowledge of the concept of cynicism. In the researches of Gökçe and Levent (2022), Akpolat and Oğuz (2021), Aksoy and Bostancı (2019), Korkut (2019) and Çakıcı (2017), Akın (2015), it was seen that teachers' perceptions of cynicism were at the level of "I disagree". The findings of these studies do not support the findings of the current research.

When the relationship between the conflict management styles used by school principals and teachers' organizational cynicism is examined, it is seen that there is a weak negative significant correlation. When the relationship between the conflict management styles used by school principals and teachers' organizational cynicism levels is examined, it is seen that there is a moderate negative correlation between organizational cynicism and integrating style, a weak negative correlation between conciliatory style and organizational cynicism, and a weak negative correlation between compromising style and organizational cynicism and dominating. There is a moderate positive correlation between style and organizational cynicism and no statistically significant correlation between avoiding style and organizational cynicism. Based on these results, we can say that as the level of using integrating, compromising or obliging styles used by school principals increases, the organizational cynicism levels of teachers will decrease, and as the level of using the dominating style increases, the organizational cynicism levels of teachers will increase. Of the conflict management styles, the one with the highest negative correlation with organizational cynicism is the integrating style. The results are not surprising. Because, as stated by Sarpkaya (2002, p.421), the successful management of the conflict by the managers in the organization helps the organization members of the organization to establish good relations with the organization. Looking at these results, it can be said that in the conflicts that arise in the organization, school principals should make efforts to clearly reveal the problem between the parties, to reach effective solutions for both sides (Karcıoğlu and Alioğulları, 2012, p.223), not to discriminate against the parties (Tink, 2019; Karademir,

2016), to have open communication (Rahim and Psenicka, 2002, p.307) and such use of integrative styles can significantly affect the the reduction of teachers' cynicism levels, that is, their negative feelings, thoughts and behaviors towards school. It is known that the decrease in teachers' levels of organizational cynicism helps them to work effectively and efficiently in school, to strengthen the bond they establish with the school, to increase their level of identification with the school and their adoption of the goals and values of the school (Akar, 2018, p.2101). Therefore, it is seen that it is very important for school principals to use integrating style.

Recommendations

Considering the results of this study, it is seen that it is very important for school principals to use conflict management styles, especially the integrative style. Similarly, as school principals use the dominating style, the increase in teachers' level of organizational cynicism is an expected and important result. It can be said that school principals' trying to apply their personal views and goals by using hierarchical power and superiority of authority and considering their personal views and goals more important than their relations with teachers (Horata, 2013, p.50; Papoutsi, 2020, p.206) increases the organizational cynicism levels of teachers. When we look at all these results, we can say that the conflict management styles of school principals affect the cynicism levels of the teachers and therefore affect many factors such as commitment to school, job performance, and motivation. It should also be noted that school principals must have a clear communication in order to create and maintain a peaceful and healthy organization. For this reason, it is important to provide in-service trainings to school principals so that they can learn about conflict management styles and what consequences the styles they prefer to use may have, and to ensure the continuity of these trainings. It is also thought that teachers do not have enough information about the concept of cynicism. Therefore, it is considered important to provide training on cynicism to teachers to make them learn or to make them be aware that cynicism affects many related factors such as their own work performance, efficiency, motivation, peace, adoption of the aims and values of the school and identification with the school and it is considered important to provide training on cynicism to school principals, who have the greatest responsibility in preventing the emergence of organizational cynicism attitudes. In order for school principals to manage conflict effectively within schools, they need to reduce uncertainty, treat employees fairly, lower stress levels, involve all staff members in decision-making processes, enhance job satisfaction and sense of

responsibility, and support teamwork (Yılmaz & Şencan, 2018). Moreover, to reduce teachers' levels of cynicism, school principals must exhibit characteristics such as openness, empathy, fairness, solidarity, and reliability (Kaptein & Wempe, 2002, as cited in De Bakker, 2007, pp. 131-132). It should also be noted that for school principals to establish and sustain a peaceful and healthy organization, they must possess clear communication skills (Tekkanat, 2019). Studies by Sarpkaya (2002) and Tuğlu (1996) indicate that a lack of communication on the part of school principals negatively impacts conflict management. Since open and honest communication within the organization can eliminate cynicism (Mathur et al., 2013, p. 63), providing training to school principals to improve their communication skills or emphasizing effective communication during interviews for school principal selection could be significant steps in this regard.

Within the scope of this study, a scale applied to 288 public secondary school teachers in Maltepe district of Istanbul. Private schools or different grades of education may be included for this study, and more extensive research may be carried out. In addition, as a result of the research, it is seen that conflict management styles and cynicism are caused or influenced by many factors. Therefore, the subject of this study can be enriched by including different variables.

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There is no conflict of interest between the authors.

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The Role of Learning Organization and Talent Management in the Effect of the Transformational Leadership Styles of School Principals in Innovation Management in their Schools

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Abstract. This research aims to examine the mediating role of learning organization and talent management in the impact of transformational leadership levels of school principals on innovation management according to the perceptions of teachers working in vocational and technical anatolian high schools. In accordance with the purpose and approach of the study, quantitative research method was used in the research. The sample consisted of 30 official vocational and technical anatolian high school principals and 562 teachers. The research data were collected with The Scale of Leadership Styles of School Principals, The Scale of Talent Management in Education, and The Scale of Learning Organization in Schools and The Scale of Innovation Management in Schools. Basic statistics and Structural Equation Modelling (Path diagram and fit indices) were used to analyze the data. The data gathered was analyzed with programs of SPSS 23.0 and AMOS. The research findings showed that there is a significant relationship between the transformational leadership styles of school principals and innovation management according to teacher perceptions, and that there is a partial mediating role of learning organization and talent management in this relationship. According to this, it can be concluded that school principals with a high level of transformational leadership will exhibit a higher level of innovation management characteristics in their schools with teachers with a high level of learning organization and talent management.

Keywords. Transformational, innovation, learning organization, talent.

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In a rapidly changing world, organizational leadership is becoming more important and is considered a factor of success. Transformational leadership refers to leaders who are trying to generate ideas in organizations, gain new perspectives in providing a new path of development and progress to the organization (Korejan and Shahbazi, 2016). By developing decisiveness, passion and loyalty between leaders and employees, mobilizing employees and successfully bringing them together in new ways to move their performance to the top is emerging as the goal of this type of leadership. Transformational leadership actions enable organizations to improve their performance in complex and unpredictable environmental conditions (Eskandari, 2014). At the same time, many organizations today have to catch up with organizational changes and transformations in order to survive. In this process, the leadership style of the organization is of great importance (Mansurova and Güney, 2018). Learning organization is another key factor that takes the school to innovation. Learning means gathering new information and shaping the old knowledge .In this way it becomes easir for a school to adopt new changes. While adding data to the existing source, talented teachers also play an important role. Learning is a process that needs a talented look, search and synthesis. Talent makes this process more innovative. Talented teachers in the schools lead their schools to innovation with their qualified features. Innovation management, itself, changes the schools into a more complex source in terms of knowledge for both teachers and students. These four concepts, transformational leadership styles, talent management, learning organization and innovation management are seen to be studied individually in the literature.

In this research, it is tried to identify the variables that affect innovation management in schools, and the level of innovation of organizations is determined. In the studies in literature, it is observed that the relationship between innovation management and one or more variables has been analyzed. In addition, in some other studies, it has been found that transformational leadership has a positive effect on innovation management (Fırat and Yeşil, 2020).

As can be understood from the pattern of this research, the relationship of transformational leadership styles of school principals with innovation management in schools is likely that an important part of the research was conducted on transformational leadership. The perspective of transformational leadership levels, individual and professional characteristics of managers have been tried to be determined. In another studies, the relationship of transformational leadership with different variables has been tried to be revealed (Buil, Martínez, and Matute 2018).

In a part of the research conducted on talent management, which is assumed to have a mediating role in this relationship, it was also tried to determine the level of talent management of school administrators, the perspective of their individual and professional characteristics (Gök, 2020). Excluding this study, the relationship between the talent management levels of school principals or managers with some variables has been determined (Pandita and Ray, 2018). Yerlikaya (2017) has tried to reveal the relationship of competencies to manage differences among teachers with talent management.

The second possible mediating variable of the research is the feature of schools as a learning organization. It is seen that in some of the studies conducted about this variable, the characteristics of schools as a learning organization have been tried to be determined. (Bil, 2018). According to the results of the research mentioned above; no research has been found to analyze whether talent management has a role on innovation management. Besides this, there is no research analyzing the effect of transformational leadership on innovation management. Similarly, no research has been found in the literature determining the mediating role of learning organization and talent management on innovation management. A modeling study using a combination of these four variables has not been observed. The variables are observed to be studied individually, and from this point, this research analyzing the relationship between these variables will be unique in the literature.

To fill this gap in the literature, it is aimed in this study to determine the mediating role of learning organization and talent management in the impact of transformational leadership styles of school principals on innovation management according to the perceptions of teachers working in vocational and technical anatolian high schools. In this aspect, this research can be said to have an original quality both in terms of its pattern and the literature. In order for innovation management, which is a very basic approach in schools today, to be realized in the proper way, some prerequisites are needed. One of them is the leadership approach adopted by the school principal. The most powerful aspect of the research is the identification of transformational school leaders who help develop a common idea about what is being done at school and why (Şahin, 2009; Saleh ve Khine, 2014), provide comprehensive educational opportunities (Bil, 2018; Albors-Garrigos, Igartua and Peiro, 2018), appreciate talent and performance (Yerlikaya, 2017; Ibrahim and Daniel, 2018) and see school as a means of integrating with the environment (Göl, 2012; Saadat and Saadat, 2016). In this research, it is predicted that transformational leadership affects innovation management both directly and indirectly through learning organization and talent management. Therefore, in this study, a structural model consisting of transformational leadership, talent management, learning organization

and innovation management was tested and for this purpose, data were collected from a total of 562 teachers and 30 school principals working at vocational and technical anatolian high school in Izmir.

Conceptual Framework

In the conceptual framework of this research, researches examining the theoretical and experimental connection between transformational leadership, learning organization, talent management and innovation management were made use of (Bass, Avolio, Jung and Berson, 2003; Davies and Davies, 2010; Ibrahim and Daniel, 2018; Muñoz-Pascual, Curado and Galende, 2019). In the light of these past findings, this research represents an expert effort in terms of evidence to this growing knowledge, but it has the capacity to contribute to the current literature by investigating the experimental relationship between transformational leadership and innovation management and besides, it also explores the mediation role of learning organization and talent management in this interaction (Figure 1). Learning organization and talent management are two mediating variables that are included in the model in order to test the relationship between transformational leadership and innovation management. These two concepts are based on four ways in which transformational leadership can affect innovation management. It is believed that these ways can be used to evaluate the direct and indirect impact of transformational leadership on innovation management. The symbolic model of the research is shown in Figure 1.

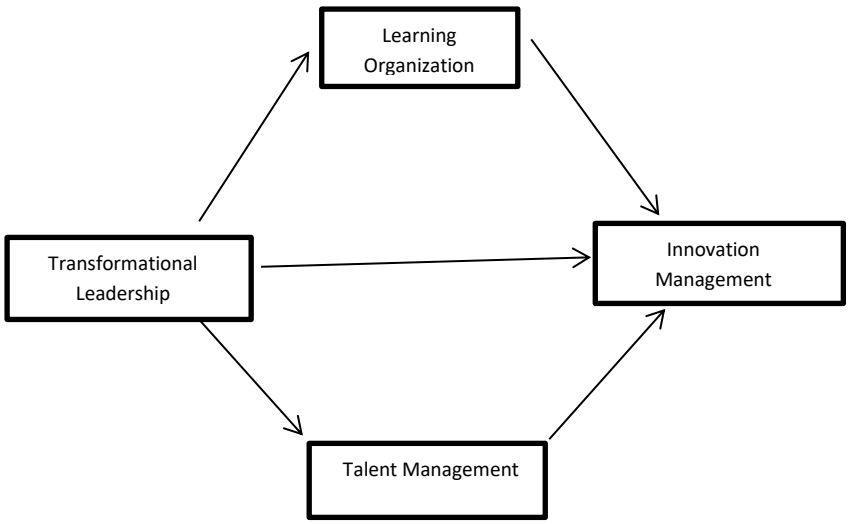


Figure 1. Conceptual Model of the Research.

Innovation Management

It can be realized with innovation that people reach new ideas by learning together. The process that includes shaping the strategic goals of an organization, developing innovations to achieve these goals, planning, directing, controlling and coordinating their implementation can be expressed as the innovation management process (Albors-Garrigos et al., 2018). Given a strong and developing focus on innovation, the human resource management of organizations also needs to review the skills of their employees. According to Meskó et al., in the next twenty years, 50% of the current professions will lose their validity. In addition to activating organizational learning, this causes human resources management to progress at a faster pace and to experience the mandatory requirements it faces in becoming suitable for practices and routines (Muñoz-Pascual et al., 2019).

In addition, it is important to reflect on the effects that innovation will have on the business and working world of the future. Besides this, the role of human resource management in supporting these changes should be carefully examined. Therefore, a deeper study of human resource management structures is required. It is necessary that routine activities are rethought, policies reviewed, new knowledge and skills are developed and that teams work in very different work environments than before (Jotabá, Fernandes, Gunkel and Kraus, 2022).

Transformational Leadership

It is thought that transformational leadership practices carried out in this direction should support the new culture and, in particular, educators should assume the role of knowledge workers and knowledge leaders (Saleh and Khine, 2014).

While subordinates recognize the credibility of their leaders as charismatic transformational leaders and that they play a strategic and central role in achieving the goals of the organization, transformational leaders should be able to define and clearly articulate the vision of the organization. As well as this, transformational leaders should be able to balance the future visions of their subordinates by paying more attention to the needs of their subordinates than they do now. Transformational leaders should also be convincing their subordinates to perform tasks outside their areas of interest for the corporate benefit of the organization (Gunawan, 2020).

Wood (2019) suggests that one of the most important tasks of transformational leaders is to increase the engagement between leaders and their followers in terms of decency and values, as well as to increase the awareness of followers about existing problems and to provide them with support, encouragement and developmental experience. This positive increase in the relationship allows

leaders to focus on improving the ability of their followers to find creative solutions to problems. in doing so, it requires providing a roadmap for the future that inspires them, providing support for the challenges of change they must face, and finally increasing determination for effective task implementation.

Talent Management

The success of organizations with higher performance depends primarily on the individual performance of employees, rather than the holistic meaning, and this basically depends on the capabilities and abilities of employees (Hongal, and Kinange 2020). Talented employees make a great contribution to the competitive advantage of their organizations by following the innovations in their fields and making the right decisions in achieving the goals. These people are people who stand out from others in terms of being ready and willing to improve themselves and learn new information by demonstrating the highest level of capacity with their immediate or long-term contribution to organizational performance (Fitzgerald, 2014; Ortlieb and Sieben, 2012).

Talent management can be seen as covering the career development of the human resource power of the organization and drawing boundaries without leaving the development roles of employees to the individuals themselves (Ibrahim and Daniel, 2018). If better talent can change the future of the business world, talent management should be given a major role in the organization. If the organization effectively implements talent management strategies, this helps to increase the commitment of the employee and, consequently, the performance of the organization. The higher the employee loyalty, the more the productivity (Hongal and Kinange, 2020).

Learning Organization

Managing human power and making maximum use of this power is possible by providing continuity to learning. The relationship between learning and performance has generally been found to be positive (Saadat and Saadat, 2016). It is observed that the information and therefore the economic indicators of the organizations that are developing as learning organizations increase (Kim, Watkins and Lu, 2017).

Information has become a critical resource for various organizations in the competitive business environment in recent years. In the field of modern management, organizational learning is proposed as a strategic tool for seizing competitive advantage and maintaining organizational success (Saadat and Saadat, 2016). The purpose of learning is not only to improve the knowledge and skills of the

employee, but also to improve organizational development and to create a flexible, dynamic and learning organizational structure (Saadat and Saadat, 2016).

People can reach new ideas by learning together with innovation. The process that includes shaping the strategic goals of an organization, developing innovations to achieve these goals, planning, directing, controlling and coordinating their implementation can be expressed as the innovation management process (Albors-Garrigos et al., 2018).

In the research conducted to determine the effects of innovation management on school performance, transformational leadership and organizational learning were evaluated as factors of innovation management and it was found that these two variables affect innovation management (Sitthisomjin, Somprach and Phuseeorn, 2018). In the study conducted to determine the relationship between managers' perception of transformational leadership and employees' talent management, it was observed that there is a strong relationship between these two variables. (Durrani, 2018).

Method

This study was carried out by using the relational screening model, one of the quantitative research methods. In quantitative approaches, phenomena are objectified by abstracting them from the processes and factors around them, and then transformed into properties that can be observed and measured. It is assumed that in this way, through accurate measurements and careful digitizations, the truth can be identified and understood (Erdoğan, 2003). In relational screening models, the presence and/or degree of change between two or more variables is tested (Karasar, 2016). There are four variables in the study, one independent, one dependent and two intermediary variables. Transformational leadership as an independent variable, innovation management as a dependent variable and learning organization and talent management as intermediary variables were used in the research. According to the perceptions of teachers working in vocational and technical Anatolian high schools, the theoretical model developed to determine the mediating role of learning organization and talent management in the impact of transformational leadership styles of school principals on innovation management is tested in the research. The test process of the model was carried out with the structural equation model and path analysis. The structural equation model is basically a combination of factor analysis and regression analysis and is a theoretical structure represented by hidden variables (Hox and Bechger, 1995).

Research Model

The current research investigates the mediating role of learning organization and talent management in the impact of transformational leadership levels of school principals on innovation management according to the perceptions of teachers working in vocational and technical Anatolian high schools in the central 11 districts of Izmir province. In the research, a relational screening model is used.

Study Group

The population of the study consists of school principals and 4870 teachers working in 73 vocational and technical anatolian high schools located in these districts. Due to the differences in the number of schools and teachers in the central districts of Izmir, each district was included in the sampling. The schools in the districts were determined by simple random sampling method (Yazıcıoğlu and Erdoğan, 2004). In the sample, 30 public vocational and technical anatolian high school principals and 562 teachers were included. They work in the central 11 districts of Izmir. After stratification, equal proportions of samples were selected from each layer by simple random method (Kılıç, 2013).

Data Collection Tools

In the study, the "The Scale of Leadership Styles of School Principals" developed by Şahin (2003) and revised by Şahin (2009) was used to measure the transformational leadership levels of school principals according to teachers' perceptions. The Cronbach Alpha Coefficient of the scale is calculated as .65 for the first sub-dimension, as .59 for the second sub-dimension and as .95 in total.

In the study, the "The Scale of Learning Organization in Schools" developed by Bil (2018) was used to measure the level of learning organization of school principals according to teachers' perceptions. Cronbach Alpha reliability coefficients is calculated, respectively, as .97 for the sub-dimension of Managing Learning, as .78 for the sub-dimension of Learning Opportunities and as .96 in total (Bil, 2018).

In the study, "The Scale of Talent Management in Education" developed by Yerlikaya (2017) was used to measure the talent management levels of school principals according to teachers' perceptions. Cronbach's Alpha internal consistency coefficient was calculated to determine the reliability of the scale. Cronbach Alpha reliability coefficients is calculated, respectively, as .92 for the sub-dimension of Goals and Talent Development, as .90 for the sub-dimension of Performance

Evaluation and Retention of Talent and as .94 in total. When the reliability levels of the total and sub-dimensions of the scale are examined, it is understood that The Scale of Talent Management in Education used in this research is reliable (Yerlikaya, 2017).

In the study, the "The Scale of Innovation Management in Schools" developed by Bülbül (2011) was used to measure the level of innovation management of school principals according to teachers' perceptions. Exploratory and confirmatory factor analysis were applied to determine the construct validity of the scale. Internal consistency coefficients of the sub-dimensions of the scale are .88 for Input Management, .93 for Innovation Strategy, .87 for Organizational Culture and Structure and .96 for Project Management. The Cronbach Alpha internal consistency coefficient for the entire scale was calculated as 0.98. According to these coefficients, it can be said that the reliability of the scale is high (Göl, 2012).

Process

The population of the study consists of school principals and 4870 teachers working in 73 vocational and technical Anatolian high schools located in these districts. While determining the sample of the research, it was thought that it would represent the population. First of all, due to the differences in the number of schools and teachers in the central districts of Izmir, each district was included in the sampling. The schools in the districts were determined by simple random sampling method (Yazıcıoğlu and Erdoğan, 2004).

The data collection was carried out both by visiting schools individually and via googleform. In order to collect data and apply measurement tools, permission to conduct a survey was obtained from the Izmir Provincial Directorate of National Education with the permission of the Ethics Committee from the Directorate of the Institute of Educational Sciences of Dokuz Eylul University. The scales, together with the permission letter received from the Izmir Provincial Directorate of National Education, were delivered to the schools where the research will be conducted, the administrators were interviewed, and explanations of the measurement tool were made to the teachers and volunteer teachers were allowed to participate in the research. The teacher who requested it filled out the measurement tool manually, and the teacher who requested it participated in the study via googleform, where the form was submitted online by the researcher. In the 2018-2019 academic year, 572 scales were returned from the scale applied to 2433 teachers working in a total of 35 public vocational and technical anatolian high schools located in 11 districts of Izmir province. However, 5

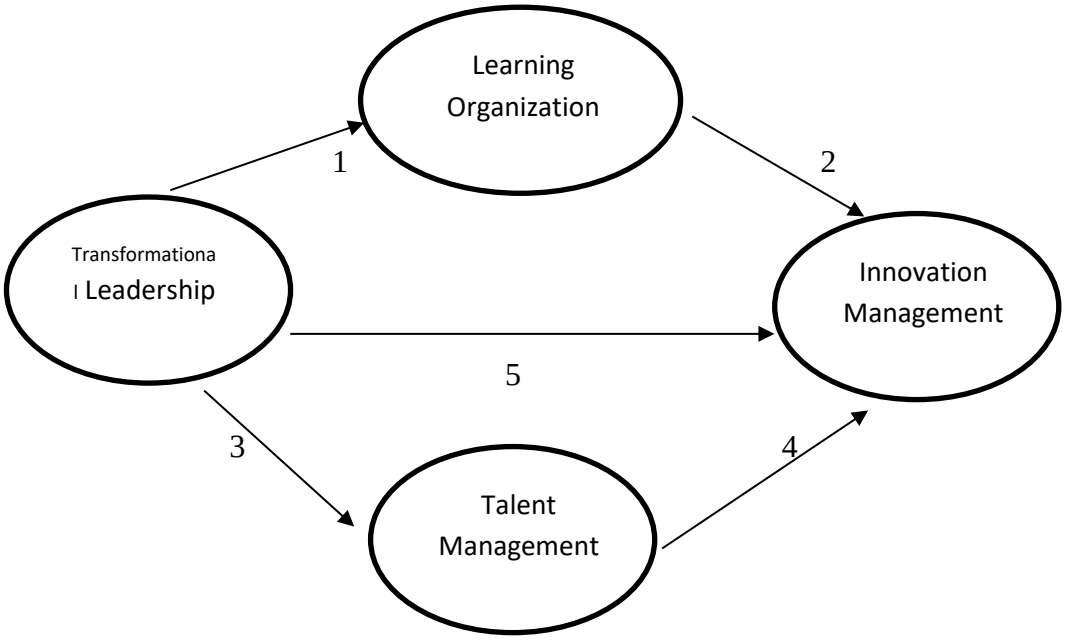
schools and 10 scales were removed from these due to insufficient data, incomplete or incorrect answers, and a total of 30 schools and 562 scales were taken into consideration.

Data Analysis

SPSS 23.0 and SPSS Amos23.0 programs were used for the identification and analysis of the data. Descriptive statistics (frequency and percentage) were used in the analysis process while calculations based on demographic variables (branch, number of in-service trainings for teachers, number of documents received, gender for principals, educational management education status and union membership status) were made. According to teachers' perceptions, structural equation modeling (AMOS) was applied to determine whether there is a mediating role of learning organization and talent management in the relationship between transformational leadership and innovation management of school principals. The Structural Equation Modeling is an effective tool to examine the relationship between multiple variables and to reveal the harmony of the scale model. According to the Structural Equation model, the $\chi 2$/sd ratio's being less than 3.0, the RMSEA ratio's being equal to or less than .08 and the CFI value's being greater than .95 show the proof that there is an acceptable model fit (Hu and Bentler, 1999). In addition, the bootstrapping method was used to calculate the direct, indirect and total effects of the variables in the model. The bootstrapping method was used to estimate the direct and indirect effect of the external variable on the internal source variable (Hayes, 2018). The path coefficients obtained in the modeling established in determining the relationships between the research variables were examined. Path diagrams and fit indices were used in the construction of the Structural Equation Model. This analysis is a technique that allows to estimate the magnitude and significance of the assumed causal relationships between two or more variables (Asher, 2013).

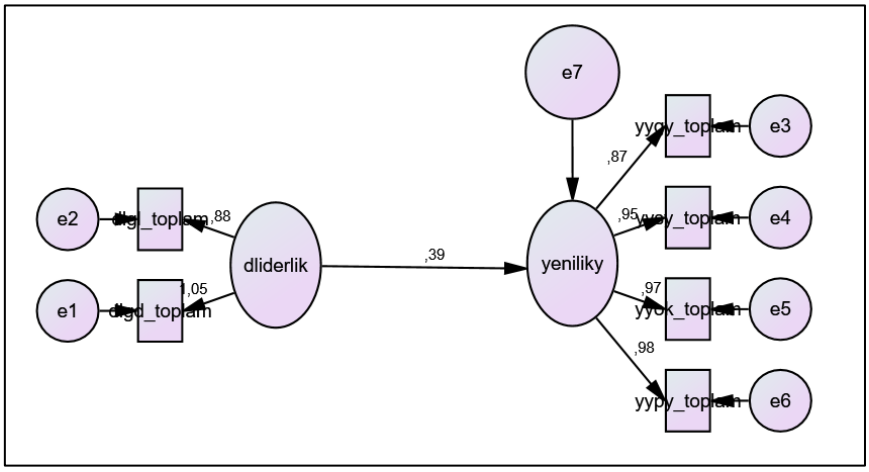
Findings

The findings are presented below. The effect of the independent variable on the intermediary variables was examined decisively (1^{st} and 3^{rd} path in Frame 2). Then, the relationship of the independent variable with the dependent variable was examined (5^{th} path in Frame 2). If the results are significant in these two cases, the independent variable and the intermediary variables are analyzed together and the effect on the dependent variable is observed (The Total of 1^{st} and 2^{nd} path and 3^{rd} and 4^{th} path in Frame 2). If the influence of the independent variable on the dependent variable has disappeared or weakened, it is assumed that the variables in the established model perform the mediating role (Baron ve Keny, 1986).



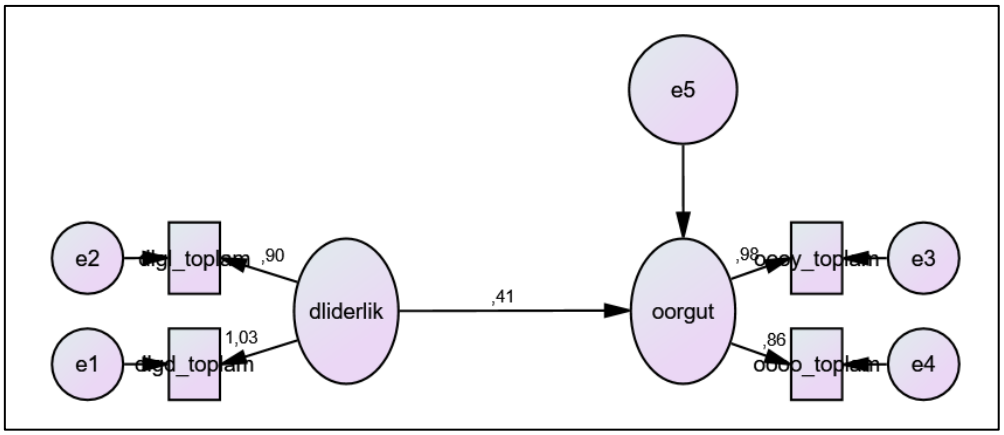
Frame 2. Scheme of Relationship between Variables (The Mediating Role of Learning Organization and Talent Management).

In order to determine the mediation role of learning organization and talent management, mediation test was applied in structural equation modeling. When conducting this analysis, the condition is sought that the compliance goodness values of the established model are at an acceptable level. When the required level of goodness of fit is achieved, firstly, the path showing the effect of the independent variable on the dependent variable (Model 1) was tested.

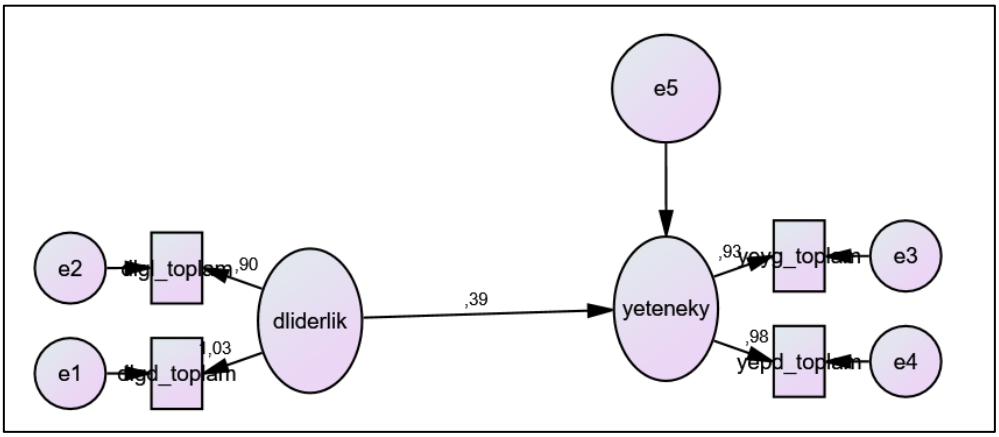


Model 1

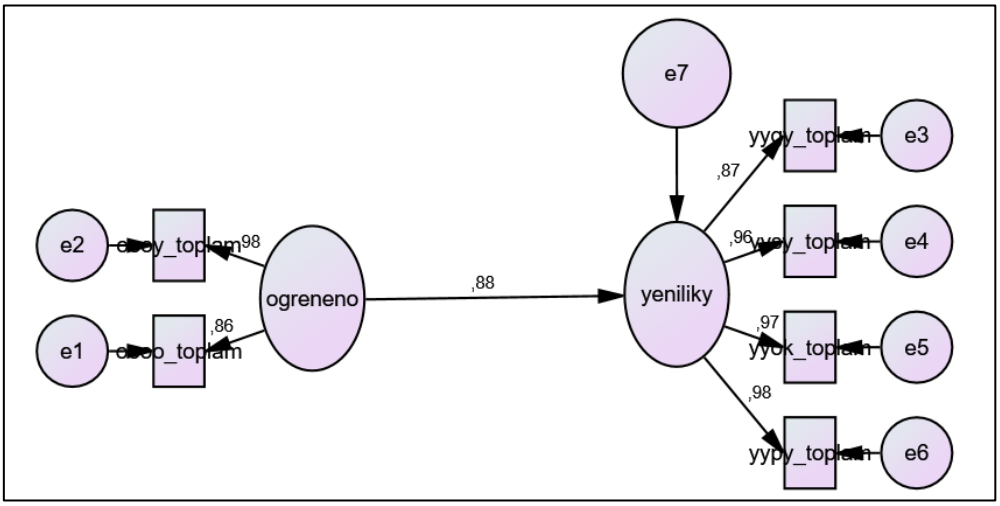
In the next stage, the paths from the independent variable to the intermediate variables (Model 2 and Model 3) and from the intermediate variables to the dependent variable (Model4 and Model 5) were tested.



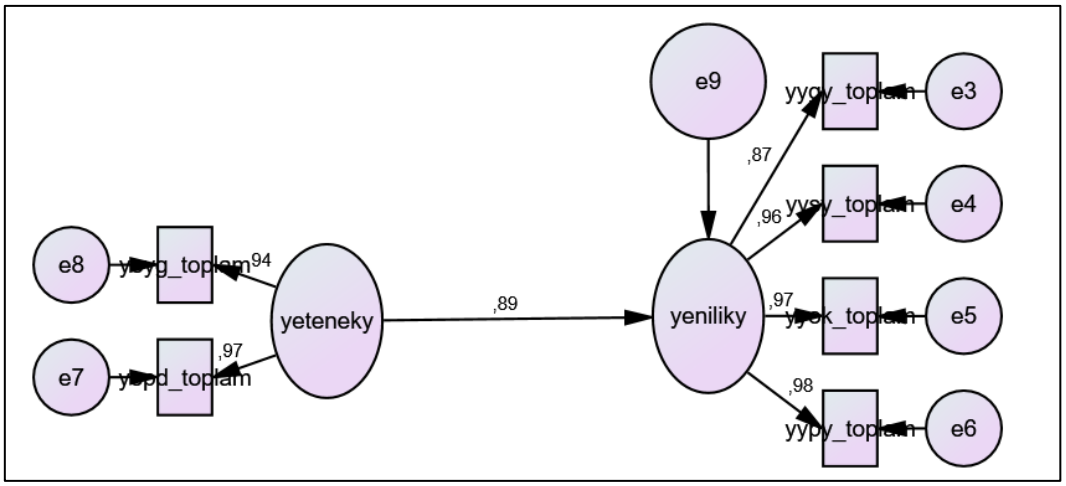
Model 2



Model 3

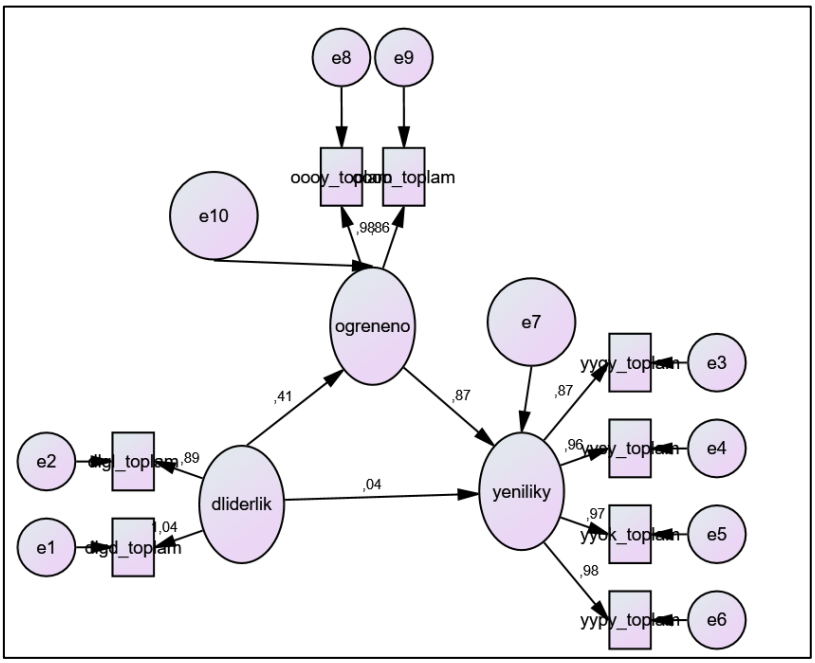


Model 4

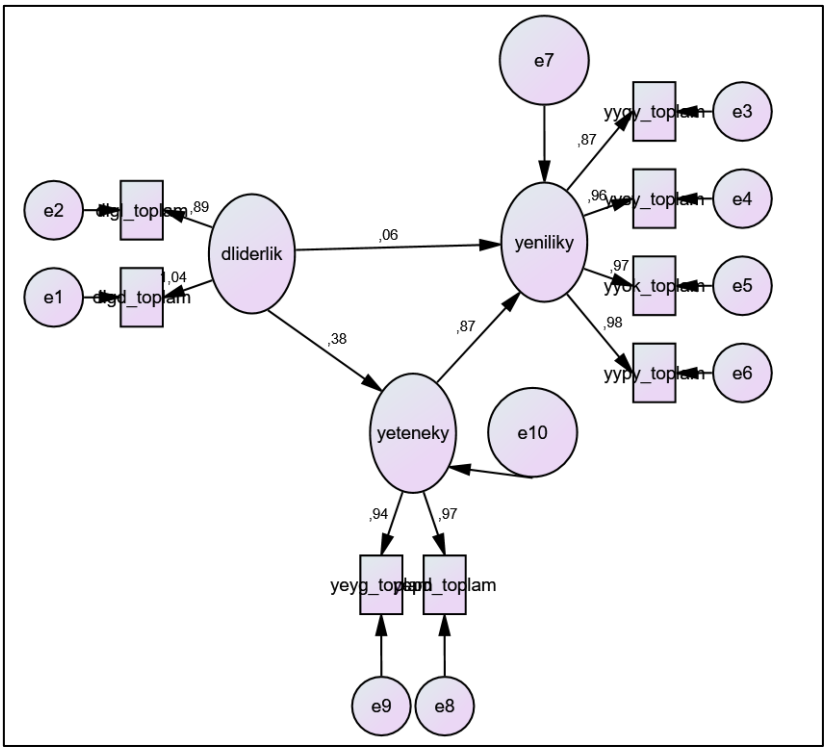


Model 5

In the next stage, the models containing the paths from the independent variable to the intermediate variables and from the intermediate variables to the dependent variable together with the models in which the path from the independent variable to the dependent variable were first tested separately (Model 6 and Model 7).

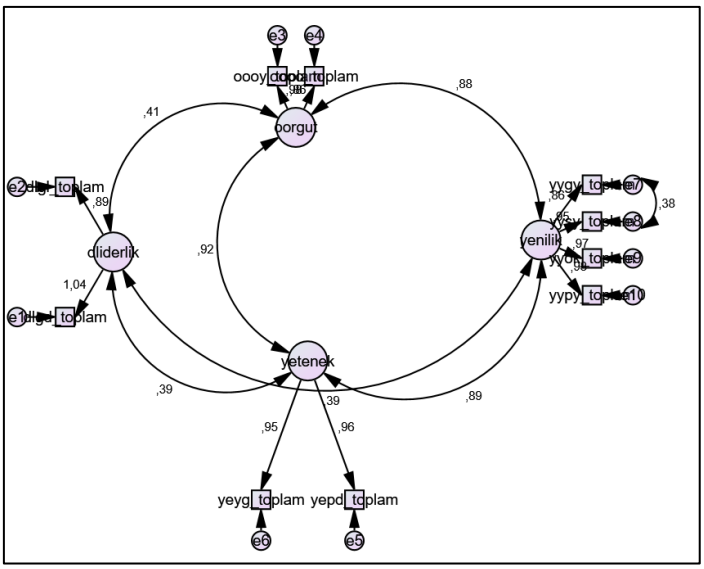


Model 6



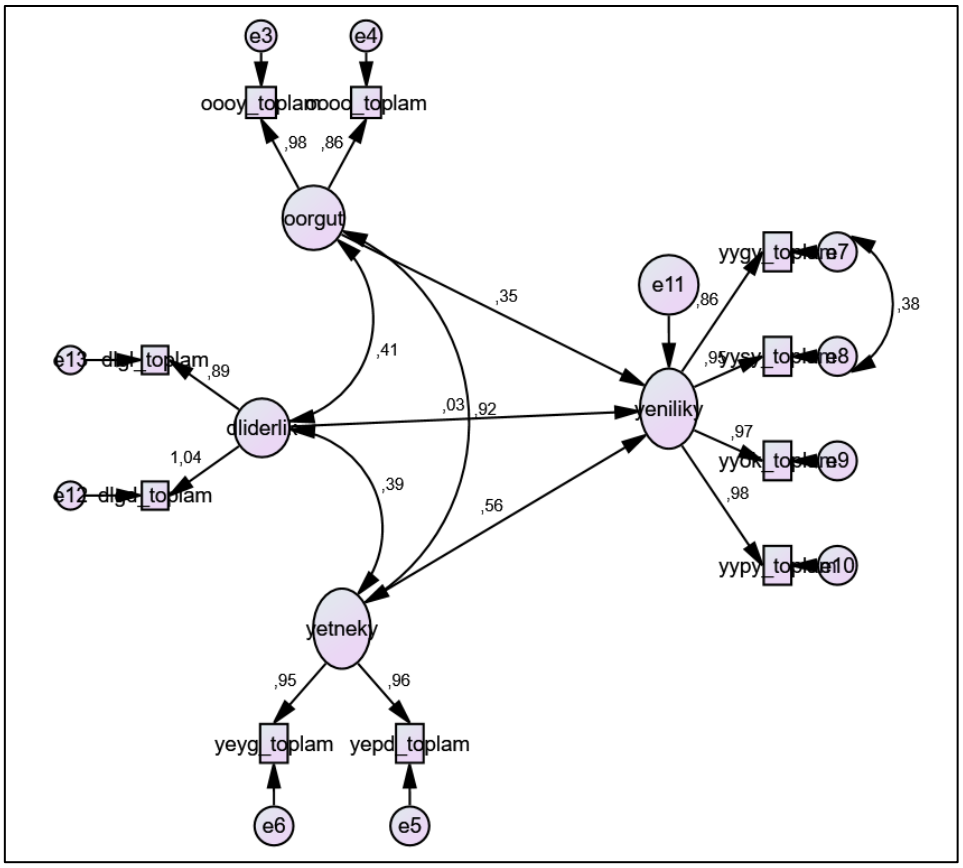
Model 7

Confirmatory factor analysis of the model was performed before the model in which the dependent variable, independent variable and intermediary variables were all tested. In order to ensure acceptable fit indices values, covariance was established between the two sub-dimensions of innovation management, the dependent variable, input management and innovation strategy and the model (Model 8), in which there are also two intermediate variables, was tested.



Model 8

It is essential that the best fit indices values are obtained from "the paths from independent variable to dependent variable and from intermediary variable to dependent variable" to be able to decide on the intermediary effect, and it is necessary that path coefficients between "independent variable and dependent variable" decrease or lose their effects totally when Model 6 and Model 7 are compared to Model 1 (Şimşek, 2001).



Model 9

It is seen that learning organization and talent management may have an intermediary effect between transformational leadership, which is an independent variable, and innovation management, which is a dependent variable due to the fact that the findings obtained in Model 9 meet the expectation of path coefficients. The fit indices values that are important in the mediation effect are given in Table 1 and the fit indices values related to the mediation test of the model are given in Table 2.

Table 1.

Limitation of Model Fit Criteria

Fit Criteria	Perfect Fit	Acceptable Fit
$\chi 2$/sd	≤3	≤5
RMSEA	0 < RMSEA <0.05	0.05 ≤ RMSEA ≤ 0.10
NFI	0.95 ≤ NFI ≤ 1	0.90 ≤NFI ≤ 0.95
CFI	0.95 ≤ CFI ≤ 1	0.90 ≤CFI ≤ 0.95
GFI	0.95 ≤ GFI ≤ 1	0.90 ≤GFI ≤ 0.95
AGFI	0.90 ≤ AGFI ≤ 1	0.85 ≤ AGFI ≤ 0.90

Resource: Schermelleh-Engel, Moosbrugger and Müller, 2003.

Table 2.

Fit Indices Related to the Mediation Test of Learning Organization and Talent Management

Fit Criteria	X^2	Sd	P	X^2/sd	AGFI	GFI	CFI	NFI	RMSEA
Model 9	121.01	28	.000	4.32	.917	.958	.989	.986	.077

Model meaningful: p<0.01

Model fit: X^2 /sd <5.0

As can be seen in Table 1 and Table 2, it has been tested that the structural equation modeling performed to decide on the mediating effect of learning organization and talent management on the impact of transformational leadership on innovation management has the expected values. In this context, firstly, the analysis results of the model created to determine whether the relationship between transformational leadership and innovation management is meaningful show that the model is meaningful. After it was seen that there is a significant relationship between transformational leadership and innovation management, transformational leadership is independent, innovation management is dependent, and learning organization and talent management are taken as intermediary variables in the model created. The fit indices obtained as a result of the test show that the model is within acceptable limits (X^2=121,01 sd=28, X^2/sd=4,32, AGFI=.92, GFI=.96, CFI=.99, NFI=.99 RMSEA=0,077).

Discussion and Conclusion

In the literature, it is seen that researchers have examined the effect of transformational leadership on innovation management. Sosik, Kahai and Avolio (1998) suggested that transformational leaders encourage creative thoughts that increase innovation within the organization

and found that transformational leadership positively and significantly affects the organization's tendency to innovation. This shows consistency with the researchers conducted by Mokhber, Vakilbashi and Ismail (2015), who found that transformational leadership has a positive and important effect on organizational innovation, by Jung et al., who found that there is a positive and important relationship between the innovation of the company and transformational leadership and by Hussain, Talib and Shah (2015). A positive, meaningful relationship at an intermediate level has been found between transformational leadership and the level of learning organization of schools in the research conducted by Safia (2020) determining the relationship between transformational leadership roles of secondary school principals and schools being a learning organization and teachers' job satisfaction levels. Transformational leadership allows individuals to create a collaborative culture in the organization that encourages teacher development, learning together, and problem solving (Hargreaves and Fink, 2006). In a study conducted by Yıldız (2019) in which the effect of transformational leadership behaviors of school administrators on teachers' perceptions of individual innovation was examined, it was found that inspiring motivation and intellectual stimulation sub-dimensions of transformational leadership predict teachers' level of innovation positively and significantly. In a study conducted by in which the role of positive psychological capital in the relationship between transformational leadership characteristics and innovation management competence of school administrators was examined a significant and high-level positive relationship was found between the transformational leadership characteristics of school principals and their competencies in innovation management. In the research conducted by Yoldaş (2019), stating the relationship between teachers' perceptions of learning organization and their attitudes towards change, it was observed that there is a positive and strong relationship between teachers' perception of learning organization and their attitudes towards change. In the research conducted by Durrani (2018) to determine the relationship between the transformational leadership approaches of managers and the talent management of employees, a strong relationship was found between managers' perception of transformational leadership and employees' talent management. In addition, the findings obtained in the study coincide with the findings of the study conducted by Esen (2016). In this research, the relationship between the leadership styles of school principals and innovation management according to the perceptions of preschool teachers was analyzed and it was concluded that there is a statistically significant positive relationship between the leadership styles of school principals and the average score of innovation management. From the point of my view, the principals with transformational leadership features who set long term aims for their schools are more likely to

new ideas, thoughts, changes and instructions. They are eager and brave to make new arrangements for their students, teachers and the schools. While making these new applications, they make all the partners participate in the decision. In this way their leadership styles directly affects the new regulations in a positive way.

The relationships detected between all these variables confirm the model that expresses the affect of transformational leadership to innovation management directly and indirectly through the learning organization and talent management suggested in the research. The findings reveal that there is a positive significant relationship between the transformational leadership levels of school principals and innovation management levels according to teacher perceptions. After the inclusion of the characteristics of schools as learning organizations and talent management variables in the model, the effect of transformational leadership levels on innovation management weakens, but still makes sense. This indicates that the characteristics of schools as a learning organization and talent management are partial intermediary variables in this relationship. In other words, it can be stated that the perceived transformational leadership levels of school principals, according to teachers, have a positive impact on innovation management through the learning organization of schools and talent management. This means that if teachers are motivated to learn themselves and their talents are rewarded and promoted by their school principals, innovations are possible. The principal sets a vision and mission for their schools. In order to accomplish this, new applications are needed. The talented teachers and teachers having desire for learning make this innovation process easier. Namely, if innovation is needed in the school, learning and talent are inevitable. According to teacher perceptions, as the transformational leadership levels of school principals' increase, the innovation management levels, the learning organization and talent management levels of their schools increase. At this point, it can be concluded that principals should form their schools according to the conditions of future. The needs and opportunities of the school should be revised by the principal and the teachers. With this data, it can be said that transformational leadership styles are the starting and triggering factor. Once the principals have these features, they can make their schools a learning organization. They can find, benefit and evaluate the talented teachers. After all this, the principals can prepare an environment in which innovation is promoted and sustained.

The increase in the level of learning organization and talent management of teachers' schools also positively affects the perceptions of innovation management towards school principals. It can be argued that school principals with a high level of transformational leadership exhibit a higher level of innovation management characteristics in their schools with teachers with a high level of learning

organization and talent management. As mentioned above, these four variables are related to each other, and an increase or decrease in one of them affects the other ones. Teachers who are determined and open to learning new things and who are interested in improving their talents and skills tend to be more positive in accomplishing innovation in their schools. Therefore, if innovation is to be realized in schools, transformational principals should benefit from talented teachers with learning capabilities.

Recommendations

Researchers can conduct new studies qualitatively with a different sample, using demographic variables and a research pattern. In the light of the findings obtained, policy developers may make the administration in public schools a professional and academic field. It is also recommended to do the research in other types of schools in other parts of the city and other cities as well. Besides this, the research includes only the public schools and the data was obtained only from these schools. Private sector could be included in the following studies. Namely, teachers and principals working in private schools may contribute to the data. The research data were obtained quantitatively, to have a deeper analysis of how school principals' transformational leadership styles lead to innovation management, a qualitative research method can be used in the further studies.

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Conflict of Interest

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Depiction of the Relationship between Human and Nature in the 9th Grade Geography Textbook

***Aysun Hajibayli, **Leyla Dönmez**

Abstract. Today, education plays an important role in people's lives. Textbooks still maintain their status in the education system. Therefore, the information contained in textbooks is very important. As the data source of this study, the 9th grade geography textbook, which was accepted as a textbook for 5 years starting from the 2019-2020 academic year with the decision of the Board of Education and Board of Education of the Ministry of National Education dated 18.04.2019 and numbered 8, was used. The aim of the research is to investigate how the relationship between human and nature is handled in the mentioned textbooks. This study was conducted using the basic qualitative research design among qualitative research designs. The data obtained through document analysis were subjected to descriptive analysis. As a result of the research, it was found that while the effects of nature on human beings in the textbooks were generally described with negative expressions, the effects of human beings on nature were described both positively and negatively.

Keywords. Human and nature, textbook, geography.

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Books are one of the most important tools that people have used for centuries to access knowledge. Despite today's age of technology, books are still very important in education. The education system relies on books as the basis for students' academic success. Textbooks play an important role in students' learning process and contribute to their success. Textbooks are used as a basic resource in students' learning process. There are many definitions of textbooks. According to Alaylıoğlu and Oğuzkan (1976), a textbook is "a book recommended to students and teachers as a basic resource for a school, class and course prepared in accordance with the criteria determined by the Ministry of National Education". Robert (2002), on the other hand, defines a textbook as "a printed work prepared for students within the framework of the information stipulated in the program in order to facilitate educational processes". There are many studies in the literature that define textbooks (Bamberger, 1975; Choppin, 1992; etc.).

The textbooks provide comprehensive coverage of the topics that students need to learn. In addition to these topics, the examples in the textbooks help students to better understand the topics. Textbooks also help students to be more active in lessons. The exercises, tests and quizzes in the textbooks help students to better understand the topics and reinforce what they have learned. Therefore, the information in textbooks should be carefully selected. There are some principles for selecting information. Seguin (1989) combines these principles into 8 categories. He defines these categories as "accuracy, precision, timeliness, objectivity, contribution to social goals, development of learning experiences and skills, advancement of concepts and skills, and interdisciplinarity". Güneş (2022) divides the content characteristics of textbooks into three categories: scientific, sociological and educational. Textbooks also help students use their time efficiently. After learning the information in the textbooks, students can use the internet to learn more. However, internet sources are not always accessible and reliable. Textbooks, on the other hand, contain information compiled from reliable sources and help students use their time efficiently. There are many studies in the literature that emphasize the importance of textbooks in education (Keleş, 2001; Şahin, 2004; etc.).

The Importance of Learning Geography

Geography is one of the oldest and fundamental fields of study, dating back to ancient Greece. No matter how long time passes, our world is still changing. Learning geography is a way to learn more about the world, which is important for a better understanding of it. It involves the study of physical phenomena such as mountains, rivers and oceans, as well as human activities such as agriculture, urbanization and globalization, helping us to understand the complex interactions

between humans and the natural world and how these interactions impact our lives and the health of our planet (H. Doğanay & S. Doğanay 2022).

One of the most important benefits of geography education is that it provides us with a global perspective. It is necessary to understand and participate in the world's physical, economic and social systems and an increasingly globalized society. Demiralp (2007) emphasizes the importance of materials in geography education. He argues that a properly selected material offers a better educational space. Geography allows us to understand and adapt to different cultures, languages and traditions globally. Understanding global issues such as inequality, poverty and migration helps us to approach others with more empathy and compassion and work towards a more just world. Furthermore, as geography is an interdisciplinary field that brings together a range of disciplines, it also provides an opportunity to learn about related disciplines, e.g. geology, ecology, anthropology and economics, etc. It is also extremely important in understanding world history, how humans have changed nature and much more. Unfortunately, studies on geography education in Türkiye give very little attention to issues such as environmental education (İncekara 2011).

Geography also reveals the distribution and value of the world's natural resources. These resources include minerals, oil, water, forests, agricultural land, biodiversity and many more. With the world's population growing, the sustainability of natural resources is a major concern. Geography makes people aware of how to conserve these resources and use them more wisely. Geography education is also extremely important to keep up with technological developments in the modern world. Technologies such as geographical information systems and satellite imagery are used to track changes on Earth. These technologies help to predict natural disasters, map landforms, monitor water resources and much more. Geography learning informs people about the use and limitations of these technologies (Ünlü 2014).

Climate change, natural disasters and resource depletion are some of the most important problems facing the world today. Geography provides the knowledge and skills needed to solve these problems and collaborate on solutions. In addition, learning about the impact of humans on the planet helps us make informed decisions on issues such as transportation, energy consumption and urbanization. Studying geography is also important to contribute to the process of developing well-informed and responsible citizens with a strong sense of citizenship, global awareness and competence (Atmaca & Çamurcu 2020).

As a result, learning geography is a way to learn more about the world, which helps us understand human interactions, natural resources, cultures, and many other things around the world. Geography education is also extremely important to contribute to solving global problems. According to Çimen (2021), geography education Türkiye is still not at a sufficient level. Improving this education is one of the main goals.

The relationship between Human and Nature

The relationship between humans and nature is a complex and multifaceted one that has evolved over thousands of years. Humans were initially dependent on nature for survival. Throughout history, humans have interacted with the natural world in different ways. Starting with hunting and gathering, the relationship has come a long way to agriculture and industrialization. Early humans were often nomadic communities, moving around in search of food and resources. Hunting and gathering for food was the main livelihood and people had to adapt to the rhythms of the natural world to survive. As human societies became more settled and agriculture was developed, the relationship between man and nature began to change. People began to grow crops and domesticate animals, which allowed them to produce more food and support large populations (Güneş, 2018).

In the 19th century, the industrial revolution marked a major turning point in the relationship between man and nature. The development of machinery and the use of fossil fuels led to unprecedented levels of economic growth and prosperity, but it also led to widespread pollution and environmental degradation. This has continued to the present day, and the global economy has become overly dependent on the use of non-renewable resources and the exploitation of natural habitats. More recently, however, there has been growing concern about the impact of these interactions on the environment and the need for a more sustainable relationship with nature (Karaca 2007). Human negative impacts on nature. Humans have a significant impact on the natural world. In recent years, the negative impacts of humans on nature have become increasingly evident. As the population increases, so does our pressure on the environment. We can categorize the negative impacts on the environment as follows.

- Habitat destruction: One of the most significant negative impacts of humans on wildlife is habitat destruction. As we have expanded our cities, farms, and infrastructure, we have cleared large areas of natural habitats, destroying the homes and breeding grounds of countless species. This has led to reduced biodiversity and the extinction of many species (Yıldırım 2019).

- Climate change: Human activities have a profound impact on wildlife, and climate change is one of these impacts. The burning of fossil fuels, deforestation and other human activities have led to increased greenhouse gas emissions. These greenhouse gases trap heat in the atmosphere and cause global temperatures to rise. This leads to melting glaciers, rising sea levels and changes in weather patterns that have serious impacts on ecosystems worldwide (Demirbaş & Aydin 2020).
- Pollution: Pollution is another major negative impact of humans on wildlife. We have introduced many chemicals and pollutants into the environment, such as pesticides, fertilizers, and industrial waste. These pollutants cause soil, water and air pollution and can have a range of negative impacts on ecosystems and their associated organisms (Menteşe 2017).
- Destruction of freshwater resources. Freshwater resources, such as rivers and lakes, have also been damaged and polluted by human activities, leading to droughts, loss of ecosystems and diminishing freshwater resources. This leads to problems such as water scarcity with serious consequences for agricultural productivity, energy production and human health (Imanov, Mammadov, Abdullayev 2014).
- Overfishing: Humans also have a significant impact on the world's oceans and nature. Overfishing has led to the depletion of fish and other animal populations and reduced biodiversity in many areas. This also has negative impacts on human communities that depend on fish for food and income.
- Invasive species: Another negative impact of humans on wildlife is the introduction of invasive species. When we moved around the world, we introduced non-native species in new environments. These species can outcompete native species and disrupt ecosystems. Invasive species pose a major threat to biodiversity and have significant economic impacts (Kekillioğlu & Bıçak 2022).

In conclusion, no one can deny the huge and negative impact of humans on nature. Everyone needs to take responsibility to reduce our impact and protect the rest of our planet for future generations.

Positive human impacts on nature. The relationship between humans and nature has often been portrayed as one in which humans have a damaging and destructive impact on nature. Indeed, human negative activities have had a significant impact on the planet, but it is important to recognize that humans also have positive impacts on nature. We can categorize the positive impacts of humans on the earth as follows.

- Conservation: Humans have played an important role in conservation efforts around the world, protecting endangered species and preserving natural habitats. Thanks to conservation efforts, many species, such as the black eagle and gray wolf in the United States, have been saved from extinction. Conservation efforts have also led to the formation of national parks and protected areas, thus protecting natural habitats and increasing diversity (Koç & Soykan, 2020).
- Restoration: People are investing in the restoration of natural habitats that have been destroyed or degraded. This includes initiatives such as restoration and wetland restoration that help regeneration.
- Forest reforestation: Deforestation is a major environmental problem, but people are also contributing to forest reforestation efforts. Trees are important for absorbing carbon dioxide from the atmosphere and providing habitat for wildlife. Forest reforestation efforts have been successful in many regions around the world, for example in China, where the government has launched a major reforestation campaign and is working to prevent desertification and improve air quality.
- Sustainable agriculture: Agriculture is a major cause of environmental degradation, but sustainable agricultural practices can positively impact wildlife. For example, organic farming uses natural methods to control insects and fertilize plants. This reduces the amount of chemicals released into the environment. Sustainable agricultural practices can also help protect soil and water resources, reduce erosion and improve water quality (Şahin & Göcen, 2021).
- Clean energy: The development of clean energy technologies such as solar and wind energy has a positive impact on the environment by reducing the amount of greenhouse gases released into the atmosphere. Clean energy technologies are becoming more economical and widespread and reduce our dependence on fossil fuels (Koç & Kaya, 2015).

In conclusion, as can be seen from the literature review, humans have a great impact on nature. The relationship between humans and nature is complex and multifaceted and has evolved throughout human history. Although human activities have many negative impacts on the environment, there is a growing need for a more sustainable and harmonious relationship with nature. By working towards this goal, we can ensure a better future for ourselves and our world.

For this, it is important to look at how this issue affects school education. Because a good future can only be achieved through the right education. The aim of this article is to contribute to the literature on this topic. The type of research, research group, data collection tools, validity and reliability, data collection techniques, analysis of the data should be detailed in the method sec

Method

Research Model

This study was conducted based on the basic qualitative research design among the designs of qualitative research method. Basic qualitative research is one of the most frequently used designs in the field of education. Basic qualitative research are studies conducted to understand a phenomenon in general, to see and explore how people make sense of life and the world. In this design, data are collected through observation, interview, and document analysis (Merriam, 2018.). Since this research also focuses on discovering a meaning and how this meaning is portrayed, the basic qualitative research design was used in the research. In short, the main purpose of this research is to discover and describe a meaning. In this research, it was attempted to make sense of and explain how the relationship between human and nature is portrayed in 9th grade geography books.

Source of Data

The data source of this research is the 9th grade geography textbook, which was "accepted as a textbook for 5 years starting from the 2019-2020 academic year with the board decision of the Ministry of National Education Board of Education and Board of Education dated 18.04.2019 and numbered 8". The reason for choosing 9th grade is that the relationship between human and nature is mostly included in this curriculum. In addition, the book accepted by the Ministry of National Education, which is easily accessible by everyone, was used as a data source, not private publishing houses. First, a literature review was conducted on the place and importance of textbooks in education, the importance of geography education and the human-nature relationship.

Data Analysis

In this study, data were collected through document analysis. "Document analysis involves the analysis of written material containing information about the phenomena and events targeted for research" (Yıldırım & Şimşek, 2016, p. 189). Descriptive analysis method was used in the research. "In the descriptive analysis method, in which the data are analyzed according to predetermined themes, the researcher can also present the data in accordance with the research questions and dimensions" (Yıldırım & Şimşek, 2016, p. 239).

Results

Nature is seen as an indispensable resource for human beings to survive. Human meets his various needs by using nature and nature provides man with various resources to sustain his life.

However, today, increasing population, industrialization and technological developments have complicated the relationship between humans and nature. Therefore, geography textbooks are very important to help students understand the relationship between humans and nature and gain awareness about the sustainable use of natural resources. Table 1 shows the chapters and lessons in the analyzed textbook where there are findings on the relationship between human and nature. The topic was analyzed under the titles "The impact of nature on people's personal lives" and "The effects of human activities on nature".

Table 1.

Chapters and Lessons of the Textbook

Section	**Lesson**
Human and Geography	Human and Nature
	Geography from Yesterday to Today
Climate Knowledge	Atmosphere and Weather Phenomena
	Weather and Climate
	Climate Elements (Temperature)
	Climate Elements (Pressure and Winds)
	Climate Elements (Humidity and Precipitation)
	Climate Types on Earth and Vegetation
Human Systems	Settlements from Past to Present.
	Settlement Types and Textures
	Affecting Settlement in Türkiye Factors
Regions and Countries	Distinguishing Regions
	Criteria Used
	Region Boundaries
Environment and Society	Our Needs and the Natural Environment
	Human-induced changes in the natural environn

The impact of nature on people's personal lives.

Nature has a significant impact on people's personal lives. People survive and increase their well-being by taking advantage of the resource's nature provides. But nature also has an impact on people's health, state of mind and social life. Nature influences everything from the way people live, the way they dress, the variety of crops they plant and grow. The textbook mentions the effects of nature on people's lives quite often. It emphasizes that people must wear thinner clothes in hot places

and thicker clothes in cold places, that climate is important in the variety of crops grown, and that people generally live in areas with a moderate climate and suitable for life.

According to the textbook, nature also influences the materials used to build structures on the land and the type of food people eat.

> *Landforms also affect our lives. Agriculture is limited and transportation conditions are difficult in places where there are more hills. For example, in Afghanistan, there are few places suitable for agriculture due to the ruggedness and transportation is not developed here. We can give Hakkâri as an example of such places in our country.(Baranaydin, Aydin & Tekbaş 2022. p13)*

As can be seen from the quote, there is a narrative that nature makes people's lives difficult. The general narration also proceeds in this direction. Although the textbook does not directly use negative expressions about the effect of nature on human life, it uses a negative perspective when describing the subject. Even when describing the positive and beautiful aspects of nature, it emphasizes the negative aspects of this subject. We can give the following excerpt as an example.

> *Another effect of landforms on our lives is that they enable the development of tourism. Some landforms such as beaches, waterfalls, volcanic mountains, fairy chimneys, lakes and caves make important contributions to tourism. On the other hand, the ruggedness of landforms negatively affects tourism as it makes transportation difficult. (Baranaydin, Aydin & Tekbaş 2022. p13)*

The effects of human activities on nature.

Humans can create significant changes in the world because of their interactions with nature. People, who live their lives by making use of natural resources, shape nature through activities such as agriculture and animal husbandry practices, industrial activities, mining, energy production and urbanization. These interactions have both positive and negative aspects.

The negative impacts of humans on nature are also quite serious. Factors such as industrial activities, greenhouse gas emissions, pollution and uncontrolled use of natural resources disrupt the balance of natural ecosystems and lead to the depletion of natural resources. Humans also cause environmental pollution by releasing their wastes that cause air, soil and water pollution into nature. As a result of this pollution, air quality deteriorates, species living in water disappear, human and animal health is affected, forests are destroyed, and climate change can also be caused. All these

impacts cause serious damage to the health of ecosystems and negatively affect the sustainable use of natural resources. The negative impacts of humans on nature disrupt the balance of nature, leading to the depletion of natural resources and a decrease in the quality of life.

Of course, human beings do not only have negative impacts on nature, but also positive ones, and they can be seen in many areas. First, by exploring and understanding nature, people are working for the protection and sustainability of their environment. As a result of these efforts, many projects are emerging that prevent pollution of the environment, loss of soil fertility, depletion of water resources and destruction of natural habitats. Humans also manage natural resources through agriculture and forestry activities. The correct implementation of these activities leads to beneficial outcomes such as keeping soil fertile, protecting water resources, preventing erosion, increasing biodiversity and maintaining air quality. Ultimately, the positive impact of humans on nature makes our world a better place through the sustainable use and conservation of natural resources.

In conclusion, human interactions with nature should be evaluated together with their positive and negative aspects. Sustainable use of natural resources, adoption of environmentally friendly practices and taking the necessary measures to protect nature can help to increase the positive aspects of human interactions with nature and reduce their negative effects. The textbook adequately addresses this issue. Both positive and negative impacts of humans on nature are explained, diversified and examples are given to support the discourse. We can look at the following excerpt about the positive effects of humans on nature.

> *The natural conditions we live in directly affect our lives. On the other hand, people make many changes in nature to get rid of the negative effects of nature. For example, thanks to the Suez Canal, transportation between the Mediterranean coasts and the coasts of South and East Asia has become much shorter. We can give many examples of this situation in our country. The July 15 Martyrs, Fatih Sultan Mehmet and Yavuz Sultan Selim bridges and the Ovit Tunnel are some of them. Tunnels and viaducts are built to provide transportation in rugged terrains, and the natural environment is changed to process mines. (Baranaydin, Aydin & Tekbaş 2022. p14)*

He also mentions the negative effects of humans on nature. Let's look at another quote on this subject.

> *The mixing of industrial wastes with water, the unconscious use of fertilizers and chemical pesticides in agriculture, and the random*

> *dumping of garbage in the natural environment are some of the reasons that lead to water pollution. For example, in Bangladesh, water pollution has reached an advanced level because of the addition of various wastes to water. A similar situation exists in Chad, Mali, Niger, and Senegal*. (Baranaydin, Aydin & Tekbas 2022. p199)

When describing the effects of human beings on nature, the textbook first talks about the effects themselves and then shows examples related to this subject. However, as it can be seen from the quotations, it shows examples from both the world and Türkiye when describing positive effects. In fact, there are more examples from Türkiye. But when it comes to negative effects, most of the examples given after the narration belong to the world. Almost no examples are given on this subject in Türkiye. Türkiye is mentioned only when describing the damages caused by pesticides. Giving examples by associating them with the immediate environment will enable children to better understand and internalize the subject. The future generation that learns about nature and grows up fully understanding the effects of human beings on it will make more effort to protect it.

Discussion and Conclusion

The relationship between humans and nature has always been a very important issue. Because while humans survive by using natural resources, they also provide a meaningful impact on nature. This interaction has become increasingly evident on a global scale over time. Therefore, it is of great importance to reveal the impact of human activities on nature and to take measures for a sustainable future. This article examines how the 9th grade geography textbook approaches the relationship between humans and nature. The book deals with human interactions with nature, covering topics such as deforestation, degradation erosion, water resources management, climate change, destruction of nature and tourism. It also discusses the impact of human activities on the natural world from a global perspective. In general, the textbook describes the effects of nature on human beings from a negative perspective, while the effects of human beings on nature are described both positively and negatively. The book does not give much space to issues related to sustainable development.

The article emphasizes how humans are limited in their interactions with nature, a key point of the book. Human activities can change and completely destroy the essence of nature. However, in order to conserve the resources that nature provides, humans need to cooperate with nature in a mutual way. Steps taken for this purpose are crucial for protecting nature and ensuring a sustainable future. Therefore, it is important to examine how this issue is reflected in education. This study aims to contribute to future changes in textbooks.

Many studies have been conducted on the topics covered in geography textbooks. Sezen and Şanlı (2017) investigated the phenomenon of migration in Geography curricula and textbooks. As a result, they determined that the subject is mainly Türkiye-centered, the international dimension and current migration movements are not sufficiently reflected, important concepts and legal regulations related to migration are missing in the content, and the information used is insufficient in terms of current and scientific aspects. This situation makes it difficult for students to understand the phenomenon of migration from a holistic and global perspective. Some of the findings are in line with this study. In this study, the fact that current issues are given less space, that examples are given from Türkiye when the positive part of the subject is explained and only from a certain part of the world when the negative part is explained makes it difficult to understand the subject with a holistic and global perspective.

Sözcü and Aydınözü (2019) examined 9th grade geography learning outcomes according to the revised Bloom's taxonomy. They determined that most of the achievements focused on conceptual knowledge, that is, generalizations and classifications. According to their research results, factual knowledge is 20% and procedural knowledge is only 12%. Important topics such as map skills are not covered sufficiently and metacognitive knowledge is almost non-existent. This deficiency makes it difficult for students to think more deeply. In the cognitive process, there are many learning outcomes in the comprehension dimension, but very few in higher level dimensions such as application and analysis. There are no outcomes in the creation dimension. According to their study, the program was weak in meeting the main purpose of geography.

In the 9th grade geography textbook, it is concluded that there is little information on the subject and that it is not reinforced with practical lessons. These results are similar to the findings of Yaman and Topçu (2022) on their own subject. In their study on "Examining the 9th Grade Geography Curriculum on the Axis of National Identity", it is seen that the 9th grade geography curriculum seems to be sufficient in terms of subjects and achievements in gaining national identity awareness, but there are deficiencies in terms of quality. In their study, it is suggested that the curriculum should be enriched with introductory trips, field studies and concrete activities in order to increase the permanence of these achievements, although it supports students to recognize the geography they live in historically and culturally and to understand the importance of natural and cultural heritage.

Tomal (2019) conducted a study on another geography textbook used in the 9th grade and found that teachers generally considered the content dimension of the book subject to the research sufficient, but they thought that the visuals and assessment and evaluation questions should be increased.

The study conducted by Gül (2013) revealed that environmental problems are not just pollution or unconscious use; it is a complex issue with social, political, economic and cultural dimensions. It is emphasized that a strong environmental awareness should be created for a solution, and the environment should be approached not as an object of consumption but as a common heritage that needs to be protected. In order to minimize the damage of technological progress to the environment, environment-centered ethics should be adopted instead of anthropocentric, environmental education should be expanded, an ecological citizenship model should be developed and a sustainable human-nature relationship should be established. As a result, this study shows how important education is in accordance with this study.

Recommendations

It is important to learn and teach about nature. The better this subject is portrayed in textbooks; the better students will grasp the subject. As a result of the research, we can make some suggestions. First, this subject can be given more space in order to make children love and understand nature. While explaining both positive and negative aspects, examples from the world and Türkiye can be given. This will help children to understand the subject well and not to get caught up in the notion that bad examples are only in a certain place. Our future is very important. To protect it, sustainable development is becoming more and more important today. Therefore, topics related to this subject can be given more space.

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The Relationship between 9th Grade Students' Symbol Sense Behaviors, Algebraic Thinking Skills and Academic Achievement: A Case Study

***Tuğba Tat, **Pınar Anapa Saban**

Abstract. The aim of this study is to investigate the relationship between ninth grade students' symbol sense behaviors, algebraic thinking skills and academic achievement. To achieve this aim, a qualitative research approach known as case study design was employed. A total of three students studying in a high school in Gümüşhane province constituted the study group of the research. In the study, considering the opinions of the mathematics teacher conducting the course and the academic achievement levels of the students in the mathematics course, one student from each achievement level was selected as low, medium and high academic achievement level. The data were acquired from five research inquiries in the literature and adapted in line accordance with expert perspectives. The data were analyzed using thematic coding with an analysis table prepared in line with expert opinions. Students with high achievement level showed symbol sense behaviors at the desired level by using symbols in a flexible and fluent way, while students with low and medium achievement level could not exhibit symbol sense behaviors at the desired level. Students with high academic achievement have advanced algebraic thinking skills. The algebraic thinking skill behaviors of students with low academic achievement are more in the form of rote stereotyped signs. As a result, students' algebraic thinking skills and symbol sense behaviors were found to be compatible with their academic achievement levels. In addition, it was concluded that there was a positive relationship between algebraic thinking skills and symbol sense behaviors.

Keywords. Symbol sense behaviors, algebraic thinking skills, academic achievement, 9th grade students.

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Since algebra is closely related to the construction, development, and communication of knowledge in all domains of mathematics (NCTM, 2000), comprehension of algebra holds significant importance within the realm of mathematical education (Chow, 2011). Algebra, being a potent instrument, exerts influence across various branches of mathematics and holds a pivotal role in the educational process of mathematics across different proficiency levels (Lacampagne, 1995; Kieran and Drijvers, 2006; Irwin and Britt, 2007). In this context, algebra has been defined as a gateway or gate keeper to advanced mathematics education for students from past to present, but this door is closed for many students (Lacampagne, 1995; Kaput, 1999; Toluk-Uçar, 2018). To be successful in algebra, algebraic thinking skills need to be developed (Kieran, 2004).

Algebraic thinking, which starts to develop from primary school, is one of the most vital and main elements of mathematical thinking and reasoning (Toluk-Uçar, 2018). In the literature, algebraic thinking process is known as the process of transition from real and mathematical contexts to structure. The evolution of the human ability to comprehend and use symbols is part of this process. The foundation of algebraic thinking begins in elementary and middle school with mathematical recognition of number patterns and progresses towards generalization. Effective algebraic thinking necessitates proficient symbolization and generalization abilities (Sibgatullin, Korzhuev, Khairullina, Sadykova, Baturina and Chauzova, 2022).

According to Sibgatullin et al., (2022), algebraic thinking typically encompasses the act of generalizing arithmetic procedures and gains intricacy with advancement, emphasizing variables. The five fundamental elements of algebraic cognition (*a. Generalization and formulation of arithmetic operations, b. Analyzing and converting specific equality issues using inverse operations and fundamental syntax, c. Examination of mathematical structures, d. Exploration of relations and functions that include both numbers and variables and e. Algebraic language and notation*) are discussed in various research studies (Usiskin, 1999; NCTM, 2000; Radford, 2000; Schliemann, Carraher and Brizuela, 2006; Stephens, Blanton, Knuth, Isler-Baykal and Gardiner, 2015).

According to Kamol (2005), the fundamental elements of algebraic thinking encompass three core skills: Notation, model (pattern), and variable. Notation entails the capacity to employ tables, graphs, symbols, etc., within a specified problem. The model comprises skills in pattern formulation and generalization. The concept of variable involves comprehending the function of variables in generalized numerical contexts. Kriegler (2007), categorizes algebraic thinking into two primary elements: the formation of mathematical thinking instruments and the examination of fundamental algebraic concepts. The mathematical thinking instruments encompass skills for problem-solving,

abilities for representation, and cognitive patterns for analysis, all of which pertain to quantitative reasoning. Fundamental algebraic concepts delineate the subject area in which the instruments for mathematical thinking are cultivated and encompass the subcategories algebra as a generalized form of arithmetic, algebra as a mode of expression, functions, and algebra as a tool for mathematical modeling.

When the basic components of algebraic thinking are examined, it is seen that algebraic thinking requires mathematical reasoning within a mental framework (Sibgatullin et. al., 2022). According to Piaget, students between the ages of 7 and 15 are in the formal processing stage. These students have serious difficulties in forming basic mathematical ideas. Among these difficulties is the concept of variable, which is one of the basic algebraic ideas. It is clear that students' difficulties in understanding and using symbols effectively will negatively affect the development of algebraic thinking and reasoning. Symbol sense, facilitates the process of algebraic reasoning (Somasundram, Akmar and Eu, 2019). Symbol sense refers to students' understanding and manipulation of algebraic symbols, which is crucial for successful algebra learning (Naidoo, 2009). In this context, teachers need to know how students use and interpret symbols in algebraic thinking. From this point of view, it is also important for students to have a developed symbol sense. What is symbol sense?

Symbol Sense

Symbol sense is a recent term in maths education, similar to number sense (Rycroft-Smith and Macey, 2022). In light of the research conducted on "number sense" during the 1980s and 1990s, the notion of expanding number sense beyond elementary arithmetic to encompass algebraic concepts in educational settings serves as a foundational element for the development of symbol sense (Arcavi, 1994). Today, just as the main focus of learning and teaching arithmetic is not the correct performance of operations on numbers, the main focus of learning and teaching algebra is not the correct symbolic manipulations. Students with a developed symbol sense can flexibly read and interpret letter symbolic expressions and fluently use the complex symbolic language of mathematics. Similar to the concept of number sense, symbol sense entails a deep understanding and perceptiveness when manipulating symbolic representations and mathematical operations. Nevertheless, the educational resources and pedagogical strategies aimed at cultivating symbol sense lack the same level of detail and elaboration in comparison to those dedicated to promoting number sense (Fey, 1990). Arcavi (1994) contended that the evolution of symbol sense is shaped by its interplay with various faculties, including numerical perception, operational understanding, and visual interpretation, ultimately resulting in progression and transformation. Symbol sense behaviors and their explanations, have main

components. These main components named as "friendliness with symbols", "reading and using symbolic expressions", "designing symbolic expressions", "symbol selection", "checking symbol meanings" and "symbol context" (Arcavi, 1994; 2005). The descriptions of these components are as follows: a) *Friendliness with symbols:* knowing when to intuit when a symbol is needed in the process of solving a problem, and vice versa, knowing when to abandon a symbol, b) *Reading and using symbolic expressions:* Pre-examination of symbols with the expectation of sensing problems and problem meanings and checking the contrast between meaning-making and symbolic use, c) *Designing symbolic expressions*: Conveying the verbal or visual data essential for advancing in a task and constructing symbolic expressions, d) *Symbol selection:* The act of selecting a symbol representation from various options for a given problem, e) *Checking symbol meanings:* This task entails the examination of the interpretations of symbols either prior to or during the implementation of a process, the resolution of an issue, or the analysis of findings, and juxtaposing the symbolic interpretation with one's own intuitive understanding of the anticipated result and f) *Symbol Context*: The recognition that symbols possess varying functions in diverse contexts, such as variables, is crucial. The utilization of a particular variable may necessitate distinct interpretations across various problem scenarios.

Symbol sense is the understanding of situations in which symbols can be used. Developing symbol sense in algebra is an important way to improve students' abstraction and generalisation skills (Arcavi, 1994; 2005; Bokhove and Drijvers, 2010; Jupri and Sispiyati, 2020). In this respect, it is expected that symbol sense is given the necessary importance and reflected in the applications. The findings from the study carried out by Dede and Argün (2003) demonstrated a recurrence in the challenges faced by both local and global students when it comes to comprehending algebra. Students' difficulties in learning algebra come from at least two sources. First and foremost, the acquisition of algebraic knowledge necessitates students to grasp the intricate system of mathematical symbols, a system that starkly differs from their prior cognitive encounters. Therefore, students need to understand symbols when learning algebra. Second, algebra is a subject that requires students to develop abstract reasoning and problem solving (Kusaeri, 2012). The concept of symbol sense pertains to the comprehension of symbols within the realm of algebra, as discussed by Bokhove (2010). In order for students to learn algebra, symbol sense should be at the heart of algebra and algebra teaching should be oriented towards it (Arcavi, 1994).

Despite the presence of overlapping yet conflicting perspectives regarding the conceptualization of algebra and algebraic reasoning, there is consensus among scholars that

proficiency in algebraic thinking necessitates adept symbolization and generalization abilities (Kaput, 2008). Based on the findings by Mason (2008), it is recommended that educators guide young learners as they embark on their journey of numerical exploration, ensuring that the process of deriving meaning from numbers gradually transitions towards the realm of algebraic reasoning. Algebraic thinking is cultivated as a result of the identification of numerical patterns in arithmetic, leading to the child's ability to make generalizations. Over the course of time and through focused educational interventions, the algebraic cognition of juvenile learners progresses in sophistication. When it comes to recognizing patterns and formulating mathematical abstractions, it is imperative for educators to tactfully steer students towards adopting an algebraic mindset. Teachers must possess a thorough understanding of their students' proficiency in algebraic thinking and their approach towards mathematical problem-solving. This knowledge is crucial for comprehending the cognitive development and logical reasoning of students, thus facilitating their engagement in substantial mathematical tasks at an advanced academic stage (Sibgatullin et al., 2022). Students' symbol sense entails their ability to recognize and interpret mathematical symbols (Mutammam and Wulandari, 2023). Understanding mathematical problems relies heavily on grasping the significance of symbols in a given context (Wardah, Utomo and Putri, 2021).

The ninth grade represents an important step in the transition from middle school to high school. As recommended by the National Research Council-[NRC] (1989), it is emphasised that the main purpose of mathematics education in the transition from middle school to high school is to develop symbol sense and to further strengthen number sense (Keller, 1993). In this context, this study was conducted with ninth grade students.

When the literature is examined, it is evident that symbol sense is a crucial ability in effectively managing symbolic expressions and algebraic operations. Furthermore, it significantly contributes to the resolution of algebraic problems (Kop, Janssen, Drijvers and van Driel, 2020; Rini, Hussen, Hidayati and Muttaqien, 2021); it is seen that it affects students' general mathematical competences (Sugilar, Kariadinata and Sobarningsih, 2019) as it is the ability to understand and use mathematical symbols effectively (Rini et al., 2021), which is very important for solving algebraic problems.

According to Arcavi (1994), symbol feeling is a feeling that occurs at all stages of problem solving. One of the most widely used theories in the problem-solving process is Polya's problem solving theory. Polya (1945) proposed that the process of problem solving can be broken down into four key stages: understanding the problem, making a plan, implementation and rechecking. This

study is believed to enhance the analysis of students' algebraic skills and cognitive stages across various levels of achievement when tackling problems through the lens of symbol sense.

From this perspective, the aim of the study is to investigate algebraic thinking skills of ninth grade students at different achievement levels (low, medium and high) through out of the symbol sense behaviors at Polya (1945)'s problem solving model. It was acknowledged that the expert evaluations regarding the challenges encountered in the methodologies employed in the research were both appropriate and adequate. It was presumed that the students provided objective and accurate responses to the inquiries posed to them throughout the interview process. A notable limitation of the study was that it was restricted to 9th grade students and five specific challenges. Additionally, another limitation of the study was that the stages of problem-solving exhibited by the students were analyzed solely through the lens of the Polya model, with a focus exclusively on the symbolic reasoning behaviors demonstrated by the students during these problem-solving phases. The sub-problem formed in accordance with the purpose and problem statement of the research can be given as follows:

- What are the algebraic thinking skills of ninth grade students at different academic achievement levels (low, medium and high) thorough out of the symbol sense behaviors at problem-solving?

Method

This study investigates the relationship between symbol sense behaviors and algebraic thinking skills in terms of academic achievement. It is structured as a case study. A case study pertains to an endeavor to examine a present occurrence, an extensive depiction, and evaluation of a restricted system, individual, group, or a specific event or situation in great detail by centering on individuals and groups within the realm of authentic situations, particularly when the distinctions between the occurrence and its context are ambiguous (Yin, 1994). This case study examines each activity separately for each student while considering the situation as a whole.

This study; is related to the process since it aims to investigate students' symbol sense behaviors and algebraic thinking skills. The content is characterized by its descriptive nature as it elucidates the cognitive processes and behavioral actions undertaken by students participating in the activities extensively. It is inductive in the sense that it deals with students' symbol sense behaviors based on algebraic thinking processes. One of the researchers acted as both teacher and researcher during the activity.

In this research, a case study was determined as the most appropriate method as it aims to examine in depth the relationship between students' algebraic thinking skills from the perspective of academic success through out of the symbol sense behaviors at problem solving.

Study Group

The investigation was carried out involving three students enrolled in the 9^{th} grade at a public high school in Gümüşhane province. The school where the study was conducted is a school with a medium socio-economic level and is located in a rural area. In order to conduct the study in the designated state school, the necessary permissions were obtained from the students and their families from the Gümüşhane Provincial Directorate of National Education. In addition, permission was obtained from the Social and Human Sciences Scientific Research and Publication Ethics Board for the study. The utilization of the "maximum diversity" sampling technique, a purposeful sampling approach, was employed to identify the research participants, which comprised three students. The primary objective is to establish a compact working group and to effectively represent the diverse student population relevant to the research topic. The objective is not to ensure diversity for the purpose of making generalizations; instead, it is to investigate whether there exist common or shared phenomena and distinctions among various scenarios, unveiling diverse aspects of the issue based on diversity (Yıldırım and Şimşek, 2016). Nevertheless, the maximum variation approach strives to uncover and recognize the primary themes that encompass a multitude of distinctions linked to the occurrence or concept being examined (Neuman, 2014). The study group, which was determined by using the purposeful sampling method, consists of three 9^{th} grade students. The reason for choosing this group is that the selected students are a heterogeneous group in terms of academic success and, according to the teacher, they are students who are thought to have good communication skills and can express themselves. In order to determine the algebraic thinking levels of the students, the “algebraic thinking level determination test” (Altun, 2005) was used with permission and after the test was applied, the algebraic thinking levels of the students were determined. For this purpose, one student from each of the three levels (low, medium and high) was selected for the study group according to, *a) the opinions of the mathematics teacher conducting the course, b) The extent of algebraic reasoning proficiency following the administration of the algebraic reasoning assessment. c) the academic success of the students in the mathematics course were taken into consideration in the selection of the students.* Since the acquisitions related to algebra learning domain in the mathematics curriculum implemented in our country were first addressed in the 6^{th} grade, the student's academic achievement in the mathematics course was determined by the 6^{th}, 7^{th} and 8^{th}

grade grades. In terms of research ethics, the study group was formed on the basis of volunteerism and student and parent permissions were obtained.

In the presentation of the data, the code names Serkan, Eda and Yıldız were used to characterise the students with low, medium and high achievement levels, respectively, instead of their real names. In this study; Serkan coded as (LALS-Low Achievement Level Student), Eda coded as (MALS-Medium Achievement Level Student) and Yıldız coded as (HALS-High Achievement Level Student).

Data Collection Tools

In the first pilot application, a total of eight symbol sense behaviors were determined by obtaining the opinions of expert mathematics educators in the field. Then, for each of these behaviors, a total of fourteen problems were created by adapting the problems related to the relevant behavior in the literature. The data collection tool consisting of these problems was applied to six 9^{th} grade students on a voluntary basis. As a result of the application, the researcher observed that four of the problems in the study could be solved by very few students, that the study took a long time and tired the students. In addition, the researcher and the experts agreed that it was not appropriate to create problems for each symbol sense behavior and that it would be more appropriate to examine symbol sense behaviors in the created problems. In addition, the experts stated that applying semi-structured interview forms in the following pilot application, including pre-interview questions that included the students' opinions about mathematics course, algebra, mathematical problems and mathematical symbols before solving the problems; and a final interview form that included their opinions about the problems applied and the symbols encountered after solving the problems would be effective in terms of enriching the study. The study, which included pre-interview and post-interview questions prepared in line with expert opinions and eight problems, was conducted with 3 randomly selected students from the 9^{th} grade. The application lasted a total of 1 week, and lasted an average of 30 minutes for each student. Since the symbol sense behaviors exhibited in three problems in the application overlapped with the symbol sense behaviors exhibited in the other five problems, it was decided to apply five problems in the final version of the study after consulting the experts.

Final data collection tool of the research was collected with a problem form consisting of; a) six pre-interview questions, b) five problems in the literature and adapted in line with the expert opinions and c) three post-interview questions.

The study involved the administration of six pre-interview inquiries (*i. are you fond of mathematics? Could you provide a rationale for your preference?, ii. in what academic year do you*

believe you excel the most in mathematics? Kindly elaborate on your reasoning., iii. Is there a particular branch of mathematics that captivates you (e.g., numbers, algebra, geometry, measurement, counting, and probability)? If so, please elucidate on the reasons behind your choice., iv) Do you encounter challenges when tackling mathematical problems?, v) How would you define the term 'algebra' in the realm of mathematics?, vi) When contemplating the concept of a 'symbol' in mathematics, what comes to mind? Which symbol or symbols do you frequently employ?) aimed at eliciting the students' opinions regarding the mathematics curriculum, their stances on problem-solving, and their attitudes towards mathematical symbols, all of which were shaped by their previous encounters.

The five study problems in the study were sometimes given as a real-life problem and sometimes as a situation requiring algebraic expression. The original researchers (Arcavi, 1994; Kenney, 2008) named these tasks as problems. For this reason, by adhering to the citations in the literature, it was preferred to use the term problem for each task instead of expressions such as question or item. Baki (2008) defined algebra as 'making generalisations', 'using operations and algorithms to solve problems', 'studying relationships between quantities' and 'studying abstract structures such as groups, rings and vector spaces'. Each component in this definition is described as school algebra understanding in Usiskin's (1999) study. The study problems used in this study, are based on the algebraic components of Usiskin's (1999) and Baki's (2008) studies as: "A) Generalisation, B) Using Operations and Algorithms to Solve the Problems, C) Quantitative Relationship".

The five study problems used in this study were named as Problem 1, Problem 2, Problem 3, Problem 4 and Problem 5, in Table 1 with two columns as characteristics of problems and algebraic components.

Table 1.

Characteristics of Problems

Study Problems	**Characteristics of Problems**	**Algebraic Components**
Problem 1: $\frac{(3x+6)}{(x+2)} = 5$ (adım 1) $3x + 6 = 5(x + 2)$ (adım 2) $3x + 6 = 5x + 10$ (adım 3) $-4 = 2x$ (adım 4) $-2 = x$ (adım 5) Buna göre cevap; ☐ Kesinlikle doğrudur ☐ Muhtemelen doğrudur ☐ Asla doğru değildir İşaretlediğiniz ifadeyi açıklayınız.	This problem is a rational equation adapted from Arcavi's (1994) study.	In the solution process of this problem students are expected to "*use operations and algorithms to solve the problem*".

Problem 2: $\|3x - \frac{2}{4}\| + 1{,}2 > 5$ eşitsizliğinde x kaçtır?	This problem is a linear inequality problem adapted from Kenney's (2008) study.	In the solution process of this problem students are expected to *"use operations and algorithms to solve the problem"*.
Problem 3: **Bir üniversitede, profesörlerin 6 katı kadar öğrenci vardır.** "P" profesör sayısını, "Ö" öğrenci sayısını göstermek üzere bu durumu temsil eden denklem/denklemler aşağıdakilerden hangisi ya da hangileridir? No Denklem 1 P=6Ö 2 6Ö=P 3 6P=Ö 4 Ö=6P 5 $\frac{Ö}{6}=P$ 6 $\frac{P}{6}=Ö$	This problem is an algebraic verbal problem which was known as the "students and professors" problem in the literature (Rosnick and Clement, 1980; Clement, Lochhead, and Monk, 1981; Clement, 1982; Arcavi, 1994).	In the solution process of this problem students are expected to see "*quantitative relationship"*.
Problem 4: Ardışık üç sayının toplamı 54 ise küçük sayı kaçtır?	This problem is a verbal problem adapted from Arcavi's (1994) study.	In the solution process of this problem, students are expected to use the *"generalisations"* "$n-1, n, n+1$" *or* "$n, n+1, n+2$" of three consecutive natural numbers in accordance with the problem context.
Problem 5: Bir dikdörtgenin **bir kenarı** % 10 arttırıldığında ve **diğer kenarı** % 10 azaltıldığında dikdörtgenin alanında nasıl bir değişim meydana gelirdi? Aşağıda verilen seçeneklerden sizin için uygun olanı işaretleyiniz ve cevabınızı açıklayınız. A) Bir değişim olmazdı, çünkü... AÇIKLAMA: B) Alan artar, çünkü... AÇIKLAMA: C) Alan azalır, çünkü... AÇIKLAMA:	This problem is a verbal problem adapted from Arcavi's (1994) study.	In the solution process of this problem, students are expected to see *the "quantitative relationship"*.

At the end of the study, a series of three semi-structured post-interview questionnaire (*i. what types of symbols such as variables, coefficients, constants, or algebraic operations did you come across in the problems explored in the study?, ii. which particular problem presented as more manageable for you to resolve? What were the underlying reasons for this ease?, iii. which specific problem posed the greatest challenge for you in terms of finding a solution?*) were asked to the students. These interviews were conducted to gain a comprehensive understanding of the students'

approaches to problem solving and to delve into the cognitive progression of individuals when confronted with algebraic challenges.

Process

In qualitative research, the researcher uses an inductive data collection process and makes the data meaningful by grouping them into codes, then themes and finally broader perspectives (Creswell, 2017). The data collection process of this research consists of six pre-interview questions, five problem questions and three post-interview questions. The data collection process in the problem research is given in Table 2.

Table 2.

Interview Durations during Data Collection Process

Data Collection Tools	Yıldız (HALS)	Eda (MALS)	Serkan (LALS)
Pre-interview inquiries	9’	5’	2’
Problem 1	6’	7’	4’
Problem 2	4’	5’	5’
Problem 3	2’ 15’’	3’	2’ 10’’
Problem 4	1’ 25’’	2’ 25’’	1’ 25’’
Problem 5	3’	5’	4’ 7’’
Post-interview inquiries	3’	2’	2’ 40’’
Total Duration	28’ 40’’	29’ 25’’	21’ 22’’

Table 2 presents the interview durations for the six pre-interview questions, five problem questions and three post-interview questions conducted with each participant during data collection process.

Data Analysis

As this is a case study, the analysis of the data followed the general steps of qualitative research, which include organizing, coding, summarizing, and interpreting the collected documents and field notes (Merriam and Tisdell, 2016; Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz and Demirel, 2017). In order to ensure the validity of this qualitative study, the researcher spent enough time in the environment where the study was conducted and had long-term interactions with the study group. First, after the data was collected, each participant was interviewed twice to check the accuracy and integrity of the results, thus trying to support the accuracy and consistency of the findings. In addition, in this study, the questions used in the semi-structured interview forms, the selection and implementation of the data collection tools, and the examination of the applications by experts in the field of education were ensured. The study group was selected using the purposive sampling method,

and the environment and participants were introduced in detail with direct quotes without any comments, while remaining faithful to the nature of the data. In order to ensure the reliability of the study, the creation of the data collection tools, the collection and analysis of the data were carried out by the researcher and three field experts. The interview audio recordings of the study were interpreted by a mathematics teacher and it was seen that the comments were consistent with the comments of the researcher. In addition, the results reached in the study were verified with the data obtained by the field experts and the researcher.

Quantitative reasoning skills encompass the analysis of problems to identify and measure crucial characteristics, along with the application of inductive and deductive reasoning methods. Thematic coding, one of the data analysis methods used in case studies, was used to analyze the data.

In this study, students' symbol sense behaviors (Arcavi, 1994; 2005; Kenney, 2008, Darojaturrofiah, 2017; Rini et al., 2021) at problem-solving phases (Polya, 1945) were combined with algebraic thinking indicators (Usiskin, 1999; Kaput, 1999; NCTM, 2000; Radford, 2000; Kamol, 2005; Kieran, 2004; Kriegler, 2007; Kaput, 2008; Baki, 2008; Schliemann et al., 2006; Stephens et al., 2015) in line by expert opinion and a thematic coding table given in Table 3 below was obtained.

Table 3.

Thematic Coding for Analysis of the Study

Phases	Symbol Sense Behaviors		Algebraic Thinking Skills Indicators
Phase 1: Understanding the Problem	***SSB-A. Friendliness with Symbols*** **1**. Understand the appropriate usage and timing for employing symbols. **2.** Understand the appropriate moment to discontinue the use of symbols. **3.** Identify the significance of symbols within the given problem **4.** Expressing symbols based on their semantic significance within the given mathematical problem ***SSB-B. Designing Symbolic Expressions*** **1.** Associating symbols with problems.		**ATSI-1:** To know the unknown meaning of the variable x. **ATSI-2:** Can use the algebraic rules of the four basic arithmetic operations in the real number system (inverse-element, unit, distributive property of multiplication over addition). **ATSI-3:** Understanding and using the unknown variable x. **ATSI-4:** The meaning of the solution $x = a$ is not interpreted. **ATSI-5:** The meaning of the solution $x = a$ is interpreted. **ATSI-6:** Interpret and use the meaning of the notations. **ATSI-7:** Basic operational skills in the process of solving equations with one unknown **ATSI-8:** Basic procedural skills in solving inequalities with one unknown (writing the fraction form of decimal numbers, knowing that the inequality will change direction by multiplying or dividing both sides of the inequality by a negative number). **ATSI-9:** Demonstrated the ability to determine the symbol representing the unknown quantities in the given problem and to know its meaning. **ATSI-10:** To have the ability to determine the symbol representing the unknown quantities in the given problem in a meaningful way. In addition to this skill, to be able to use the skill of determining the equation by reading the symbol meanings.
Phase 2: Planning Problem Solving	***SSB-C. Symbol Selection*** **1.** Selecting the most suitable symbol for addressing the problem at hand **2.** Opting for the proper depiction of the symbol selected for the problem ***SSB-D. Reading and Using Symbolic Expressions*** **1.** The symbols are expressed within the mathematical models formulated in the given problem **2.** Elucidate the significance of the mathematical model formulated within the context of the problem at hand		

Phase 3: Implementing the Problem-Solving Plan	***SSB-E. Symbol Selection*** **1.** Using mathematical models to solve the problem ***SSB-F. Reading and Using Symbolic Expressions*** **1.** Utilizing the selected approach for problem resolution ***SSB- G. Friendliness with Symbols*** **1.** Applying symbols accurately at every stage of problem-solving ***SSB-H. Designing Symbolic Expressions*** **1.** The capability to effectively construct the verbal and visual data required for the resolution		**ATSI-11:** To have the ability to determine the symbol representing the unknown quantities in the given problem in a meaningful way. In addition to this skill, to be able to use the skills of determining the equation and writing equivalent equations by reading the symbol meanings. **ATSI-12:** Could not show algebraic thinking skills. **ATSI-13:** Considering the definition of consecutive number, three consecutive numbers were expressed symbolically. Using these symbolic expressions, the students demonstrated their ability to construct and solve the related equation. **ATSI-14:** Problem solving in special cases. **ATSI-15:** To create a model by considering the quantitative changes given in the problem and solving the problem by applying the necessary operations.
Phase 4: Going Back and Checking the Solution	***SSB-I. Checking Symbol Meanings*** **1.** Demonstrate the validity of the symbols employed in executing the problem-solving process. ***SSB-J. Symbol Context*** **1.** The interpretation of symbols may vary across different problem scenario		

Note:
1) **"**SSB" means "Symbol Sense Behaviors"
2) "ATSI" means "Algebraic Thinking Skills Indicators"

In alignment with the essence of qualitative inquiry the assessment of the study's trustworthiness and dependability is denoted as 'credibility' in lieu of 'internal validity', 'transferability' in place of 'external validity', 'consistency' rather than 'internal reliability', and 'confirmability' as opposed to 'external reliability' (Guba, 1981; Guba and Lincoln, 1981). In order to ensure the validity of the study, the researcher spent sufficient time in the environment where the study was conducted to collect data and interacted with the study group for a long time. In order to support the accuracy and consistency of the findings, each participant was interviewed twice, and the selection and implementation of the data collection tools and the applications were examined by experts in the field of education. The research's study group was chosen using the purposive sampling technique. The setting and the participants were introduced in detail with direct quotations, without commentary, remaining faithful to the nature of the data. In order to ensure the reliability of the study, the consistency between the researcher and the field experts was taken into consideration in the creation of data collection tools, data collection and analysis stages. In order to determine the comprehensibility of the problems in the research applications by the students and the possible situations/problems that may arise during the implementation of these activities, a pilot application was carried out. As a result of the pilot applications, the experts reached a consensus that it would be

more appropriate to examine the symbol sense behaviors in the problems created instead of creating problems for each symbol behavior.

Results

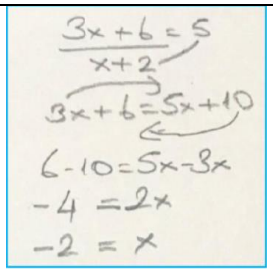
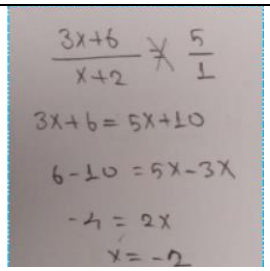
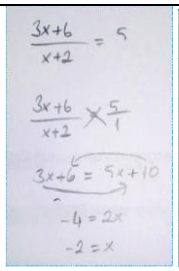
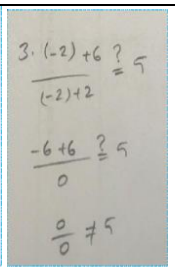
The data of the research obtained from student's solution of five problem. In this segment, the outcomes derived from analyzing the data gathered as part of the study are showcased.

Findings from Problem 1

Students' solutions to Problem 1 are summarized in Table 4.

Table 4.

Problem 1 and Student Solutions

Serkan (LALS)	Eda (MALS)	Yıldız (HALS)
Serkan answered, *"I checked all the steps, the product of ins and outs was done and x was found. Therefore, it is definitely correct"*. When Serkan was asked to solve the problem, he first did the inner-outer multiplication, then he used the distributive property of multiplication over addition to reach the result $x = -2$.	Eda replied, *"That's probably right. I checked all the steps, the product of ins and outs was done and* $x = -2$ *was found. However, since* $x = -2$ *makes the denominator zero, the equation is incorrect"*. Eda solved the problem by using the distributive property of inner-outer product and multiplication on addition.	Yıldız replied: *"It is never true. If we put the fraction on the left side in brackets of* 3*, the numerator becomes* 3 *times the denominator. In this case, the left side becomes* 3*. Since the right and left sides are not equal, the solution is incorrect"*. In the solution process of the problem, he reached the solution $x = -2$ by using the inside-outside product and the distributive property of multiplication on addition. However, he showed that $x = -2$ did not satisfy the equation.
		 

When the student responses presented in Table 4 are analysed, it is noteworthy that students with low and medium academic achievement levels could not see the multiple relationship between the numerator and denominator of the algebraic fraction given in the problem and could not

immediately apply the steps in solving an equation in mode. Students with low and medium achievement levels both know the unknown meaning of the variable x and can use the algebraic rules of the four basic arithmetic operations in the real number system (inverse-element, unit, distributive property of multiplication on addition). Serkan (LALS), is not aware that $x = -2$ is not a solution because it makes the value in the denominator zero, so he could not interpret the solution $x = -2$. However, Eda (MALS) interpreted the meaning of the solution $x = -2$. Eda (MALS), was aware of this situation. Yıldız (HALS), stated that the expression $3 = 5$ is a contradiction by considering the multiple relationship between the numerator and denominator of the algebraic fraction given in the problem, and then solved the equation by performing the appropriate operational procedures, reached the result $x = -2$ and showed that this result did not satisfy the equation. She was able to understand and use the variable x as an unknown. Also, like the other two students, she was able to use the algebraic rules of the four basic arithmetic operations in the real number system (inverse-element, unit, distribution property of multiplication over addition). In addition, she was able to interpret and use the parity meaning of the '=' notation. When the information is summarized in terms of students' algebraic thinking skills, all three students knew the unknown meaning of the variable x and all students except the student with low academic achievement level were able to manipulate numbers and symbols meaningfully using algebraic rules.

When the study examined in terms of the students' symbol sense behaviors in the problem-solving phases. At the 'understanding the problem' phase, all three students exhibited the behavior of 'friendliness with symbols' by determining that the symbol x means the unknown. At the 'planning to solve the problem' phase, Serkan (LALS) exhibited the behavior of 'reading and using symbolic expressions' by making the expression 5 and $(x + 2)$ correctly by using the distributive property of multiplication on addition'; Eda (MALS) exhibited 'reading and using symbolic expressions' behavior by knowing that the expression given in the question was a rational expression and Yıldız (HALS) is also knowing that the expression given in the question was a rational expression like Eda (MALS). Yıldız (HALS), interpreted the mathematical expression (contradiction) $3 = 5$ by comparing the symbolic expressions $3x + 6$ in the numerator and $x + 2$ in the denominator of the given algebraic fraction. These are indicators of symbol behaviors of 'reading and using symbolic-expressions'. At the 'implementing the problem-solving plan' phase, Serkan (LALS), Eda (MALS) and Yıldız (HALS) both solved the equation established to solve the problem, followed the order of operations and used the properties of operations. The symbol sense behaviors exhibited at this phase for them are 'symbol selection' and 'friendliness with symbols'. At the "going back and checking the solution"

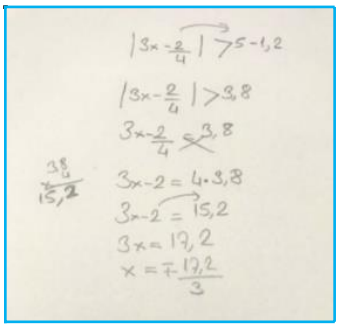
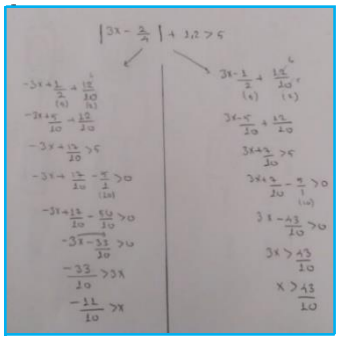
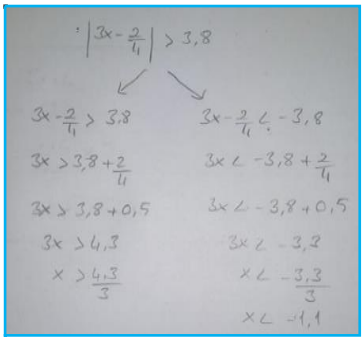
phase, Serkan (LALS) did not exhibited any symbol sense. At this phase, Eda (MALS), stated that the result $x = -2$ made the denominator zero and therefore the equation was an incorrect equation after finishing the operation. This means 'checking symbol meanings'. At the "going back and checking the solution" phase, Yıldız (HALS) stated that the numerator and denominator for $x = -2$ were zero, in this case, there was an uncertainty of $0/0$ on the left side of the equation, and the right side of the equation was '5', which proved the correctness of her answer 'It is never correct' when she first read the problem. So at this phase she exhibited the behavior of 'checking the symbol meanings'.

Findings from Problem 2.

Students' solutions for Problem 2 are given in Table 5.

Table 5.

Problem 2 and Student Solutions

Serkan (LALS)	Eda (MALS)	Yıldız (HALS)
Serkan commented on Problem 2*: "There are too many symbols in this problem. It seemed very complicated to me"*. He solved the problem by ignoring inequality and absolute value notations. He made the comment "*When I see the absolute value sign, I remember that the number has one minus and one plus*" and solved the problem as follows.	After reading the second problem, Eda said *"As far as I remember, absolute value has two results.* The *result of this operation is one minus and one plus"* and solved the problem as shown in the figure below.	Yıldız said " *There are absolute value and inequality.* The *question is complicated because there are too many symbols..."* and analysed the problem as follows.
		

When Table 5 is analysed, the student with low academic achievement solved the equation by using the equals symbol instead of the inequality symbol and determined the result as only one value.

It is seen that the students with medium and high academic achievement did not analyse the sign inside the absolute value, solved two separate inequalities depending on the variable and did not compare the solutions obtained from these two inequalities with the solutions obtained from the sign analysis. Therefore, the results obtained from the solutions of two separate inequalities were left as they were and the solution set was not shown. Serkan (LALS) has basic operational skills in the process of solving equations with one unknown. Eda (MALS) and Yıldız (HALS) have basic procedural skills in solving inequalities with one unknown (writing the fraction form of decimal numbers, knowing that the inequality will change direction by multiplying or dividing both sides of the inequality by a negative number). When the information in Table 5 is summarized in terms of students' algebraic thinking skills, all students interpreted the symbol x as an unknown. It is seen that the student with low academic achievement level cannot comprehend the relational difference between equality and inequality and has procedural skills. On the other hand, students with medium and high academic achievement levels can be said to have only basic procedural skills due to their inability to understand the concepts of absolute value and inequality.

The study was also examined in terms of students' symbol perception behaviors in the problem-solving stages. At the ‘understanding the problem’ phase, Eda (MALS) and Yıldız (HALS) exhibited ‘friendliness with symbols’ behavior since they knew that the symbol ‘x’ represented the unknown. Serkan (LALS) displayed the same symbol detection behavior as them. He subtracted 1,2 from 5 to leave 'x' alone. Serkan (LALS) did not exhibit any symbol sense behavior for this problem in the other phases except for the ‘understanding the problem’ phase. Eda (MALS) and Yıldız (HALS) exhibited the behavior of ‘reading and using symbolic expressions’ in the ‘planning problem solving’ phase, as they continued the process by using the properties of the absolute value expression, Eda (MALS) and Yıldız (HALS) exhibited the ‘symbol selection’ behavior at the ‘implementing the problem-solving plan’ phase because they solved the equation established for the solution of the problem, followed the sequence of operations and used the properties of the operations.Unlike Serkan (LALS) and Eda (MALS), Yıldız provided the solution by giving special values to 'x' at the ‘going back and checking the solution’ phase. This shows that Yıldız exhibited the behavior of 'checking symbol meanings' at this phase.

Findings from Problem 3.

Students' solutions for Problem 3 are given in Table 6.

Table 6.

Problem 3 and Student Solutions

Serkan (LALS)	Eda (MALS)	Yıldız (HALS)
After reading Problem 3, Serkan *answered as follows: "If we call the professor P, then the student is $6S$ and therefore I think the correct choice is "$6S = P$".*	After reading the third problem, Eda answered *"If we call the professor P, then the correct option is "$6P = S$".*	After reading the third problem, Yıldız determined the symbols P for the number of professors and S for the number of students and reached the equation $6P = S$. While reviewing the options, she commented that *"if I divide both sides by six, then the option $S/6 = P$ is also suitable for this problem"*. Yıldız marked equations 3 and 5 in the problem.

However, in Table 6, Yıldız (HALS) and Eda (MALS) were able to correctly read and interpret the quantitative relationship between the number of teachers and the number of students given in the problem. Serkan (LALS), on the other hand, could not read the relationship between the quantities given in the problem correctly and could not find the correct equation. In addition, Serkan (LALS), could only determine the symbol representing the unknown quantities in the problem. The students with medium and high academic achievement were able to identify the symbols representing the unknown quantities (number of professors and students), see the relationship between these quantities and write the related equation. However, only Yıldız (HALS) was able to see the equivalent representation of the equation.

The study was also examined in terms of students' symbol perception behaviors in the problem-solving phases. Serkan (LALS) exhibited 'friendliness with symbols' behavior by selecting 'S' and 'P' symbols at the 'understanding the problem' phase. In this sense, Serkan (LALS) showed the ability to know how and when to use symbols. The student named Eda (MALS), on the other hand, exhibited 'friendliness with symbols' behavior at the 'understanding the problem' phase because she used the symbols 'S' and 'P', knew that the symbols 'S' and 'P' were changing quantities, and was able to write that the number of students was 6 times the number of professors. In addition, at this phase, she exhibited the behavior of 'designing symbolic expressions' because she formed the algebraic expression $'6\mathrm{P} = \mathrm{S}'$. At the 'understanding the problem' phase, Yıldız (HALS) formed the algebraic expressions $6\mathrm{P} = \mathrm{S}$ and $\mathrm{S}/6 = \mathrm{P}$ by using the symbols 'S' and 'P'. Yıldız also knew that the

symbols 'S' and 'P' are changing quantities and that the number of students is 6 times the number of professors or that one sixth of the number of students is a professor. This shows that she exhibited 'friendliness with symbols' behavior at this phase of problem solving. At the 'planning problem solving' phase, Eda (MALS), exhibited the behavior of 'symbol selection' because she could choose the symbols 'S' and 'P', and the behavior of 'reading and using symbolic expressions' because she explained the meaning of the mathematical-model he created by expressing the symbols in the equation '$6P = S$'. Choosing the symbols 'S' and 'P' and explaining the meaning of the mathematical model Yıldız (HALS), created by expressing these symbols in the equations $6P = S$ and $S/6 = P$ shows that she exhibited the behaviors of 'symbol selection' and 'reading and using symbolic expressions' at the 'planning problem solving' phase.

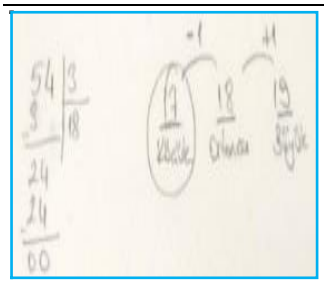
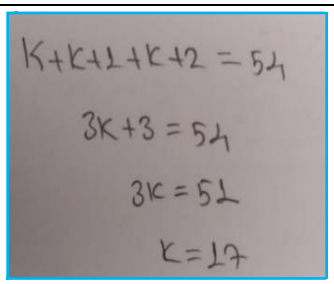
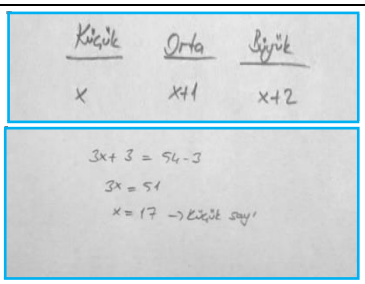
At the phase of 'implementing the problem-solving plan', Eda (MALS), exhibited the behavior of 'symbol selection' because she multiplied the number of professors by 6. Finding the number of students by multiplying the number of professors by 6 and finding the number of professors by dividing the number of students by 6 shows that Yıldız (HALS), exhibited the behavior of 'symbol selection' in the 'implementing the problem-solving plan' phase. In the 'going back and checking the solution' phase, when asked whether Eda (MALS) would use the un-knowns 'P' and 'S' in another problem, she replied '...if there is an equation starting with the letters P and S. For example, if there was a problem such as the amount of cake per student as a result of distributing 1 cake to 6 students, it would be as if'. This shows that Eda (MALS), exhibited 'symbol context' behavior at this phase. As a result, Eda (MALS) was able to identify the symbol representing the unknown quantities in the given problem in a meaningful way. In addition to this skill, she was also able to determine the equation by reading the symbol meanings. The fact that he rechecked the correctness of the options Yıldız (HALS), marked and the algebraic expressions she found and stated that she could use the un-knowns 'P' and 'S' for another problem shows that she exhibited the behaviors of 'checking symbol meanings' and 'symbol context' in the 'going back and checking the solution' phase. In this context, Yıldız (HALS), has the ability to determine the symbol representing the unknown quantities in the given problem in a meaningful way. In addition to this skill, she was able to use the skills of determining equations and writing equations by reading symbol meanings.

Findings from Problem 4.

Students' solutions for Problem 4 are given in Table 7.

Table 7.

Problem 4 and Student Solutions

Serkan (LALS)	Eda (MALS)	Yıldız (HALS)
Serkan, read the fourth problem and said *"There is a rule used in solving such problems. I divide* 54 *by* 3 *and find the median number, then I decrease by 1 to reach the small number"* and solved the problem. Serkan's solution is given below.	After reading the fourth problem, Eda *gave the values of "k", "$k+1$" and "$k+2$"* in order to solve the problem *based on the definition that consecutive numbers, that is, numbers increasing one by one, are consecutive numbers and solved the problem. The solution is given in the figure below.*	Yıldız read the fourth problem and said *"It says consecutive number. Numbers that come one after the other and have a difference between them are called consecutive numbers."* Yıldız identified three consecutive numbers in the figure to solve *the problem.* The solution of the problem is given below.
		

In Table 7, academically successful and moderately successful students demonstrated the ability to symbolise three consecutive numbers, write and solve the related equation. However, since it was not clear how the student with low academic achievement used algebraic reasoning in the solution, the researcher interviewed the student about the solution of the problem. The dialogue between the researcher and Serkan is given below.

Researcher: Why did you prefer such a solution?

Serkan (LALS): It is a solution I remember from secondary school. Given the sum of three consecutive numbers, if I divide the sum by three, the median number is reached. It gives me an advantage in solving such problems.

Researcher: Well...How can you solve this question using symbols?

Serkan (LALS): If the sum of three numbers is 54...It says the sum of three numbers. If I use three letters instead of numbers...

After these comments, Serkan wrote the equation given in Figure 1.

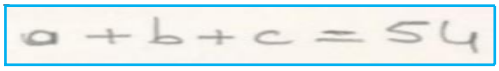


Figure 1. Serkan's equation for Problem 4.

Serkan (LALS), could not continue the process after writing the equation and said "*I always get confused when letters are involved. Therefore, I cannot solve this question in this way*".

The interview between Eda (MALS), a student with moderate academic achievement, and the researcher about the use of variables in the sense of unknown is as follows:

Researcher: Why did you use the variables "k", "k + 1", "k + 2" in solving the problem? Can you explain?

Eda (MALS): Normally, I use the letters "x" or "y" when I make equations, but when I read the word consecutive, I think of increasing or decreasing numbers depending on "k" or "n".

Researcher: Would you use "k" as an unknown in another problem?

Eda (MALS): I use "k" especially in problems about consecutive numbers or numbers that are multiples of each other.

The interview between Yıldız (HALS), a student with high academic achievement, and the researcher about the use of variables in the sense of unknown is as follows.

Researcher: Can you explain why you indicated the unknown with "x" in the solution of the problem?

Yıldız (HALS): When I think of unknown, I always think of "x".

Researcher: Would you represent the unknown with "x" in another problem solution?

Yıldız (HALS): Yes.

In this interview between the researcher and Yıldız (HALS), the view that the symbol "x" is common in the use of variables in the sense of unknown was revealed.

Researcher: If the largest number was asked in this problem, how would you determine the consecutive numbers?

Yıldız (HALS): Since the unknown would be the largest number, I would determine the largest number as "x", the median number as "x − 1" and the smallest number as "x − 2".

In the light of the interviews between the researcher and the students, it is seen that students with medium and high academic achievement levels comprehended the concept of consecutive number as "the number that follows a number and has 1 more". Accordingly, it is seen that the students have the behavior of determining the appropriate representation form of the selected symbol. On the other hand, since the student with low academic achievement level did not have the concept of consecutive number, he/she did not have the ability to represent the variable in accordance with

the problem context. Serkan (LALS) could not show algebraic thinking skills. Eda (MALS) and Yıldız (HALS) considered the definition of consecutive number, three consecutive numbers were expressed symbolically. And they used these symbolic expressions, the students demonstrated their ability to construct and solve the related equation. When the study is summarized in terms of students' algebraic thinking skills, students were able to use the concept of consecutive number in a meaningful way. The symbolic expression of the problem sentence was reflected with the related equation. The equation was analysed by applying algebraic and arithmetical operations.

When the study was analysed in terms of students' symbol perception behaviors in problem solving phases; at the 'understanding the problem' phase, Serkan (LALS) exhibited 'friendliness with symbols' and 'designing symbolic expressions' behavior by using the algebraic expression 'a + b + c' for the sum of three numbers; Eda (MALS), said: "*Numbers that come one after the other, that is, numbers that increase one by one, are called consecutive numbers. Therefore, if I call the small number 'k', the other numbers will be 'k + 1' and 'k + 2'* and displayed the behaviors of "friendliness with symbols" and "designing symbolic expressions"; Yıldız (HALS) was able to determine the expressions 'x, $x + 1$ and $x + 2$' for three consecutive numbers, so she exhibited the behaviors of 'friendliness with symbols' and 'designing symbolic expressions' too. At the 'planning problem solving' phase, Serkan (LALS) used the letters a, b, c for three numbers and wrote the equation 'a + b + c = 54' so he exhibited the behavior of 'reading and using symbolic expressions'; Eda (MALS) exhibited the behavior of 'symbol selection' by choosing the right symbol to solve the problem, choosing the appropriate representation method of the symbol chosen in the problem because she called the small number as "k", and the other numbers as "k + 1", "k + 2". Yıldız (HALS) exhibited the behaviors of choosing the correct symbol to solve the problem, expressing symbols in the mathematical models created in the problem, explaining the meaning of the mathematical model created in the problem and choosing the appropriate representation method of the symbol chosen in the problem. These indicators show that Yıldız exhibited the behaviors of 'symbol selection' and 'reading and using symbolic expressions' in the 'planning problem solving' phase. In the "implementing the problem-solving plan" phase, Serkan (LALS) could not exhibited any symbol sense at this phase. Eda (MALS), formed the equation by choosing the correct symbols, performed the necessary operations to solve the problem, and used the order of operations and the properties of the operations correctly while solving the equation established to solve the problem. This shows that the student exhibited 'symbol selection', 'reading and using symbolic expressions' and 'friendliness with symbols' behaviors at this phase of problem solving. Yıldız (HALS), used the

selected method to solve the problem, constructed and solved the equation correctly by equaling the sum of the three consecutive numbers she has chosen to 54 and solves the equation correctly. This corresponds, to the behaviors of 'symbol selection', 'reading and using symbolic expressions' and 'friendliness with symbols' at the phase of "implementing the problem-solving plan". Serkan (LALS), could not exhibit any behavior at this phase. In the "going back and checking the solution" phase, Eda (MALS), demonstrated 'symbol context' behavior by stating that she could use 'k' for another problem. Yıldız (HALS), solved the equation and found the small number and then verified the operation and said that she could use 'x' for any problem shows that she exhibited the behaviors of 'checking the symbol meanings' and 'symbol context' in the "going back and checking the solution" phase.

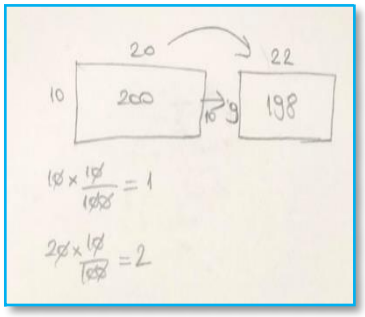
Findings from Problem 5.

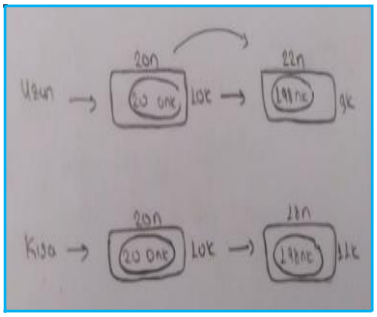
Students' solutions for Problem 5, are given in Table 8.

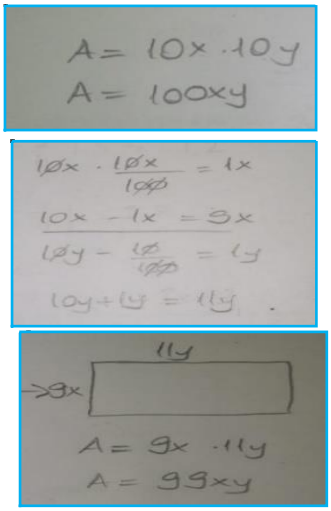
Table 8.

Problem 5 and Student Solutions

Serkan (LALS)	Eda (MALS)	Yıldız (HALS)
When Serkan first read the fifth problem, he stated that there could not be a change in the area value since the amount of increase and decrease in the side lengths of the rectangle was the same (10%). Then, for ease of operation, he drew a rectangle with side lengths of 10 br and 20 br and concluded that there would be a decrease in the area by numerical calculations. The solution is given below.	When Eda first read the problem, she stated that there would be no change in the area value of the rectangle since there would be a 10% increase and decrease in the side lengths of the rectangle. She chose a rectangle with side lengths of 10n and 10k in order to easily calculate the 10% increase and decrease. "*Now I am confused here because it says one side or something. I don't know which side it is, so I draw two different rectangles because it says one side*." As can be seen from the solution given below, he was able to see the decrease in the area value after making numerical calculations for two different situations.	Yıldız stated that he would not answer the problem without making numerical calculations. He drew a rectangle with 10x and 10y side lengths, increased one side length by 10% and decreased the other side length by 10%, determined the change in the area value of the rectangle numerically and answered the question. The solution is given below.







When Table 8 is analysed, it is seen that the students with low and medium academic achievement made a comment that there would be no change in the area value of the rectangle due to the same amount (10%) increase and decrease in the side lengths of the rectangle. The student with high academic achievement stated that he could not make a comment without making any calculations.

When the study is summarized in terms of students' algebraic thinking skills, Serkan (LALS), did problem-solving in special cases. Eda (MALS) and Yıldız (HALS) created a model by considering the quantitative changes given in the problem and solving the problem by applying the necessary operations. They have the ability to create models by considering the quantitative changes given in the problem, and to determine the quantitative relationships expressed verbally, symbolically and numerically.

Symbol sense behaviors of the students observed in Table 8 according to their academic achievement levels: a) The fact that Serkan (LALS) solved over a rectangle with lengths of 10 units and 20 units is an indication of his symbol abandonment behavior. In order to easily calculate the 10% increase and decrease in the side lengths of the rectangle, Eda (MALS), drew a rectangle with side lengths 10n and 20k, while the student with high academic achievement drew a rectangle with side lengths 10x and 10y. This is an indication that students with medium and high academic achievement have the behaviors of "knowing how and when to use symbols", "associating symbols with the problem" and "writing symbols according to the meaning in the problem" as symbol sense.

The study was also analysed in terms of students' symbol perception behaviors in problem solving phases. At the 'understanding the problem' phase, Serkan (LALS), drew a rectangle to solve

the problem and abandoned the symbols. The fact that he stated that it was easy to get the percentages of the numbers 10 and 20 that he chose for the solution of the problem points to the behavior of "designing symbolic expressions" at the phase of 'understanding the problem'. Eda (MALS), drew two different rectangles and used the values '10k' and '20n' for the short and long sides of the rectangle, respectively. When asked why she used the values '10k' and '20n', she stated that it was easier to calculate the percentage with these values. This shows that the student exhibited the behaviors of 'friendliness with symbols' and 'designing symbolic expressions' at the "understanding the problem" phase. Yıldız (HALS) used the values '10x' and '10y' to solve the problem, drew a rectangle to solve the problem, and determined the short side of the rectangle as '10x' and the long side as '10y'. She said that she determined these expressions because it was easy to get the percentages of '10x' and '10y'. These indicators correspond to the behaviors of 'friendliness with symbols' and 'designing symbolic expressions' in the 'understanding the problem' phase. In the 'planning to solve the problem' phase, Serkan (LALS), stated that it was easy to get the percentage of the numbers '10' and '20' he chose to solve the problem, and he also drew a rectangle and gave numerical values as '10' and '20' on its sides. Thus, Serkan (LALS) exhibited the behavior of 'reading and using symbolic expressions' in this phase. Eda (MALS), chose the correct symbols to solve the problem and expressed the symbols in the mathematical models created in the problem. These approaches show that she exhibited 'symbol selection' and 'reading symbolic expressions' behaviors at this phase. Yıldız (HALS), said that *'I should use numbers whose products are* 100 *to do operations with percentages because it makes the operation easier and determined the values* 10*x and* 10*y for the side lengths of the rectangle'*. Then she wrote that the expression $10x.\,10y = 100xy$ is the area of a rectangle with a short side length of 10x and a long side length of 10y. These correspond to the behaviors of 'symbol selection' and 'reading and using symbolic expressions' in the 'planning problem solving' phase. At the "implementing the problem-solving plan" phase; Eda (MALS) and Yıldız (HALS) calculated the percentages of increase and decrease in the side lengths of the rectangles, finding the areas of the rectangles correctly after the operations and drawing two new rectangles with the same area after the operations show that the student exhibited the behaviors of 'symbol selection', 'reading and using symbolic expressions', 'friendliness with symbols' and 'designing symbolic expressions' at this phase. Serkan (LALS) could not exhibit any symbol sense at the "applying the problem-solving plan" and "going back and checking the solution" phases. Eda (MALS) exhibited 'symbol context' behavior at the "going back and checking the solution" phase by saying that the side lengths of the rectangle could also be '10x' and '20y'. When Yıldız (HALS)

stated that the area decreased after finishing the process and when asked whether he could give another value for the side lengths of the rectangle, he said that he could also use the values '10m' and '10n', which corresponds to the 'symbol context' behavior in relation to explaining that the symbols used will have different meanings in different problems.

The fact that the students correctly calculated the change in the side lengths of the rectangles they identified as models and saw the decrease in the area value is an indication of their behaviors of "using mathematical models to solve the problem" and "expressing the symbols in the mathematical models created in the problem".

Thematic coding, a data analysis technique commonly employed in case studies, was utilized for the examination of the data. Thematic analysis constitutes a form of qualitative analysis that focuses on the identification of patterns within the data and the development of themes. According to Boyatzis (1998), thematic coding is characterized not as a unique methodology but rather as a versatile instrument that can be applied across various research approaches. Findings from five problems of this study, Table 9 shows that the summarize of them. Analysis of the summarize is made with thematic coding from Table 3.

Table 9

Summarising the Findings Obtained from the Problems by Thematic Coding

Students	**Serkan (LLAS)**		**Eda (MLAS)**		**Yıldız (HLAS)**	
Categories	**SSB**	**ATSI**	**SSB**	**ATSI**	**SSB**	**ATSI**
Problem 1	SSB-A.3 SSB-D.1 SSB-E.1 SSB-G.1	ATSI-1 ATSI-2 ATSI-4	SSB-A.3 SSB-D.1 SSB-E.1 SSB-G.1 SSB-I.1	ATSI-1 ATSI-2 ATSI-5	SSB-A.3 SSB-D.1 SSB-E.1 SSB-G.1 SSB-I.1	ATSI-2 ATSI-3 ATSI-6
Problem 2	SSB-A.3	ATSI-7	SSB-A.3 SSB-D.1 SSB-E.1	ATSI-8	SSB-A.3 SSB-D.1 SSB-E.1 SSB-I.1	ATSI-8
Problem 3	SSB-A.1	ATSI-9	SSB-A.1 SSB-A.3 SSB-A.4 SSB-B.1 SSB-C.1	ATSI-10	SSB-A.1 SSB-B.1 SSB-A.3 SSB-A.4 SSB-C.1	ATSI-11

			SSB-D.1 SSB-D.2 SSB-E.1 SSB-J.1		SSB-D.1 SSB-D.2 SSB-E.1 SSB-I.1 SSB-J.1	
Problem 4	SSB-A.1 SSB-B.1 SSB-D.1 SSB-D.2	ATSI-12	SSB-A.1 SSB-A.3 SSB-B.1 SSB-C.1 SSB-C.2 SSB-E.1 SSB-F.1 SSB-G.1 SSB-J.1	ATSI-13	SSB-A.1 SSB-A.3 SSB-B.1 SSB-C.1 SSB-C.2 SSB-D.1 SSB-D.2 SSB-E.1 SSB-F.1 SSB-G.1 SSB-I.1 SSB-J.1	ATSI-13
Problem 5	SSB-A.2 SSB-B.1 SSB-D.1	ATSI-14	SSB-A.1 SSB-A.2 SSB-A.3 SSB-B.1 SSB-C.1 SSB-D.1 SSB-E.1 SSB-F.1 SSB-G.1 SSB-H.1 SSB-J.1	ATSI-15	SSB-A.1 SSB-A.2 SSB-A.3 SSB-A.4 SSB-C.1 SSB-D.1 SSB-D.2 SSB-E.1 SSB-F.1 SSB-G.1 SSB-H.1 SSB-I.1 SSB-J.1	ATSI-15

Discussion and Conclusion

In the first step of this study, which was carried out with three ninth grade students with low, medium and high achievement levels, pre-interview questions were asked to the students. According to the findings obtained from the pre-interview questions, the student with low achievement level disliked mathematics, mostly because he could not concretize the symbols, and felt more successful in class levels where arithmetic was at the forefront; the student with medium achievement level saw mathematics as a set of formulas, could not fully comprehend the symbols, and could sometimes use algebra while solving problems; On the other hand, students with high achievement level were always interested in mathematics, liked the subject of solving equations, which is the focus of algebra teaching, and were able to make connections between algebraic properties and rules, symbolic and numerical representations.

In second step of the study, in which algebraic thinking skills and symbol sense behaviors of ninth grade students were investigated from the perspective of academic achievement, results were obtained that are thought to contribute to the mathematics teaching literature in terms of how students use and interpret symbols in the algebraic thinking process.

I. The Relationship between Academic Achievement and Algebraic Thinking Skills

In the solution of the equation with algebraic fraction given in the first problem, only the student with high academic achievement level showed meaningful symbolic reading and interpretation skills by establishing the relationship between the symbolic expressions in the numerator and denominator and solved the problem without performing standard procedural steps. In other words, the academically successful student showed the ability to use the symbolic expressions in the given algebraic equation flexibly. When the student was asked to solve the given equation, he/she solved the equation by using the relevant operation properties correctly. Arithmetic is necessary to understand the basic relationships of numbers, while algebra is necessary to develop more complex mathematical thinking skills. The combination of these two areas strengthens students' mathematical problem-solving skills and prepares them for more advanced mathematical topics. Being good at both arithmetic and algebraic terms require having basic arithmetic knowledge, algebraic thinking skills, problem-solving skills, logic and critical thinking, and abstract thinking skills, as well as being successful in application and practice and error analysis. Based on the observation that this student can also perform basic operations quickly and accurately; is careful when solving equations, simplifying expressions, and performing mathematical operations; understands mathematical problems and develops appropriate solutions to the problem; evaluates results logically by thinking step by step; can grasp mathematical structures and relationships; and knows how to use

arithmetic and algebraic operations in daily life and in different contexts, it can be said that this student's basic operation skills are good in both arithmetic and algebraic terms. Students with low and medium achievement levels analysed the equation using standard algebraic properties without showing symbolic reading and interpretation skills. However, while the student with an average academic achievement level provided the result obtained in the solution of the equation, the student with a low academic achievement level did not provide the solution. The student with low academic achievement did not interpret the solution while performing the algebraic manipulations correctly. This behavior caused him to choose the wrong option in solving the problem. In the solution process of this problem, the students correctly solved the algebraic equation manipulatively by using the related operations and algorithms correctly. However, in this process, while the student with high academic achievement solved the algebraic equation by using the symbols flexibly and fluently, the student with low academic achievement solved the mode in a meaningless way.

In the second problem of the study, students were given an inequality (>) with absolute value and asked the solution set. The student with a low level of academic achievement analysed the inequality with absolute value as a linear equation, ignoring the concept of absolute value. On the other hand, students with medium and high academic achievement level transformed the absolute value inequality into two separate expressions without analysing the sign inside the absolute value and made certain algebraic calculations without establishing any logical relationship between these two inequalities. However, they could not determine the solution set. These behaviors are consistent with the studies of Şandır, Ubuz and Argün (2002), Demetgül and Baki (2020). From this point of view, it was concluded that ninth grade students tended to use the rules learned in the concept of absolute value and inequality in a meaningless way rather than meaningful analysis in both the definition and properties of absolute value and inequality solutions.

In the third problem of the study, also known as the "*student-professor*" problem in the literature, students were expected to be able to recognise the quantitative relationship in the algebraic expression of the problem. In the solution of this problem, the student with a low level of achievement fell into a linguistic trap and marked the wrong option by making a reversal error. While the student with a medium achievement level was able to recognise only one of the correct options through meaningful algebraic reading and interpretation, the student with a high level of academic achievement marked both correct options. This result is consistent with Rosnick and Clement (1980); Clement, Lochhead and Monk (1981) studies.

In the fourth problem of the study, the algebraic thinking skill expected from the students is the symbolic expression of three consecutive numbers in generalised arithmetic and the solution of the related equation in the context of the problem. The student with low academic achievement level could not express three consecutive numbers symbolically and could not write the related equation. The student made a meaningless solution completely by rote memorisation depending on the rule given in the lesson. Christou and Vosniadou (2005) posit that students demonstrate a tendency to construe real symbols within algebra solely in the context of natural numbers, a phenomenon heavily shaped by the structural characteristics of the algebraic entity. This phenomenon exerts a notable impact on the comprehension of symbols and the thought processes involved in algebraic manipulation.

On the other hand, students with medium and high academic achievement were able to express three consecutive numbers symbolically as generalised numbers by using the concept of consecutive number in a meaningful way and made the necessary manipulative analyses by writing the related equation.

In the fifth problem of the study, the algebraic thinking skill expected from the students is to be able to reason algebraically about the quantitative relations in the verbal expression of the problem. To be able to construct and solve the relevant symbolic equation by correctly analysing the quantitative relations given in the problem. The student with low academic achievement analysed the problem arithmetically by determining numerical values appropriate to the problem context. The students with medium and high academic achievement expressed the quantitative reasoning in the problem sentence with appropriate symbolic representations and solved the problem by writing the relevant equation.

In the light of the detailed analyses of the five study questions given above, it was concluded that the algebraic thinking skill that the student with low achievement level had the most difficulty was the ability to use symbols and algebraic relationships. In addition to this result, it was determined that the algebraic thinking skills of the students with high achievement level were higher than the other students. These results are consistent with the study of Bağdat and Anapa-Saban (2014). Another result obtained in the study regarding algebraic thinking skills is that students with high and medium academic achievement levels did not have difficulty in the process of solving algebraic equations, while medium and low achievement students had difficulty in solving inequalities with absolute values. This result is consistent with Kenney (2008).

II. The Relationship between Academic Achievement and Symbol Sense Behaviors

When the results of the study on symbol sense behaviors from the perspective of academic achievement were examined, it was found that the student with low achievement level could not use symbols and letters in problem solving phases and preferred arithmetic solutions instead of algebraic solutions. It was concluded that the student could not present the information extracted from the problems in a mathematically correct way and, accordingly, could not think algebraically in depth in applying and interpreting mathematical findings. The absence of symbol sense results in the adoption of ad hoc approaches rather than systematic algebraic methods (Turşucu, Spandaw & de Vires, 2018). The students demonstrated a diminished symbol sense attributed to insufficient conceptual understanding. These results are similar to, Naidoo (2009); Darojaturrofiah's (2017) and Sugilar, et al., (2019) studies. Kenney (2008) stated that students with low achievement level can analyse and formulate quantitative relationships in problems appropriately, but they have difficulty in drawing logical conclusions in the solving and interpretation phases. In this context, the results of the study are also compatible with the results of Kenney (2008).

The student possessing an medium level of academic achievement successfully reformulated the quantitative relationships in each problem using symbolic and verbal representations. While resolving the problem, the student managed to analyze the information in the problem's new expression, identify, and implement the required solution strategies. The outcomes derived from this student with a moderate level of academic achievement align with the findings of Darojaturrofiah (2017). In addition, Eda (MALS), successfully completed the step of going back and checking the solution in most of the questions. Rini, et al., (2021) stated that students who successfully complete the step of going back and checking the solution from problem solving steps generally show symbol sense behaviors. In this sense, Eda (MALS), was found to have more competence in symbol sense behaviors than Serkan (LALS).

The student who demonstrated a high degree of academic accomplishment exhibited a proficient and flexible utilization of symbols and letters throughout the problem-solving process. Moreover, she displayed the ability to systematically analyze the quantitative relationships within each problem, as well as to formulate and resolve the requisite equations. Consequently, meaningful and logical outcomes were derived for each problem. Within this framework, the student with elevated academic attainment displayed accurate symbol interpretation behaviors while addressing the problems. This research finding aligns with the works of Kenney (2008), Darojaturrofiah (2017), Sugilar, et al., (2019) and Rini et al., (2021).

The findings derived from the research demonstrate that individuals exhibiting a high level of academic accomplishment possess enhanced skills in algebraic reasoning and symbol interpretation.

In this particular context, a direct correlation exists between the level of academic achievement and the development of algebraic thinking skills and behaviors related to symbol sense.

In the third and last step of the study, three students were asked the final interview questions. The findings obtained from the results of the interview were used to obtain more information about the symbol sense of the students while solving algebraic problems. According to the findings obtained from the final interview questions, it was concluded that the student with a low level of achievement saw the symbols as letters and was more successful in the problem requiring numerical calculations without letters, the student with a medium level of achievement saw the symbols as signs and the problem of consecutive numbers, which she had more experience before, was easier for her, and the student with a high level of achievement saw the symbols as both letters, operation symbols and other symbols, and the problem in which she could make modelling was easier for her.

Recommendations

This section presents recommendations for practitioners and researchers based on the findings and results of the study.

Recommendations for practitioners: To develop a symbol sense in teachers, teacher training should include information on the importance of symbolism, its components, and how to impart it to students. New tasks and problems that will enhance symbol sense can be created by teachers using the services of technology.

Recommendations for researchers: In future studies, starting from the sixth grade, which is the first stage of algebra education, the symbol sense behaviors of students at different levels (middle school, high school, undergraduate), especially the 6^{th}, 7^{th} and 8^{th} grade levels, can be examined. In future studies, tasks from different algebraic topics such as logarithms, polynomials, functions, logic, linear algebra, derivatives, integrals, polynomials, trigonometry, derivatives, integrals, complex numbers, etc. can be prepared to examine students' symbolic sense behavior. Future studies may examine the relationships between "number sense", "symbol sense", and "structure sense" together and look at algebraic thinking from a different perspective.

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Adaptation Study of the Ecological Literacy Scale for Middle School Students

***Kevser Arslan, **Aslı Görgülü Arı**

Abstract. The aim of this study is to adapt the Ecological Literacy Scale developed by Ha, Huang, Zhang, and Dong (2021) into Turkish and conduct validity and reliability analyses. During the Turkish adaptation phase, both Turkish translation and English back-translation of the scale were performed by language experts to ensure linguistic equivalence. Language equivalences of the scale to be adapted were tested, adjustments were made based on expert opinions, and linguistic and stylistic controls were ensured. The scale, after a pilot application, was administered to 515 middle school students from different grade levels who were identified as the study group. The study data were analyzed using statistical software. Exploratory factor analyses were conducted on the data collected for the Ecological Literacy Scale. Following the analyses, a structure consisting of five subscales and 30 items was obtained. It was revealed that the factor loadings of the scale were at a very high level. The 5-factor structure of the scale was confirmed, and it was found that the fit indices were acceptable and showed excellent fit. The Cronbach's alpha internal consistency coefficient for the entire scale was calculated and determined to be 0.834. As a result of the study, a 5-point likert type "Ecological Literacy Scale" consisting of 5 factors and 30 items was adapted into Turkish. The adapted Ecological Literacy Scale was found to be a valid and reliable tool suitable for middle school students. A measurement tool that researchers and educators can benefit from has been added to the literature.

Keywords: Environmental education, ecological literacy, validity, reliability, adaptation.

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All living beings, including humans, engage in direct or indirect interactions with the environmental system throughout their lifetimes. Within the environmental system, humans utilize environmental resources for various life activities (Kayan, 2018). The unsustainable and unconscious use of natural resources by individuals has resulted in irreversible damage to both underground and surface resources, leading to resource depletion. As a result, industrial production, irregular urbanization, and consumption habits have increased the pressure on the environment, paving the way for environmental problems (Akyüz, 2015).

With the harm caused to environmental elements, adverse global repercussions have started to manifest themselves significantly. The process leading to environmental problems becoming one of the world's fundamental issues has become inevitable. When considering the development of environmental issues, it is evident that human behavior is the most critical factor (Çakır Arıca & Kağar, 2018; Gülersoy, Dülger, Dursun, Ay & Duyal, 2020). With the increasing ecological problems due to the rise in environmental issues, it has become imperative for humans to live in harmony with other living beings and the environment, thus enhancing the importance of the science of ecology (Demir, 2022). Ecology, as a part of the environmental system, is based on the study of interactions between living beings and their environment. Furthermore, ecology can be described as a scientific field that explores how vital activities within the triangle of living organisms, inanimate elements, and the environment can mutually influence each other to ensure sustainability (Demir, 2021).

The science of ecology plays a significant role in offering valuable solutions to environmental problems and promoting a positive attitude toward nature (Hammarsten et al., 2019; Lewinsohn et al., 2015). It can be stated that humans also play an important role in maintaining the ecological balance within the environmental system. Ecological balance is achieved when individuals and their physical environments have healthy and mutually beneficial relationships (Erkal, Şafak &Yertutan, 2011). Pitman et al. (2018) indicate that the integrity of the relationship between humans and nature is fundamental for the survival of all living beings. The knowledge and understanding of individuals about the world's life form the central point of ecological literacy, which is proposed to be essential for the continuity of sustainable living.

In recent years, ecological literacy, arising from the growing ecological issues, focuses on a scientific perspective that is considered as a component of environmental literacy and necessitates having knowledge in the process of making effective decisions related to the environment (Okyay,

Demir, Sayın & Özdemir, 2021). Ecological literacy is concerned with understanding how individuals interact within the ecosystem and how they can ensure sustainability (Hammarsten et al., 2019). Ha, Huang, Zhang & Dong (2021) explain ecological literacy as the intersection of ecology with various disciplines, proposing it as a solution to the frequent occurrence of ecological problems. It is also mentioned that it plays a significant role in achieving harmony between humans and nature, and consequently, in sustainable development.

Similarly, Lees (2017) defines the process of an individual adapting to the ecological environment they live in as ecological literacy. Ha, Huang, Zhang & Dong (2021) propose five dimensions within the framework of ecological literacy: ecological knowledge, ecological awareness, ecological ethics, ecological emotions, and ecological behavior. Within these dimensions, the emphasis is on actions such as being ecologically knowledgeable, disseminating knowledge, increasing ecological conservation awareness, and guiding the sustainable development of ecological behavior.

The cultivation of students with ecological literacy skills and environmentally sensitive behaviors forms a robust foundation in the process of sustainable development (Demir, 2022). This is because individuals with ecological literacy will act by recognizing the changing natural balances and the importance of the ecosystem, causing less harm to the environment (Dündar & Kızık, 2022). An ecologically literate individual understands environmental truths, is aware of environmental issues, and demonstrates the ability to develop solutions for these problems (McBride et al., 2013). Such an individual can establish a relationship with nature, internalize it, make daily choices with consideration for their impact on the environment, and take action for sustainable living (Çabuk, 2019). Moreover, they can contribute to improving the environment, aim to reduce negative activities, and generate solutions (Khanal, Pandey, Khan, Mishra & Kunwar, 2020).

The acquisition of ecological literacy by individuals and their education accordingly is one of the most important steps to address ecological problems and leave a habitable world for future generations (Çakır Arıca & Kağar, 2018). Ecological literacy shifts the focus from short-term solutions to embracing sustainable steps, thereby presenting an alternative (Ferreira, Cruz &Pitarra, 2016; Okyay et al., 2021). Educating ecologically literate individuals, considered as the key to solving ecological crises, is most effectively done through schools (Ikhsan et al., 2019; Wallace, 2019; Wooltorton, 2006; Yıldırım & Hablemitoğlu, 2013).

Ecological literacy education is expected to promote the acquisition of knowledge about climate change, environmental pollution, lifestyle, production and consumption issues, as well as fostering responsibility in solving these problems (Levinshon et al., 2015). Furthermore, it can be regarded as a process of developing attitudes, values, knowledge, and skills related to nature, and exploring ways to live in harmony with the environment (Aydın, Dündar, & Korkut, 2016).

Individuals should be educated to become ecologically literate individuals who are knowledgeable about ecological issues, actively seek solutions, and uphold ecological ethical values. Ensuring that individuals become ecologically literate will play a significant role in shaping the future of the world positively and addressing global environmental problems. One of the forefront alternative solutions that can be proposed to leave a sustainable world for future generations is to make individuals ecologically literate. Therefore, it has been emphasized that individuals need to receive effective ecological education, and this education should be especially provided at the elementary and middle school levels (Gülersoy et al., 2020; Yıldırım & Hablemitoğlu, 2013). Additionally, there is a need to assess individuals' knowledge levels, awareness, ethical values, emotional, and behavioral aspects.

The development of an assessment tool that can determine the readiness of students in terms of ecological literacy skills and evaluate their ecological literacy levels would be valuable. Therefore, the introduction of an assessment tool that can measure middle school students' ecological literacy would be a significant step. It is expected that the measurement tool will be useful for researchers and educators. In this study, the aim is to adapt the "Ecological Literacy Scale" developed by Ha, Huang, Zhang & Dong (2021) into Turkish and to conduct validity and reliability analyses, addressing the following research questions:

1. Does the "Ecological Literacy Scale" adapted into Turkish for middle school students yield valid results?

2. Does the "Ecological Literacy Scale" adapted into Turkish for middle school students yield reliable results?

Method

Research Model

The study was conducted within the framework of an exploratory sequential design design from mixed research methods. It is the process of starting with the qualitative stage and then moving on to the quantitative stage. After the qualitative data are collected and analyzed, the data

are tested and quantitative methods are diagnosed. The exploratory sequential design design can be used in the development of a measurement tool (Creswell & Creswell, 2021).

Study Group

The participants of the study consist of middle school students from different grade levels in a public middle school located in Istanbul, during the 2022-2023 academic year. A total of 515 middle school students, from each grade level (5th, 6th, 7th, and 8th), are included. The research participants were determined using a purposive sampling method through a convenient sampling approach. In convenient sampling, the goal is to reach the study group in a practical manner, eliminating time constraints during the research process (Patton, 2014; Yıldırım & Şimşek, 2018). The characteristics of the students who participated in the research are presented in Table 1.

Table 1.

Qualifications of the Students Participating in the Research

Demographic features	Exploratory Factor Analysis	Confirmatory Factor Analysis	Total
	Gender		
Girl	172	110	**282**
Boy	143	90	**233**
Total	**315**	**200**	**515**
	Grade		
5.	77	55	**132**
6.	78	42	**120**
7.	79	48	**127**
8	81	55	**136**
Total	**315**	**200**	**515**

When examining Table 1, the characteristics of the middle school students who participated in the research, as well as the sample distributions for exploratory factor analysis and confirmatory factor analysis, can be observed. The study participants consist of 282 female students and 233 male students. Additionally, there are 132 students from the fifth grade, 120 from the sixth grade, 127

from the seventh grade, and 136 from the eighth grade. In this context, it can be said that the research group is distributed approximately evenly across each grade level.

Out of the 500 participants in the research, 300 constitute the data set for exploratory factor analysis, while 200 are included for confirmatory factor analysis. Literature in the field suggests working with a sample size of approximately 3 to 5 times the number of items in the scale (Bryman & Cramer, 2001; Sönmez & Alacapınar, 2016). In confirmatory factor analysis, a sample size of 150 or more is expected to be appropriate (Muthen & Muthen, 2002). Therefore, it can be understood that including 315 students in the exploratory factor analysis process and 200 students in the confirmatory factor analysis process is appropriate in the current scale development study.

Adaptation Process and Planning of the Measurement Tool

The shaping and planning of the research process were influenced by adaptation studies of measurement tools conducted in the literature. Within the framework of the literature in the field (Alexandre &Coluci, 2011; Bayık & Gürbüz, 2016; Çapık, Gözüm &Aksayan, 2018; Gelen et al., 2019; Heggestad et al., 2019; Korkmaz, Çakır & Erdoğmuş, 2021; Seçer, 2018; Şeker &Gençdoğan, 2014; Stover et al., 2012), the stages of the current study are presented in Figure 1.

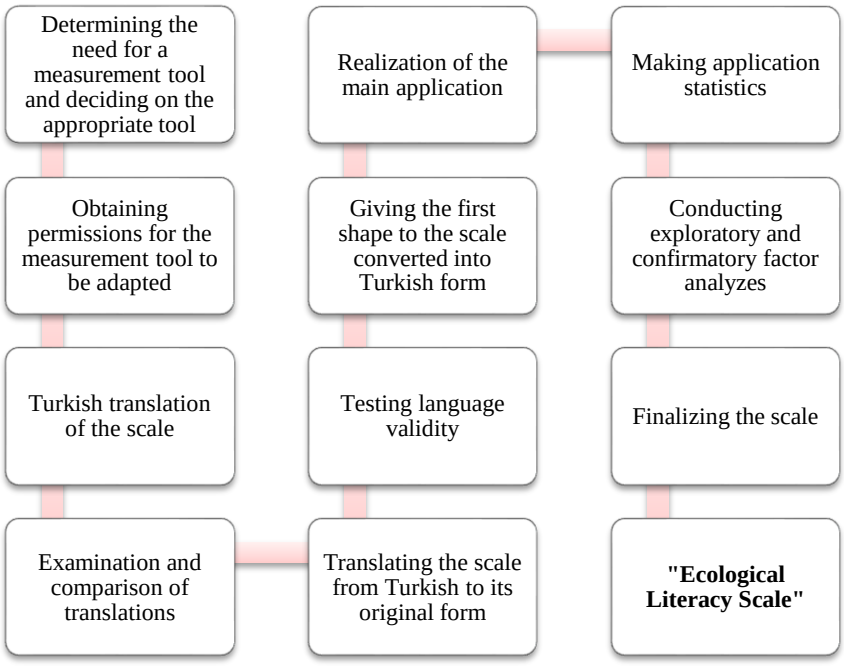

Figure 1. Adaptation Process and Planning Stages of the Ecology Literacy Measurement Tool.

When examining Figure 1, the stages of the adaptation and planning process for the ecological literacy measurement tool can be observed. In the first stage, an extensive literature review was

conducted, and due to the absence of a measurement tool with appropriate psychometric properties, the need for an ecological literacy scale was identified. Following the literature review, it was decided to adapt an ecological literacy scale with suitable content and characteristics.

The scale considered for adaptation was approved by the original authors, and permission for adaptation was obtained via email. The original form of the scale was translated into Turkish by six language and translation experts, independently of each other. The translated forms were brought together, and a review and comparison process of the translations was conducted. The translation forms were checked for semantic, theoretical, and cultural appropriateness. They were also reviewed for linguistic suitability and clarity in Turkish. Adjustments were made to improve comprehensibility in some of the scale items. For example, the sentence "*I am very disgusted by the destruction of the ecological environment*." was modified to "*I don't like the destruction of the ecological environment*.” Several items given in question form were transformed into plain sentences. For example, the item "*How much do you know about rubbish classification*?" was modified to "*I have knowledge about garbage classification.*" Different rating scales used in a few questions were standardized to the same format with all other items. Some inverted sentence structures in the Turkish version were corrected. Minor changes were made to the scale items. Unnecessary and inappropriate words in the scale items were removed, and words used incorrectly were replaced, necessitating necessary adjustments.

The measurement tool that underwent translation into Turkish was retranslated into the original language by two language experts. Subsequently, a comparison process between the Turkish form and the original form revealed no significant differences. Following the translation processes, it was indicated that the adaptation of the scale to the Turkish version was completed.

To establish linguistic equivalence, the form was administered to 35 middle school students who represent the target audience. Turkish and original language forms were administered to the students at two-week intervals. The correlation values of the data obtained from the applications were examined. Form 1 was evaluated by a total of 8 experts, including a social studies educator, 2 environmental scientists, 2 measurement and evaluation specialists, 2 science educators, and 1 science teacher. A pilot application was conducted with a middle school group consisting of 45 participants, and subsequently, the scale took its final form. After this final version, the main implementation of the scale was carried out.

Following the main application, the data obtained were subjected to exploratory factor analysis. As a result of the exploratory analyses, it was deemed appropriate to remove 10 items. The structure of the remaining 30-item scale was confirmed by confirmatory factor analysis. Given that the adapted scale was originally of the 5-point likert type, the form was prepared in a 5-point likert format. The rating system was structured as follows: "1: strongly disagree," "2: disagree," "3: neutral," "4: agree" and "5: strongly agree." Additionally, a brief and concise instruction explaining the purpose and instructions for the scale was added to the draft form. As a result, the adapted "Ecological Literacy Scale" with established validity and reliability was presented.

Data Collection Tool and Data Collection Process

Within the framework of the study, data was obtained through ecological literacy measurement, which was intended to be adapted. The psychometric properties of the original form of the scale are given in Table 2 (Ha et al., 2021).

Table 2.

Psychometric Properties of the Ecological Literacy Measurement Tool

Sub-Dimensions	Number of Items
Ecological Information	8
Ecological Awareness	8
Ecological Ethics	8
Ecological Feeling	8
Ecological Behavior	8
Total	40
Cronbach Alpha: 0.888	
Rated on a 5-point Likert Type	

Table 2 presents information about the psychometric properties of the ecological literacy measurement tool. The original version of the measurement tool intended for adaptation consists of 5 different sub-dimensions. The dimensions of the scale include environmental science-related knowledge, ecological awareness, ecological ethics, ecological emotions, and ecological behavior. Each sub-factor of the scale contains 8 items, resulting in a total of 40 items. The scale employs a 5-point Likert scale for rating. In the ecological knowledge dimension, the rating scale consists of "Very familiar," "Familiar," "Undecided," "Not Familiar," and "Not Familiar at All." In the ecological behavior dimension, the rating scale comprises "Always," "Frequently," "Sometimes,"

"Rarely," and "Never." For the other dimensions, the rating scale includes "Strongly Disagree," "Disagree," "Undecided," "Agree," and "Strongly Agree."

The internal consistency of the scale, as measured by Cronbach's alpha reliability coefficient, is 0.888. The original form of the Ecological Literacy Scale to be adapted is provided in (Appendix 1). Prior to proceeding with the administration of the form, the necessary explanations and instructions for filling out the form were provided to the students. Data collection was carried out during the second semester of the 2022-2023 academic year. No interventions were made with the students until the data collection process was completed. The process of obtaining data for the study was conducted face-to-face with the participating middle school students in a classroom setting.

Data Analysis

The research data were analyzed using quantitative analysis methods. The data were evaluated through the SPSS and LISREL statistical software programs. Initially, data obtained from student participants were checked, and forms with missing information were separated from the data set. The remaining forms were transferred to the SPSS program, where missing data were identified and the data set was prepared for analysis.

The data obtained from the application of the adapted scale form in its original and Turkish versions at two-week intervals were analyzed through the calculation of Pearson product-moment correlation coefficients at the item level and related paired t-test results. The data obtained from the main application were examined to determine whether they exhibited a normal distribution. Factor analysis was conducted to ensure the construct validity of the scale and to decide on the items that should be included in the scale. Prior to proceeding to the factor analysis stage, the Kaiser-Meyer-Olkin (KMO) and Bartlett tests were conducted to assess the suitability of the data for factor analysis. Subsequently, exploratory factor analysis was performed. In this analysis, items with factor loadings above 0.40 were accepted. Moreover, items with a minimum difference of 0,10 in factor loadings among multiple factors were removed after the rotation process.

As a result of the analysis, it was deemed appropriate to remove a total of 10 items from the scale. After completing the exploratory factor analysis, confirmatory factor analysis was conducted to confirm the factor loadings and sub-dimensions. The data set obtained from the second sample group was transferred to the LISREL program to perform the confirmatory factor analysis. In this analysis, factor loadings and fit indices of the scale items were confirmed, and the reliability of the entire scale and its sub-dimensions was assessed by calculating the Cronbach's alpha internal

consistency coefficient. The Cronbach's alpha internal consistency coefficient for reliability was calculated in a different sample (n=120). An independent t-test analysis was conducted to identify differences between item scores. Mean, standard deviation, and item-total correlation values for the items were determined. Furthermore, correlation values between the factors were calculated to determine the relationships between the factors (Acar Güvendir & Özerk Özkan, 2022; Büyüköztürk, 2019; Seçer, 2017; Şeker & Gençdoğan, 2014; Tabachnick & Fidell, 2019).

Ethical Process of Research

Regarding the ethical process of the research, participants were informed that the research would be used for scientific purposes, and that the confidentiality of their data would be maintained. Informed consent forms were obtained from the middle school students who voluntarily participated in the study. The purpose of the study, the reason for its conduct, and the intended use of the responses were clearly explained to the students. Additionally, student names and surnames were kept confidential and a coding method was employed. Within the framework of the conducted research, the necessary legal permissions were obtained from the university's academic ethics committee and the Ministry of National Education.

Results

Validity and reliability analyses of the adaptation of the Ecological Literacy Scale to Turkish have been presented in the results section. In order to determine the linguistic equivalence of the Turkish version of the Ecological Literacy Scale, a test-retest method was used, and it was administered to 35 participants. Following the administration, the Pearson product-moment correlation coefficients and related paired t-test results were calculated for both the original and Turkish forms, as presented in Table 3.

Table 3.

Related Group T-Test Results of Linguistic Equivalence

		Original Form	**Turkish Form**
Original Form	Pearson Correlation (r)	1	.906**
	P (Significance)		.000
	N	35	35
Turkish Form	Pearson Correlation (r)	.906**	1
	P (Significance)	.000	
	N	35	35

When examining Table 3, Pearson product-moment correlation coefficients and related paired t-test results for items from the original and Turkish forms of the Ecological Literacy Scale, pertaining to linguistic equivalence, are observed. Upon reviewing the correlation results for linguistic equivalence examination, it is evident that there is a high level of relationship between the original form and the Turkish form of the scale ($r=0.906$; $p<0.01$).

In order to ensure the normality distribution assumption of the data set before starting the factor analysis process of the adaptation phase, the normality distribution test results of the data set of the scale are given in Table 4.

Table 4.

Normality Test Results

	Kolmogorov-Smirnov			**Shapiro-Wilk**		
	Statistics	Degrees of Freedom	P Significance	Statistics	Degrees of	P Significanc
Total		(df)	(sig)		Freedom(df)	(sig)
	.038	315	.200*	.996	315	.660

When examining Table 4, the results of the normality distribution test for the dataset of the adapted Ecological Literacy Scale are observed. Upon inspecting the normality test results for the adapted scale, it was determined that there was no significant difference according to the normality tests, and the data exhibited a normal distribution ($p>0.05$). Furthermore, the skewness and kurtosis values for the dataset are within the range of -1.96 to +1.96 (skewness: -0.053; kurtosis: -0.154), while the mode, median, and mean values are close to each other (3.70; 3.73), as reported by Can (2022). The results of the Kaiser-Meyer-Olkin (KMO) and Bartlett tests, presented in Table 5, demonstrate that the sample size is sufficient and that the data is suitable for factor analysis prior to conducting the exploratory factor analysis.

Table 5.

KMO and Bartlett Test Results

KMO	**0.816**	
Barlett	Chi-square Value	2717.179
Test	Degrees of Freedom	435
Results	Significance	.000

When examining Table 5, the results of the Kaiser-Meyer-Olkin (KMO) and Bartlett tests for the dataset of the adapted Ecological Literacy Scale are presented. Upon reviewing the KMO and Bartlett's test results, the Kaiser-Meyer-Olkin value for the scale was found to be 0.816. The Bartlett test yielded a chi-square value of 2717.179 with 435 degrees of freedom ($p<0.01$).

Following the rotation process conducted during the exploratory factor analysis, the explained variance ratios based on eigenvalue statistics obtained from the rotated component matrix are presented in Table 6.

Table 6.

Eigenvalues of the Scale

Factors	Total	Explained Variance	Cumulative (%)
1	3.418	11.395	11.395
2	2.942	9.806	21.200
3	2.703	9.010	30.210
4	2.649	8.830	39.041
5	2.311	7.703	46.744

When examining Table 6, the explained variance ratios based on eigenvalue statistics obtained from the rotated component matrix of the adapted Ecological Literacy Scale are observed. It is understood that the items in the measurement instrument are grouped under 5 sub-factors and each factor explains a total of 46.744% of the variance.

As a result of the exploratory factor analysis, the factor distributions of each item remaining in the scale and the values related to the loadings of the items in the factors are given in Table 7.

Table 7.

Factor Load Values of Scale Items and Factors

Item No.	Factor-1	Factor-2	Factor-3	Factor-4	Factor-5
I1	0.768				
I2	0.707				
I3	0.685				
I4	0.648				
I5	0.639				
I6	0.601				
I7	0.480				

I8	0.693				
I9	0.639				
I10	0.613				
I11	0.562				
I12	0.557				
I13	0.513				
I14	0.454				
I15		0.687			
I16		0.659			
I17		0.627			
I18		0.586			
I19		0.554			
I20		0.538			
I21			0.611		
I22			0.606		
I23			0.569		
I24			0.518		
I25			0.494		
I26				0.704	
I27				0.591	
I28				0.580	
I29				0.526	
I30				0.480	

When examining Table 7, values related to the factor distributions of each remaining item in the adapted Ecological Literacy Scale and the factor loadings of items within the factors obtained from the rotated component matrix of the factor analysis are observed. The factor loadings for the scale range from 0.454 to 0.768. The factor loadings for the first factor of the scale range between 0.480 and 0.768, while those for the second factor vary from 0.454 to 0.693. The factor loadings for the third factor of the scale range between 0.538 and 0.687, the fourth factor ranges from 0.494 to 0.611, and the fifth factor has factor loadings between 0.480 and 0.704.

The results related to the common factor variances for the remaining items in the scale following the rotation process conducted during the exploratory factor analysis are presented in Table 8.

Table 8.

Common Factor Variance Values of Scale Items after Rotation

Item No	Starting Values	Factor Variance	Item No	Starting Values	Factor Variance
I1	1.000	0.635	**I16**	1.000	0.576
I2	1.000	0.551	**I17**	1.000	0.431
I3	1.000	0.539	**I18**	1.000	0.410
I4	1.000	0.463	**I19**	1.000	0.477
I5	1.000	0.513	**I20**	1.000	0.362
I6	1.000	0.452	**I21**	1.000	0.527
I7	1.000	0.501	**I22**	1.000	0.466
I8	1.000	0.555	**I23**	1.000	0.412
I9	1.000	0.509	**I24**	1.000	0.385
I10	1.000	0.498	**I25**	1.000	0.408
I11	1.000	0.426	**M26**	1.000	0.581
I12	1.000	0.467	**M27**	1.000	0.414
I13	1.000	0.389	**M28**	1.000	0.367
I14	1.000	0.342	**M39**	1.000	0.387
I15	1.000	0.543	**M30**	1.000	0.436

When examining Table 8, values related to the common factor variances for the remaining items in the adapted scale following the rotation process conducted during the exploratory factor analysis are observed. Upon reviewing the values, it is understood that the common factor variance values for the items fall within the range of 0.342 to 0.635. It has been determined that all common factor variance values are above 0.30.

The line graph of the factors obtained after the exploratory factor analysis is shown in Figure 2.

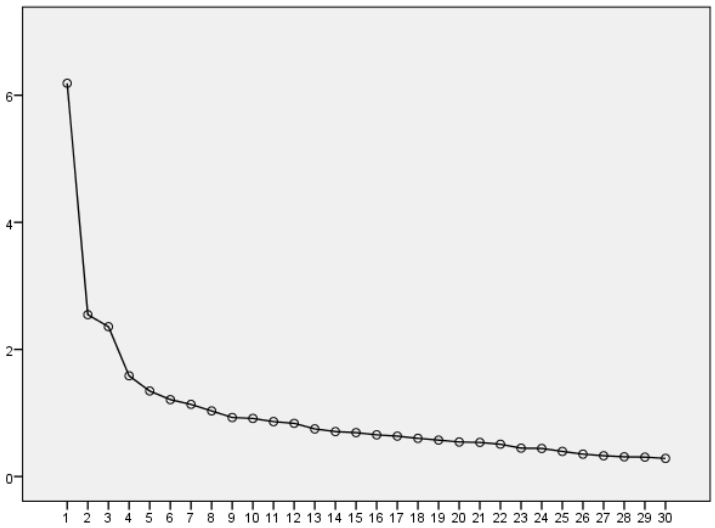

Figure 2. Line graph of exploratory factor analysis result.

When examining Figure 2, it is evident that there is a distinct breaking point in the eigenvalue scree plot of the adapted scale, and from this point onwards, the curve becomes horizontal. This indicates that the scale conforms to a 5-factor structure. To confirm the scale that was validated through exploratory factor analysis, confirmatory factor analyses were conducted, and the obtained t-values are presented in Figure 3.

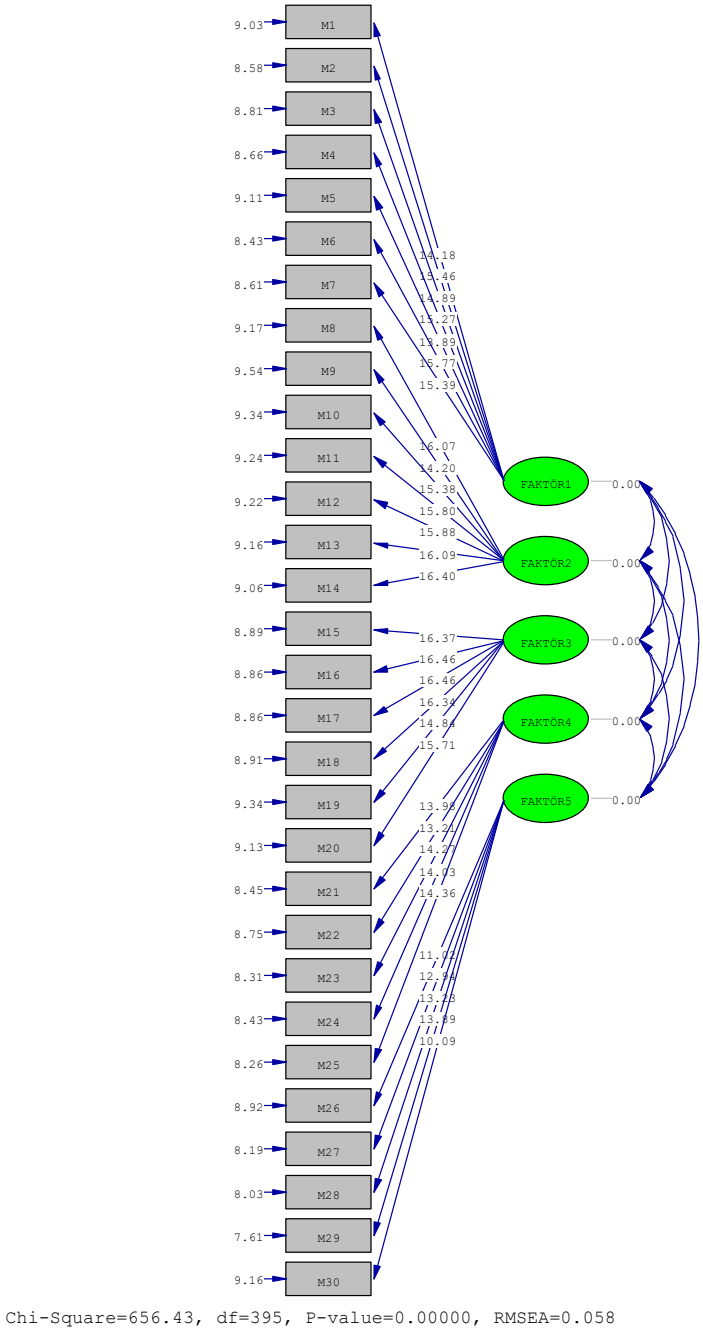

Figure 3. Confirmatory Factor Analysis t-Values Roadmap.

In Figure 3, t-values for the confirmatory factor analysis conducted to confirm the 5-factor structure as established by exploratory factor analysis are displayed. There are no red arrow indicators on the figure. It is observed that the t-values for the entire scale range between 10.05 and 16.46. The t-values for the first factor range from 13.89 to 15.77, the second factor's t-values range from 14.20 to 16.40, the third factor's t-values range from 14.84 to 16.46, the fourth factor's t-values range from 13.21 to 14.36, and the t-values for the fifth factor range from 10.09 to 13.89.

The loading values of the items obtained as a result of the confirmatory factor analyzes are shown in Figure 4.

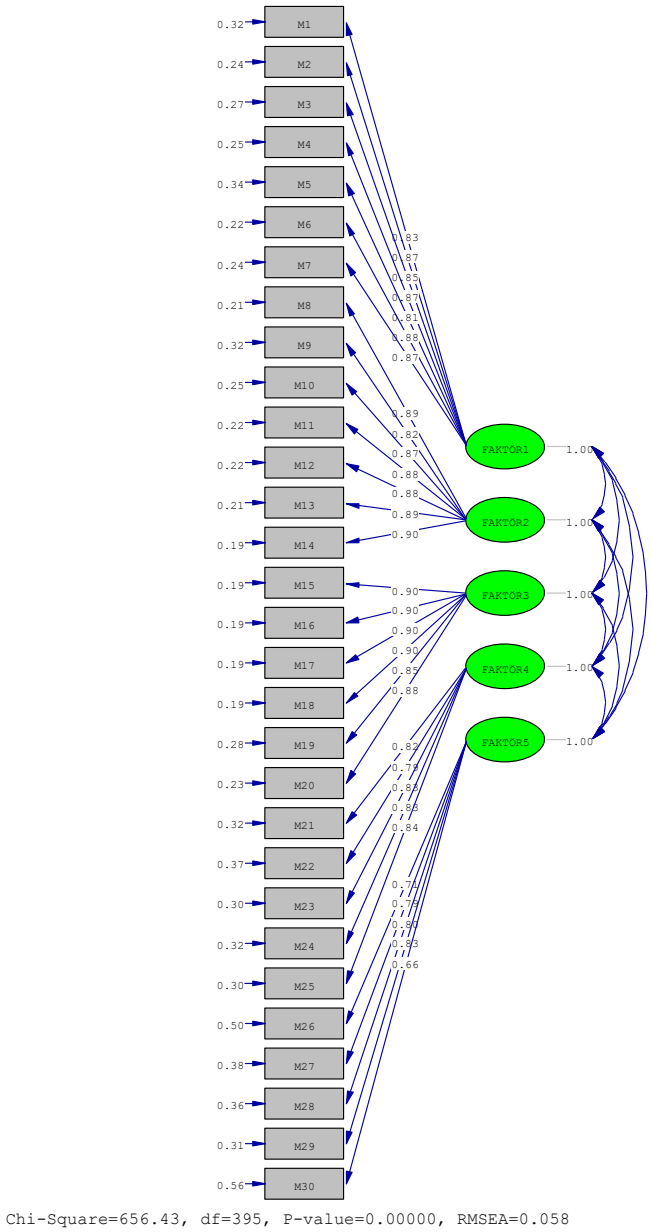

Figure 4. Confirmatory Factor Analysis Item Loading Road Map.

When examining Figure 4, the factor loading values for the scale items obtained from the confirmatory factor analysis are displayed. The item loading values for the items in the scale range from 0.66 to 0.90. The item loading values for the first factor range from 0.81 to 0.87, for the second factor they range from 0.82 to 0.90, for the third factor they range from 0.85 to 0.90, for the fourth factor they range from 0.80 to 0.84, and for the fifth factor, they range from 0.66 to 0.83.

After the analysis, the goodness-of-fit indices for the CFA model (Seçer, 2018) were examined, and the results are presented in Table 9.

Table 9.

Goodness-of-Fit Indices for the DFA Model Obtained from the Scale

Fit Index	Result	Comment
χ2 /df	1.66	Perfect Fit
NNFI	0.95	Perfect Fit
IFI	0.96	Perfect Fit
CFI	0.96	Perfect Fit
GFI	0.82 (0.85)	Acceptable Fit
NFI	0.90	Acceptable Fit
AGFI	0.80	Acceptable Fit
PNFI	0.82	Acceptable Fit
PGFI	0.70	Acceptable Fit
SRMR	0.037	Perfect Fit
RMSEA	0.058 (0.050)	Perfect Fit
RMR	0.084	Acceptable Fit
RFI	0.90	Acceptable Fit

When examining Table 9, the goodness-of-fit indices obtained from the confirmatory factor analysis of the adapted scale are observed. The fit indices indicate that the scale items exhibit excellent or acceptable fit. Values for χ2/df, NNFI, IFI, CFI, AGFI, PNFI, PGFI, RFI, SRMR, RMSEA, and RMR point to good and excellent fit, confirming that the model fit of the scale structure has been achieved.

Cronbach's alpha internal consistency coefficients were calculated to assess the reliability of the adapted scale as a whole and for the scale factors, and the obtained values are presented in Table 10.

Table 10.

Reliability Coefficients for Factors and the Entire Scale

Factor Name	Number of Items	Cronbach Alpha
Ecological Information	7	0.762
Ecological Awareness	7	0.781
Ecological Ethics	6	0.786
Ecological Feeling	5	0.730
Ecological Behavior	5	0.733
Total	**30**	**0.834**

When examining Table 10, the reliability coefficient values calculated for the adapted scale and for each factor of the scale are observed. It is understood that the Cronbach's alpha reliability coefficient for the entire scale is 0.834. The reliability coefficient for the first sub-factor, which is the ecological knowledge dimension, is 0.762, for the second sub-factor, the ecological awareness dimension, it is 0.781, for the third sub-factor, the ecological ethics dimension, it is 0.786, for the fourth sub-factor, the ecological emotion dimension, it is 0.730, and for the fifth sub-factor, the ecological behavior dimension, it is 0.733.

In order to examine the measurement status of the items in the adapted scale for the intended construct, item-total correlation values were calculated for each item. Furthermore, the values of t-tests indicating the differences between item scores in the parent and subgroups of the scale exceeding 27% were determined. The results of item analysis, including item means, standard deviations, item-total correlations, and t-values for the items, are presented in Table 11.

Table 11.

Item Analysis Results of the Scale

Item	Group	Mean	Standard Deviation	Item Total Correlation	t- Value	Significance (p)
I1	Parent	3.6512	1.41228	0.326	11.645	.000
	Sub	1.7093	.62996			
I2	Parent	3.9651	1.13187	0.369	8.964	.000
	Sub	2.4884	1.02606			
I3	Parent	3.6395	1.41349	0.389	10.178	.000
	Sub	1.8256	.85669			
I4	Parent	3.9767	1.20759	0.433	8.489	.000

	Sub	2.3140	1.35700			
I5	Parent	4.4419	.91529	0.536	8.695	.000
	Sub	2.8140	1.47538			
I6	Parent	4.4471	.91944	0.464	8.675	.000
	Sub	2.8140	1.47538			
I7	Parent	4.1977	.99196	0.408	9.253	.000
	Sub	2.7558	1.05089			
I8	Parent	4.4070	.75736	0.493	6.760	.000
	Sub	3.5116	.96704			
I9	Parent	4.5698	.72826	0.427	7.182	.000
	Sub	3.5465	1.10248			
I10	Parent	4.3837	.78469	0.456	7.827	.000
	Sub	3.2093	1.14908			
I11	Parent	4.5465	.73014	0.411	7.293	.000
	Sub	3.4651	1.16516			
I12	Parent	4.5698	.72826	0.412	7.613	.000
	Sub	3.3837	1,24776			
I13	Parent	4.1279	1.06048	0.336	9.009	.000
	Sub	2.5698	1.20334			
I14	Parent	4.1860	.98830	0.464	7.167	.000
	Sub	2.8953	1.34627			
I15	Parent	4.0581	1.08849	0.376	9.659	.000
	Sub	2.5000	1.02613			
I16	Parent	4.2209	.96285	0.358	9.527	.000
	Sub	2.7674	1.03667			
I17	Parent	4.0000	1.11672	0.316	9.633	.000
	Sub	2.3256	1.16257			
I18	Parent	4.3721	1.08516	0.313	8.792	.000
	Sub	2.5698	1.56085			
I19	Parent	3.7791	1.35821	0.326	7.976	.000
	Sub	2.2442	1.15744			
I20	Parent	4.4535	.91596	0.319	8.076	.000
	Sub	3.0233	1.36319			
I21	Parent	4.6512	.62811	0.430	8.911	.000
	Sub	3.3605	1.18731			

I22	Parent	4.3721	.79774	0.397	7.105	.000
	Sub	3.2558	1.21932			
I23	Parent	4.7907	.53394	0.326	7.244	.000
	Sub	3.8605	1.06454			
I24	Parent	4.4302	.72826	0.367	8.026	.000
	Sub	3.2791	1.11304			
I25	Parent	4.5698	.72826		7.805	.000
	Sub	3.3372	1.27058	0.320		
I26	Parent	4.4535	.91596	0.353	7.841	.000
	Sub	3.1279	1.27230			
I27	Parent	4.0233	1.04010		8.164	.000
	Sub	2.8605	.81404	0.325		
I28	Parent	4.1047	1.07407	0.320	9.193	.000
	Sub	2.6047	1.06582			
I29	Parent	4.2326	.95393		8.074	.000
	Sub	2.7674	1.38627	0.458		
I30	Parent	3.3256	1.18264		10.738	.000
	Sub	1.6163	.88342	0.337		

When examining Table 11, item-total correlation values for each item in the scale, t-values indicating the differences between item scores in the parent and subgroups exceeding 27%, item means, and standard deviation values for the items are observed. The item-total correlation values for the items in the scale are above 0.30, ranging between 0.305 and 0.533. Additionally, it is worth noting that there is a significant difference between the means of parent and subgroups for each item in the scale (p: 0.000 < 0.05).

Following the factor analysis and exploratory analyses conducted for the intended adaptation of the measurement instrument, information about the items removed from the original form of the scale and the remaining items is presented in Table 13.

Table 13.

Items Included After Analysis from the Original Form of the Measurement Tool

Factor	Items Removed from the Original Scale	Items Remaining on the Scale
Ecological Information	1 Item	7 Items
Ecological Awareness	1 Item	7 Items
Ecological Ethics	2 Items	6 Items
Ecological Feeling	3 Items	5 Items
Ecological Behavior	3 Items	5 Items
Total	**10 Items**	**30 Items**

When examining Table 13, information about the items removed from the original form of the scale and the remaining items after the analyses conducted for the adapted measurement instrument is presented. A total of 10 items have been removed from the original form of the scale. One item was removed from the first factor, one from the second factor, two from the third factor, and three each from the fourth and fifth factors. In summary, the Ecological Literacy Scale, comprising 30 items with a 5-factor structure, has been obtained. The final version of the adapted scale in Turkish is provided (Appendix 2).

The Pearson correlation coefficient values representing the relationship between the factors in the scale are presented in Table 14.

Table 14.

Correlation Values Between Sub-Factors in the Measurement Tool

		Factor-1	Factor-2	Factor-3	Factor-4	Factor-5
Factor-1	r	1	.388**	.209**	.247**	.343**
	p		.000	.000	.000	.000
Factor-2	r	.388**	1	.285**	.538**	.361**
	p	.000		.000	.000	.000
Factor-3	r	.209**	.285**	1	.267**	.365**
	p	.000	.000		.000	.000
Factor-4	r	.247**	.538**	.267**	1	.305**
	p	.000	.000	.000		.000
Factor-5	r	.343**	.361**	.365**	.305**	1
	p	.000	.000	.000	.000	

****P<0.01, R= Pearson Correlation Coefficient**

When examining Table 14, Pearson correlation coefficient values representing the relationship between the sub-factors in the scale are observed. A positive and significant relationship is observed between the first factor and the second factor ($r=0.388$; $p<0.01$), between the first factor and the third factor ($r=0.209$; $p<0.01$), between the first factor and the fourth factor ($r=0.247$; $p<0.01$), and between the first factor and the fifth factor ($r=0.343$; $p<0.01$). Additionally, a positive and significant relationship is observed between the second factor and the fourth factor ($r=0.538$; $p<0.01$), between the second factor and the third factor ($r=0.285$; $p<0.01$), and between the second factor and the fifth factor ($r=0.361$; $p<0.01$). There is also a positive and significant relationship between the third factor and the fourth factor ($r=0.267$; $p<0.01$) and between the third factor and the fifth factor ($r=0.365$; $p<0.01$).

Discussion and Conclusion

The research aimed to adapt the Ecological Literacy Scale developed by Ha, Huang, Zhang & Dong (2021) into Turkish and conduct validity and reliability analyses. The goal was to create a valid and reliable measurement tool for middle school students. Ensuring the cultural appropriateness and comprehensibility of the adapted scale enhances the validity and reliability results of the measurement tool and prevents the acquisition of erroneous data (Johnson & Christensen, 2014). Thus, the adaptation process of the measurement tool, including item translations, scale administration, factor analyses, and finalizing the scale, was carried out with great care.

Following the language validation analyses of the measurement tool's original and Turkish forms, it was determined that language equivalence was established (Seçer, 2018; Şeker & Gençdoğan, 2014). The scale items with established language validity were presented to expert opinions. According to the Lawshe (1975) technique, expert opinions were evaluated, and it was decided to conduct a pilot application without removing any items from the scale to meet the minimum content validity ratio, which is 0.750 for 8 experts (KGO). In the pilot application phase, the most suitable sampling method was generally purposive sampling due to matching the characteristics of the target audience (Erkuş, 2012). Therefore, 20 students who met the qualifications of the target group were selected for the pilot application. In the main implementation phase, the study was conducted with 315 students, with an average of 7-8 participants per item (315/40). In scale studies, it is recommended to work with approximately 3 to 5 times the number of items in the scale (Bryman & Cramer, 2001; Seçer, 2018; Sönmez & Alacapınar, 2016). It can be inferred that the sample size is appropriate in this regard. In many studies examining scale studies,

the sample group generally consists of 300 or more participants (Akbaş et al., 2019; Akçay et al., 2018; Gül & Sözbilir, 2015; Şahin & Boztunç Öztürk, 2018). However, the relatively higher number of participants per item, around 5-9, supports our study (Akbaş et al., 2019). Tabachnick & Fidell (2019) suggest that having at least 300 participants may be beneficial for conducting factor analysis.

In the process of extracting a factor from items that come together because they measure similar attributes through exploratory factor analysis, items with a relationship to one factor but low loadings on other factors are attempted to be grouped together (Can, 2022). Similarly, Şeker & Gençdoğan (2014) suggest that during exploratory factor analysis, items in a measurement tool are expected to be grouped into specific sub-dimensions. The varimax rotation, one of the most common orthogonal rotation methods, is typically used during the rotation process in exploratory factor analysis. The varimax rotation attempts to minimize the number of variables with high loadings on each factor (Pallant, 2020). Therefore, it was considered appropriate to use varimax rotation in the exploratory factor analysis in this study. The KMO value of the study's dataset was obtained as 0.816. A KMO value of 0.60 or higher is expected, along with a significant result in the Barlett test, to confirm the suitability of the data for exploratory factor analysis (Büyüköztürk, 2019; Pallant, 2020; Tabachnick & Fidell, 2019). Therefore, it can be said that the study's data is suitable for factor analysis. In the context of the study, the variance explaining the 5-dimensional structure ranging between 40% and 60% indicates that the variance ratios are sufficient (Tavşancıl, 2014). Additionally, since the eigen values for the 5 sub-dimensions are greater than 1, it was considered appropriate to treat them as factors (Howards, 2016). Following the rotation process, all factor loading values in the factors are above 0.40, indicating that all items have relatively good values (Costello & Osborne, 2005; Field, 2013; Howard, 2016; Seçer, 2017).

Confirmatory factor analysis, as a method used to confirm a predetermined model during the adaptation process (Şeker & Gençdoğan, 2014; Yaşlıoğlu, 2017), similarly yielded factor loadings above 0.40. The fit indices for the confirmatory factor analysis were between 0.90 and 0.96, signifying acceptable and excellent fit (DeVellis & Thorpe, 2021; Erkorkmaz et al., 2013; Howard, 2016; Seçer, 2018; Sürücü, Şeşen & Maslakçı, 2021; Şeker & Gençdoğan, 2014; Can, 2022; Tabachnick & Fidell, 2019).

The reliability of measurement instruments is of paramount importance. Reliability of a scale is associated with its internal consistency, indicating how well the items comprising the scale are in

agreement and measure the same construct. Cronbach's alpha coefficient is widely used in studies for assessing reliability (Pallant, 2020). A calculated coefficient should ideally be at least 0.70 (DeVellis & Thorpe, 2021; Karakoç & Dönmez, 2014). As Can (2022) similarly states, a reliability coefficient between 0.90 and 1 in measurements indicates a very high level of reliability. In this study, the internal consistency coefficient of the adapted scale was calculated as 0.834. Therefore, it is demonstrated that the value of the adapted scale is highly reliable. Akçay et al. (2018) indicated in their synthesis studies that internal consistency coefficients are commonly calculated in adaptation studies, especially with Likert-type scales. Consistent with other scale studies, it was reported in this study that Cronbach's α coefficient is used for assessing reliability (Acar Güvendir & Özer Özkan, 2015; Delice & Ergene, 2015; Gül & Sözbilir, 2015; Şahin & Boztunç Öztürk, 2018). The item analysis, including the item-total correlation coefficients of the scale's items and the independent sample t-test values between sub and parent groups, is of considerable importance. In this context, it is important that the item-total correlation coefficient values obtained in this study are above 0.30, suggesting that the items are appropriate to be retained in the scale (Büyüköztürk, 2019). Furthermore, a measurement instrument should be compared using the independent sample t-test to distinguish between individuals who exhibit the behavior to be measured and those who do not. This process can indicate that there is a significant difference in mean scores, implying that the measurement instrument distinguishes students who exhibit the intended target behavior from those who do not (Can, 2022). The significant differences found between the means of sub and parent groups for each item in this study ($p < 0.05$) underscore the discriminatory power of the items.

Recommendations

The ecology literacy scale adapted into Turkish has been tested for its appropriateness for middle school students, validity, and reliability. This scale can be used in various studies involving middle school students. By determining individuals' levels of ecological literacy, appropriate educational plans and strategies can be developed to enhance their ecological literacy skills. Furthermore, the impact of ecological literacy scores on different variables can be examined. For qualitative studies, interviews with participants can provide insights into factors that support ecological literacy scores. Comparisons can also be made between ecological literacy scores of middle school students at different levels. The adapted scale into Turkish is expected to serve as an alternative measurement tool for researchers and educators working in the fields of the environment and ecology.

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Indicate if there is ethics committee approval. Otherwise, by stating that you have carried out the research within the Ethics committee approval was obtained for the study.

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Teachers' Opinions on the Teaching Skills of Primary Teacher Candidates

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Abstract. The purpose of this research is to determine the opinions of primary teachers regarding the teaching skills of teacher candidates taking the teaching practice course. In order to achieve this purpose, the opinions of 3 primary teachers working in a primary school were examined. The classroom teachers who participated in the research were educators with at least 25 years of experience in their profession. In the research, a semi-structured interview design, one of the qualitative research methods, was used. The primary teachers who shared their experiences teach 1st-2nd-3rd-4th grades in a primary school. The interviews lasted 1 hour and 50 minutes in total. According to the research findings, the problems of primary teachers working in a primary school were gathered under the themes of "subject field knowledge, field education knowledge, planning, classroom management and communication".

Keywords. Primary teachers, preservice teachers, teaching skills.

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The future of a society is directly related to the quality of education that individuals who make up a society receive. Because education enables individuals to reach the necessary knowledge and skills of the age they live in and to develop the society they live in with this knowledge and skills. The concretization of the first knowledge and skills learned is through the solving of reading and writing. The education period in which reading and writing are learned, the individual gains awareness of himself and his environment, socializes, and is an important step towards preparing for his future profession is primary school (Gültekin, 2007). One of the most important goals of education is to carry out this important period in the most efficient way, with qualified teaching programs and qualified teachers (Taşkaya, 2012). For this reason, teachers who can provide qualified education must be aware of responsibility and be useful educators for themselves and their environment. Therefore, teachers who will raise individuals who make up a society must be well-educated and equipped with knowledge and skills that change and increase every day (Bayrak Özmutlu&Ergan, 2022). Since teaching, which is the most important concept in this process, is defined as "organizing, directing and facilitating the changes that will occur in the behavior of the individual", the teachers who will teach should be trained with this goal in mind so that they can provide the most accurate guidance (Girgin, 2015, p.315). Teaching can also be considered as a profession that requires being in touch with people as well as field knowledge and skills. The fact that a profession dedicated to educating and developing people is described as a "sacred profession" by society shows that it is related to the status of the teaching profession and its respect in society.

When the sacred profession is described, the branch that comes to mind the most is classroom teaching. In the important and critical years of childhood, they need to be trained to be well-equipped and qualified as they are important stakeholders of social life. In this way, it is expected that they have a leadership spirit that can be a role model for the students they address, and that they have qualities such as guiding, inspiring and receiving. Therefore, teaching exists together with the individual as an activity. For this reason, the family in which the individual first socializes after birth can also be interpreted as the first structure in which they receive education. However, such education is "... unplanned and unprogrammed, a typical public education that is done as much as the need felt at the moment. It is not the case that every parent has gone through a private teaching course." (Çelikkaya, 2010). The only competent person in educating and guiding the child at the basic education level is the classroom teacher. The characteristics such as knowledge, skills and attitudes that a classroom teacher must have in order to successfully fulfill their profession also constitute the competence areas of the teaching profession. Social values and differences are

effective in the classifications related to these areas. Nevertheless, it is possible to talk about three different competence areas in the teaching profession as "field knowledge, teaching professional knowledge and general culture" (Şişman, 2010). These competences may require various adaptations in terms of conditions and time. Because teaching is a profession that requires adaptation according to changes at the national or global level. The most recent example of this is the global pandemic Covid-19, which has engulfed the whole world in 2020 and disrupted the routine with its effects. In special cases such as the global pandemic that affects every country, the knowledge and skills required by the teaching profession can be updated, changed or re-evaluated. Because social changes and technological developments caused by major events with global impact necessitate the development of teaching-learning approaches and the review of currently used methods and techniques. In order for teachers to be trained with the flexibility to adapt to all these changes, this "flexibility" skill must be provided or its foundation must be laid in undergraduate education. Mustan (2002, p.116) grouped teacher training under three headings: "individual and social readiness, university education, and in-service training." The individual and social readiness mentioned here needs to be updated according to the requirements of the period.

It is important to evaluate the teaching profession together with the issue of "how to create a future". The future that is built is connected to young people; and the people who will educate young people are connected to teachers. A "teacher candidate" who receives teacher training at the faculty is considered as a faculty student who has completed the necessary conditions for teaching practice and will perform school practice (YÖK, 1998, p.5). Therefore, it is obvious that a teacher who has completed his education needs experience in order to gain the competencies appropriate to his field. In addition to the information a teacher acquires from the courses he takes at the faculty of education and the books he reads, the view that he can learn by experiencing in the field -in other words, in the classroom- has been seen in the studies in the literature. Kudu, Özbek and Bindak (2006, p.108) reached the finding in their study that "A large portion of teacher candidates find the teaching profession more difficult than they know, but their interest in the teaching profession increases thanks to the practice courses". This data shows how important practice courses are for teacher candidates to gain experience. In order to train teacher candidates who are learning how to learn, eager to teach, and have a guiding and leading spirit, the state should determine the qualified schools and experienced teachers in the schools where these candidates can do their internships; and faculties of education should prefer faculty members who will guide them at every stage of the teaching practice process.

The changing course content in education faculties in recent years raises the question of whether all these needs have been met. Despite this, the fact that they have been subject to so many changes may indicate the importance given to education faculties and teacher training (Abazaoğlu et al., 2016). The content of the Teaching Practice 1-2 courses updated by the Council of Higher Education has been stated as "making observations on field-specific special teaching methods and techniques; making micro-teaching applications using field-specific special teaching methods and techniques; being able to plan a lesson independently; developing activities and materials related to the lesson; preparing teaching environments; managing, measuring, evaluating and reflecting on the class" (YÖK, 2019, pp.11-12). In addition to the Teaching Practice 1-2 courses mentioned above, the School Experience course, which was removed from the program after 2019 and eliminated the opportunity for teacher candidates to gain more experience in schools, is the first experience of teacher candidates before they start their profession. It is thought that such changes in the field of education "reflect the social, cultural, scientific and economic characteristics of each curriculum, regardless of the paradigm it is prepared in" (Özcan, 2011, p.62). School Experience is defined as "a process consisting of planned activities that are introductory to the teaching profession, which is the preparation phase for teaching practice, so that the prospective teacher can observe the teaching practices and skills" (YÖK, 1998, p.5). The School Experience course in the old programs enables the prospective teacher to self-criticize himself by observing both the students, the teachers and the school administration in detail before starting teaching in the presence of the class. However, it can be said that the removal of this course with the new program has disrupted the observation of the environment before the prospective teacher takes the stage. The criteria required by the Teaching Practice 1-2 course and given by the Ministry of National Education for the evaluation of the faculty members in the faculties of education are the same as the criteria issued in 1999. These criteria are; (1) subject area and field education knowledge, (2) teaching-learning process (planning, teaching process, classroom management, communication), (3) evaluation and record keeping, (4) other professional competencies". When the current teacher competencies taken as reference in the research were compared to the teacher competencies listed in 1999, it was seen that the subject area and field education knowledge and teaching-learning process titles remained the same.

In light of these explanations regarding teacher training and the problems that the teacher to be trained will encounter, the purpose of the research is to determine the "opinions of classroom teachers about the skills of classroom teacher candidates within the scope of teaching practice". In order to achieve this aim, the following questions were sought:

Classroom teachers, teacher candidates who come to the teaching practice internship;

1. What are their opinions regarding subject matter knowledge?

2. What are their opinions regarding field knowledge?

3. What are their opinions regarding lesson planning (teaching process and classroom management) skills?

4. What are their opinions regarding communication skills?

Method

The type of research, research group, data collection tools, validity and reliability, data collection techniques, analysis of the data should be detailed in the method section.

Research Model

In this study, which revealed the opinions of the teachers about the teaching skills of the prospective teachers, the interview design, one of the qualitative research methods, was used. The interview was conducted in order to determine the opinions of the prospective teachers about the teaching skills of the prospective teachers taking the Teaching Practice course. The research is a descriptive study that reveals the current situation of the prospective teachers based on the opinions of the teachers. Interview is one of the most common data collection techniques used in the qualitative research method. Interview, which is a very powerful method in terms of revealing the data, opinions, experiences and feelings of individuals, is based on the most common form of communication, speech. When considered in terms of its basic dimensions, it is a data collection process that requires special training. In this process; ensuring that the other party responds to the questions asked comfortably, honestly and accurately is defined as the main task of the interview (Yıldırım, Şimşek, 2000).

Study Group

The study group consists of 3 class teachers who teach different classes in a primary school in the city center of Eskişehir. The research data were collected in the “practice school” where teaching practices were carried out. Practice School is defined as “public and private primary, secondary schools and non-formal education institutions affiliated to the Ministry of National Education where teaching practices are carried out” (YÖK, 1998, p.5). In addition, the teaching staff who conducts Teaching Practice I-II within the scope of the research is the “practice teaching

staff". Practice Teaching Staff is defined as "a person who carries out teaching in the field of the teacher candidate and provides guidance and counseling to the teacher candidate by observing him/her during the practice studies at school, and is specialized in field teaching" (YÖK, 1998, p.5). In the process of determining the research group, primary school teachers who have been mentoring pre-service teachers for many years to share their teaching experiences in the same school were chosen as the sample. The demographic information of the three practice teachers in the study group is given in Table 1.

Table 1.

Information about the Classroom Teachers in the Study Group

Teacher Name	Gender	Years	Undergrad. Depar.	Number of times graduated	How many interns evaluated
Teacher F.	male	19	classroom teaching	4	28
Teacher Y.	male	23	French lang. and lit.	5	46
Teacher H.	male	23	classroom teaching	5	30

When the demographic information of the teachers in the study group is examined (Table 1), the class teachers who participated in the study voluntarily work in the same primary school. In addition to being a primary school teacher, they also worked as administrators for a while after starting their profession. "Teacher F.", with 19 years of experience in class teaching, has worked in many parts of Turkey. He is an experienced teacher who taught a combined class in addition to being a primary school administrator for 4 years. "Teacher Y." is an educator who has been working as a class teacher for 23 years. Graduating from the French language and literature department, "Teacher Y." earned the right to become a primary school teacher by receiving pedagogical formation and, like the other teachers mentioned in the study, he also worked as an administrator for a while. "Teacher H." has also been a class teacher for 23 years. He also worked as an administrator for 8 years, 4 years in a secondary school and 4 years in a primary school. The class teachers in the study group share their experiences with the prospective teachers who come for internship practice during their teaching career and observe these candidates. Teaching practice course is a course in which prospective teachers in their final year of the classroom teaching department gain professional experience, and it is a course that provides continuity, gradualness and solidarity by preparing teaching-learning activities related to different classes and units.

Table 2.

Prospective Teachers in the Study Group

Term	Number of teacher candidates	Gender
2015-2016	Fall: 17 people	14 women / 3 men
2017-2018	Fall: 15 people	10 women / 5 men
	Spring: 16 people	11 women / 5 men
2018-2019	Fall: 8 people	7 women / 1 man
	Spring: 8 people	8 women / --
2019-2020	Fall: 8 people	7 women / 1 man
	Spring: 8 people	7 women / 1 man
2020-2021	Fall: 5 people	2 women / 3 men
2021-2022	Fall: 9 people	9 women / --
	Spring: 10 people	9 women / 1 man
6 years	**104 teacher candidates**	**84 women / 20 men**

Three primary teachers in the study group provided support to a total of 104 intern primary school teacher candidates within the scope of the Teaching Practice course for 6 years. 84 of the teacher candidates who were interviewed by these teachers were female and 20 were male. Due to the global pandemic in 2020, 5 teacher candidates experienced teaching practice within the scope of distance education.

Data Collection Tools

The data collection tool shows the criteria that the practice academic and practice teachers observe and evaluate the teacher candidates. These are listed under 5 headings as “subject field knowledge, field education knowledge, teaching process, classroom management and communication” as given in Table 3.

Table 3.

Teacher Practice Course Teacher Candidate Observation Criteria Topics

	Subject Area Knowledge Criteria
1	Knowing the basic principles and concepts related to the subject
2	Being able to relate the basic principles and concepts in the subject with logical consistency
3	Being able to use the verbal and visual language required by the subject appropriately*
4	Being able to relate the subject to other subjects in the field
	Field Education Knowledge Criteria
5	Knowing special teaching approaches, methods and techniques
6	Being able to benefit from teaching technologies
7	Being able to determine incorrectly developed concepts in students
8	Being able to create appropriate and sufficient answers to student questions
9	Being able to ensure the safety of the learning environment*
	Teaching Process Skill Criteria
10	Being able to relate the subject to previous and subsequent lessons
11	Being able to determine methods and techniques appropriate for the achievements
12	Being able to use time efficiently
13	Being able to organize activities for the active participation of students
14	Being able to continue teaching according to individual differences
15	Being able to select and prepare appropriate tools and materials
16	Being able to use teaching tools and materials appropriately for the class level
17	Intermediate summarization during the lesson to be able to
18	To be able to give feedback according to students' level of understanding
19	To be able to relate the subject to life
20	To be able to use assessment techniques appropriate for the outcomes
	Classroom Management Criteria at the Beginning / During / End of the Lesson
21	To be able to make an appropriate introduction to the lesson*
22	To be able to attract interest and attention to the lesson
23	To be able to provide a democratic learning environment
24	To be able to ensure continuity of interest and motivation in the lesson*
25	To be able to take appropriate precautions against interruptions and obstacles*
26	To be able to benefit from praise and sanctions
27	To be able to wrap up the lesson
28	To be able to provide information and homework about the upcoming lesson
29	To be able to prepare students for dismissal from the classroom*
	Communication Skills Criteria
30	To be able to communicate effectively with students
31	To be able to give understandable explanations and instructions
32	To be able to ask thought-provoking questions appropriate for the subject*
33	To be able to use tone of voice effectively
34	To listen to students with interest
35	To be able to use verbal language and body language effectively

Among the above criteria used by both the practice teacher and the practice instructor within the scope of the Teaching Practice course, the subheadings of "teaching process" and "classroom management" are included under the title of "teaching process". The title of "classroom management" consists of three subsections: "at the beginning of the lesson", "during the lesson" and "at the end of the lesson".

Process

The data of the study were obtained from three classroom teachers who volunteered to participate in the study and were assigned to a public school in the city center of Eskişehir. The opinions of 4th grade students sent to them by the Department of Classroom Teaching of the Faculty of Education of Eskişehir Osmangazi University between 2015-2021 about their teaching skills were collected based on the criteria mentioned above. In order to collect the research data, an interview form consisting of semi-structured questions was developed by the researchers and in-depth interviews were conducted with 3 primary school teachers using this form. The interviews with the teachers lasted an average of 50 minutes, a total of 150 minutes of interviews were recorded with three teachers, and a data file was obtained from the transcripts of these interviews. All interviews were conducted at the school where the teachers worked, on a day and at a time convenient for the teachers, in the school meeting hall, in a seating arrangement opposite each other. It was stated that there was no obligation to speak in a certain order during the interview. A name was used for each participating teacher and the interviews were recorded using a digital recorder.

Data Analysis

The main purpose of content analysis is to reach concepts that will clarify the data obtained (Yıldırım & Şimşek, 2011). Within the scope of the research, the "Teaching Practice Observation Form" was taken as a reference to evaluate the teaching skills of pre-service teachers in faculties of education and the subheadings of "subject field knowledge, field education knowledge, teaching process, classroom management, communication" were determined for the teaching skills of pre-service teachers. Based on these criteria, semi-structured interview form questions were prepared. Thanks to the data obtained by collecting the opinions of the teachers, the sub-heading "problems arising from the system" was added to the sub-headings. The data obtained within the scope of the research was analyzed by transferring the teachers' opinions to the electronic environment by remaining faithful to the audio recordings. The audio recordings listened to by the researcher were

written under the appropriate items in the interview form. The opinions that repeated each other were written once and their frequencies were written on the edges of the items. In order to ensure the reliability and validity of the research and to consider whether the teachers' opinions were distributed appropriately to the items in the data collection tool, opinions were obtained from 3 experts working in the field of classroom education, measurement and evaluation, and classroom teaching. A similarity of 84.7% was obtained between the expert opinions. The findings that differed between the expert opinions were reviewed again and brought together at a common point. In the data analysis process, Miles & Huberman's (1994) reliability formula "Reliability = Consensus / (Consensus + Disagreement)" was used, and the agreement between the researchers was found to be 84.7%. This result shows that the results obtained are reliable.

Results

In this study, where the opinions of classroom teachers about the teaching skills of prospective classroom teachers were examined, the findings were given and interpreted under six headings as "subject field knowledge, field education knowledge, teaching process, classroom management, communication, problems originating from the system" based on the five headings determined in the data collection tools. While analyzing the teachers' opinions, findings regarding the teaching practice system and some problems originating from the education system were also reached and added under a sixth heading.

4.1. Findings Regarding the Subject Area Knowledge of Prospective Teachers

This section includes the findings regarding the opinions of three teachers regarding the subject area knowledge of prospective teachers. The three teachers interviewed expressed their opinions regarding the first of the four interview questions in this section. The table regarding this is given below.

Table 4.

Teachers' Opinions about Prospective Teachers' Subject Matter Knowledge

Question	Question Text	f
1	Knowing the basic principles and concepts related to the subject	4
2	Being able to relate the basic principles and concepts in the subject with logical consistency	1
3	Being able to use the verbal and visual language (figure, diagram, graph, formula, etc.) required by the subject in an appropriate manner*	2
4	Being able to relate the subject to other subjects in the field	1
		8

When the Table 4 is examined, 3 primary class teachers mostly expressed their opinions about the teacher candidates' "knowing the basic principles and concepts related to the subject field" skills. In addition, they also made determinations about other items. Teachers' opinions about the item "knowing the basic principles and concepts related to the subject field" are given below.

> *"Subject field knowledge competence is a matter that varies according to the student's own ability. Some can do it, some cannot."* (Teacher Y.)

> *"While the student was teaching the 'K' sound, he could not realize the sound teaching during that lesson due to nervousness. This is due to the lack of subject field knowledge."* (Teacher H.)

> *"I realized that a pre-service teacher did not know which countries we fought with in the Çanakkale War and the War of Independence. This mistake stems from his subject field knowledge."* (Teacher Y.)

> *"One day one of the students excitedly raised his hand to ask a question to the trainee. The student who took his turn asked the meaning of a word he didn't understand. The trainee could not explain it. Then he said, "Kids, I am a student too, don't push too hard." The student teacher could not give an appropriate answer to the student's question."* (Teacher Y.)

When the opinions of three classroom teachers are examined, it is seen that the teacher candidates' ability to know the basic principles and concepts related to the subject area varies individually, they have deficiencies in their knowledge of teaching initial reading and writing, and they get excited due to their lack of experience in teaching in the classroom, and therefore they forget the subjects they know.

Teachers' opinions on other items in the subject area information are given below.

> *"I also agree that pre-service teachers are lacking in recommending books. They are not adapted to the age and level and interest of the students. In the past, there used to be 100 basic books to be read. I am not talking about that. But there is definitely one thing that a teacher should not recommend a book he/she has not read, a book he/she does not understand."* (Teacher H.)

> *"Every year we are reading with the children the books they have chosen. When a trainee volunteered to choose a book, I gave my approval. I asked her which book she wanted to choose and she said The Little Prince. When I asked her if she had read it, she said she had read it before. Then I realized that pre-service teachers want to recommend books in such situations, but these are books they read as a hobby."* (Teacher Y.)

> *"Pre-service teachers try to teach all the letters at once, they want to use all the examples at the same time. When teaching, they prefer to teach vowels the most because it is easier for them. They have problems following the sequence, they want to teach new words without giving the syllable. The problems they encounter in the process of teaching primary reading and writing stem from the lack of subject knowledge. For example, when one of the candidates was at the stage of making the sound "H" recognized, he tried to make this sound recognized as "HO" because he did not know the order of sound groups, that is, because of his lack of subject knowledge."* (Teacher F.)

"In the first grade, everything should be related because we focus on literacy. We observe that the academic knowledge of the candidates is lacking in this regard, but we have the opportunity to close this gap in the traineeship. (Teacher F.)

When the opinions of the teachers participating in the research were examined, it was stated that the teacher candidates were inadequate in teaching letters at the first reading and writing stage or that they may lack subject area knowledge. It was observed that the candidates were inadequate in recommending books to the students in terms of level and content. In addition, it was stated that the candidates were inadequate in relating the subjects to other courses and life, but that they could compensate for this inadequacy with experience. When the opinions of the three teachers about the subject area knowledge of the teacher candidates were examined, it was understood that the candidates were inadequate due to their inexperience and limited internship period. It was understood that having subject area knowledge, as in many areas, showed individual differences. It was understood that the candidates' doing more and diverse readings would contribute both to having information that would support their subject area knowledge and to becoming an intellectual individual.

4.2. Findings Regarding the Field Education Knowledge of Prospective Teachers

This section includes the findings regarding the views of the three teachers who participated in the research regarding the field education knowledge of prospective teachers. Three experienced classroom teachers who participated in the interview expressed their views regarding the first of the 5 interview items in this section. The table regarding this is given below.

Table 5.

Teachers' Opinions about the Field Education Knowledge of Teacher Candidates

Question	Question Text	f
5	Knowing specific instructional approaches	10
6	Being able to utilize instructional technologies	2
7	Identifying misconceptions that have developed in students	-
8	Providing appropriate and sufficient responses to student questions	2
9	Ensuring the safety of the learning environment	-
		14

When the table above is examined, three classroom teachers have expressed their opinions about the skills of teacher candidates "knowing special education approaches, methods and techniques" from the 5 items specified in the table. In addition, they have also determined the skills of teacher candidates "benefiting from educational technologies" and "creating appropriate and sufficient answers to student questions". They have not expressed their opinions about the other two

items. Teachers' opinions about the item "knowing special education approaches, methods and techniques" regarding field education knowledge are given below.

> *"We see that candidates are not well-qualified for field education. Candidates need to be supported in this process."* (Teacher H.)
>
> *"...when an inexperienced pre-service primary school teacher reads the text to 2-3 students in the class, he considers the reading activity as finished, this is not the way to do it."* (Teacher F.)
>
> *"For example, this year's (2018-2019) candidates performed very well in field education in the Science course."* (Teacher Y.)
>
> *"Pre-service teachers try to teach letters all at once, they want to use all the examples at the same time. When teaching, they mostly prefer to teach vowels because it is easier for them. They have problems following the sequence, they want to teach words without giving the syllable."* (Teacher F.)
>
> *"The problems they face in the process of teaching primary reading and writing stem from the lack of subject knowledge. For example, when one of the candidates was in the phase of making the sound "H" felt, the reason why he tried to make this sound felt as "HO" was that he did not know the order of sound groups, that is, due to insufficient subject knowledge."* (Teacher F.)
>
> *"Another example occurred when the pre-service teacher was explaining the subject of hours in the mathematics lesson. The candidate had difficulty in explaining this lesson. Actually, he knows the subject, but he doesn't know how and how much to explain. He cannot control the time."* (Teacher Y.)
>
> *"After teaching the full hour, the half hour, he also teaches the quarter. Then he immediately starts asking about time problems. This is not the method. You cannot move on to the problem before the hour is fully learned. In addition, the student's previous knowledge should be restored first. The telling time was a problem not only for one candidate but for more than one candidate. These deficiencies are due to a lack of experience."* (Teacher Y.)
>
> *"Not everything should be seen as a mistake. We started with traditional methods of lecturing, but then we realized that it wasn't working like that. We immediately started looking for something else, and we abandoned traditional lecturing and turned to different methods and techniques. For example, when graduated pre-service teachers start their job, they get in touch with us. From the feedback, they understand that a topic can be easily explained even with a song. They learn this by experiencing it."* (Teacher Y.)
>
> *"Every year we read with the children the books they choose. When a trainee volunteered to choose a book, I gave my approval. I asked her which book she wanted to choose and she said The Little Prince. When I asked her if she had read it, she said she had read it before. Then I realized that pre-service teachers want to recommend books in such situations, but these are books they read as a hobby."* (Teacher Y.)
>
> *"Candidates have knowledge, but they have problems in applying it. In other words, he does not know in which part he should teach the content knowledge. This shows that content knowledge teaching needs to be revised."* (Teacher Y.)

When the opinions of three class teachers were examined, it was seen that although the teacher candidates had knowledge about the subjects, they could not understand "where, how, how much" they would use this information until they took the teaching practice course. Although the

candidates had the necessary technical and methodological knowledge, problems were observed in the practice phase regarding time control or adequacy of the activity. The fact that the letter groups were not taught in order, especially in the first reading and writing course, shows that the candidate had problems in the practice phase even if he knew the order of the letter groups.

The opinions of three classroom teachers regarding the items “Being able to benefit from teaching technologies” and “Being able to create adequate answers to student questions” are given below.

> *“...unlike the rote memorization system, we teach that this is repetitive addition and in the first place, we teach by using the terms grains or times nicely in sentences. So we do not immediately say '2 times 1 is equal to 2'. The materials provided by the pre-service teachers while explaining this subject are more prone to the rote memorization system. This causes mistakes in the language of instruction, in other words, in the field.”* (Teacher F.)
>
> *“I observed that the courses they took at the university were very sufficient in material design and that the candidates benefited from the ability to design in every course.”* (Teacher Y.)
>
> *“One of my first grade students asked a question: 'The sun illuminates us, but why is space black?' The prospective teacher could not give a convincing answer. Trainees sometimes have difficulty in bringing the vocabulary they use into the classroom level.”* (Teacher F.)
>
> *“One day one of the students eagerly raised his hand to ask a question to the trainee. The student who took the floor asked the meaning of the word he did not understand. The intern could not explain it. Then he said, 'Children, I am a student too, don't push too hard.' The student teacher could not give an appropriate answer to the student's question.”* (Teacher Y.)

When the teachers' opinions were examined, it was seen that "candidates are both good at using teaching technologies" and inadequate in terms of the system. The contradictory statements made by the classroom teachers were not intervened in during the interview and were recorded as they were.

According to the teachers' opinions stated above, there are situations where the candidates are both good and inadequate in field education. However, the main reason for their inadequacy is related to this entire system and stems from inexperience.

4.3. Findings Regarding the Teaching Process Skills of Prospective Teachers

This section includes findings regarding the opinions of three teachers regarding the teaching process skills of prospective teachers. The three teachers interviewed attempted to answer all but 1 of the 11 interview items in this section. The relevant table is provided below. The "-" sign in the frequency column indicates that the teachers did not express an opinion on this item.

Table 6.

Teachers' Opinions about the Teaching Process Skills of Prospective Teachers

Question	Question Text	f
10	Relating the topic to previous und upcoming lessons	3
11	Identifying methods and techniques suitable for learning objectives	2
12	Using time efficiently	3
13	Organizing activities to ensure active student participation	1
14	Adapting instruction to individual differences	-
15	Selecting and preparing appropriate tools and materials	3
16	Using instructional tools and materials in a way suitable for the class level	1
17	Summarizing periodically throughout the lesson	1
18	Providing feedback based on students' levels of understanding	3
19	Relating the topic to real-life situations	2
20	Using assessment techniques appropriate for the learning objectives	3
		22

When the table above is examined, 3 classroom teachers expressed their opinions on all but one item regarding the "teaching process skills of prospective teachers." Teachers' opinions on the item "Being able to relate the subject to previous and subsequent lessons" are given below.

"Everything should be related in the first grade because we focus on reading and writing. We observe that the academic knowledge of the candidates is lacking in this regard, but they have the opportunity to close this gap in the traineeship." (Teacher F.)

"When the candidates first arrive, they cannot associate the course with previous courses, there is no such thing as transition. There was nothing like this during the internship. They saw that they can use mathematics in music and music in the body." (Teacher Y.)

"After teaching the full hour, half hour, he teaches the quarter hour. Then he immediately asks about time problems. This is not the way. You cannot move on to the problem before the hour is fully learned. In addition, the student's previous knowledge should be refreshed first. The clock narration was a problem not only for one candidate but for more than one candidate. These deficiencies stem from inexperience." (Teacher Y.)

When the teachers' views on the above item are examined, it is seen that the candidates' ability to relate the subjects to the previous and next lessons is insufficient. Although it is stated that their academic knowledge on this subject is insufficient, the candidates have the opportunity to observe how they can relate the lessons within the scope of the internship.

The opinions of three teachers about "using time efficiently" are given below.

"Another example occurred when the pre-service teacher was explaining the subject of hours in the mathematics lesson. The candidate had difficulty in explaining this topic. Actually, he knows the subject, but he doesn't know how and how much to explain. He cannot control the time." (Teacher Y.)

"Pre-service teachers who cannot control their time are unable to recover at the end of the lesson. If they had time control, they would not have this problem." (Teacher Y.)

"They had difficulty in using time efficiently in the first 10 weeks. It is impossible to teach 1st grade students for 40 minutes continuously." (Teacher H.)

When the teachers' opinions on the above item are examined, it is seen that teacher candidates are inadequate in using their time efficiently. Therefore, it becomes impossible for them to wrap up the lesson without wasting time or due to inadequate lesson management.

"Candidates try to do many things at the same time. For example, one candidate prepared a crossword puzzle as an activity. There are 10 unknown words in the puzzle. There was not enough time to do all of them. Both the questions were difficult and the activity could not be completed because there were too many words. If there were 5 words instead of 10, it would have been very appropriate." (Teacher H.)

"...unlike the rote memorization system, we teach that this is repetitive addition and in the first place, we teach by using the terms grains or times nicely in sentences. So we do not immediately say '2 times 1 is equal to 2'. The materials provided by the pre-service teachers while explaining this subject are more prone to the rote memorization system. This causes mistakes in the language of instruction, in other words, in the field." (Teacher F.)

"I observed that the courses they took at the university were very sufficient in material design and that the candidates benefited from the ability to design in every course." (Teacher Y.)

When the above views on this item are examined, the ability of teacher candidates to prepare appropriate materials is seen as sufficient. However, it is seen that some problems may be experienced in the implementation of the material in the classroom.

The teacher's opinion regarding the item "Being able to provide feedback according to students' level of understanding" is given below.

"Candidates gain the habit of giving feedback over time, mostly towards the end of the traineeship. However, a subject that should not be forgotten in any lesson can only be fully learned if the traineeship practice is spread over 4 years." (Teacher Y.)

"One of my first grade students asked a question: 'The sun illuminates us, but why is space black?' The prospective teacher could not give a satisfactory answer. Trainees sometimes have difficulty in bringing the terms they use to the classroom level." (Teacher F.)

"One day one of the students eagerly raised his hand to ask a question to the trainee. The student who took the floor asked the meaning of the word he did not understand. The intern could not explain it. Then he said, 'Children, I am a student too, don't push too hard.' The student teacher could not give an appropriate answer to the student's question." (Teacher Y.)

When the teachers' opinions on the above item are examined, it is seen that the candidates' feedback skills are insufficient at the beginning of the teaching practice course. It is stated that the language used by the candidates is not easy enough for the student to understand. It is seen that

these stated problems can only be solved by revising the internship practice and by the teacher candidate feeling like a real teacher.

Teachers' opinions regarding the item "Being able to relate the subject to life" are given below.

> *"You need to be in the classroom to relate subjects to life. They see that this can be done in our classrooms and they can apply it when they are assigned. Thus, they learn that teaching is learned after they take up their job. But I do not agree with this idea, it should change. The courses in the undergraduate program provide academic knowledge, but there are problems in the process of applying the knowledge."* (Teacher Y.)

> *"The ability of pre-service teachers to relate the subjects covered in the lessons with life is gained in the internship."* (Teacher H., Y., F.)

Teachers' opinions regarding the item "Being able to determine methods and techniques appropriate for the outcomes" are given below.

> *"During the lesson planning process, it is important for the candidates to associate the subjects and achievements with specific days and weeks in order to reinforce the teaching. It is difficult for them to learn this with only 6 hours in 14 weeks."* (Teacher H.)

> *"Not everything should be seen as a mistake. We started with lecturing, but then we realized that this was not working. We immediately started looking for something else, and we abandoned lecturing and turned to different methods and techniques. For example, when graduated pre-service teachers start working, they get in touch with us. From the feedback, they understand that a topic can be easily explained even with a song. They learn this by experiencing it."* (Teacher Y.)

When the opinions are examined, it is seen that the candidates are inadequate in determining the methods and techniques suitable for the achievement due to the internship period.

Teachers' opinions on other items in the table are given below.

> *"Candidates prefer measurement and evaluation techniques that are eliminative in the classroom. However, since there are no grades in grades 1-2-3, measurement should take a back seat. When we ask candidates to prepare sample questions or worksheets, they complain about the difficulty of the scale. Candidates who are selective, eliminative in the classroom and prefer a scale that shows the best are inadequate in this subject." (Teacher Y.)*

> *"... an inexperienced classroom teacher candidate considers the reading activity finished when he/she lets 2-3 students in the class read the reading passage, this is not the best way to do it." (Teacher F.)*

The teacher's opinion on the item "being able to summarize during the lesson" is given below.

> *"Candidates do not summarize during the lesson or they forget." (Teacher H.)*

When the teachers' opinions on the above item are examined, it is seen that the candidates are difficult to measure and evaluate and therefore they are inadequate. In addition, it was seen that the

candidates' skills in making interim summaries during the course are inadequate. When the opinions of three class teachers are examined, it is understood that the candidate who took the teaching practice course is inadequate in terms of using time efficiently and due to this inadequacy, he does not give feedback and does not make interim summaries or forgets. The teachers stated that the fact that the teacher candidates cannot meet with the practice teacher before the internship period for lesson plans regarding the design of appropriate tools and equipment is disadvantageous in terms of planning. On the other hand, the three teachers who participated in the research emphasized that teaching is learned by experience, and they stated that there is also a candidate who does not feel like a teacher during the internship. Experienced teachers who suggested that teaching practice should be divided into 4 years emphasized that teaching is learned after starting the job. In addition, three teachers did not express an opinion on the item that the candidates can continue teaching according to individual differences.

4.4. Findings Regarding the Classroom Management Skills of Prospective Teachers

This section includes the findings of the interviews of three interviewed teachers regarding the classroom management skills of prospective teachers. The three interviewed teachers expressed their opinions on some of the 9 interview items in this section. No opinion was expressed on the item with a "-" in the frequency column. The table regarding this is given below.

Table 7.

Teachers' Opinions on Classroom Management Skills of Prospective Teachers

Criterion		Question	Question Text	f
Classroom Management	At the beginning of the lesson	21	Making an appropriate introduction to the lesson	-
		22	Capturing students' interest and attention	1
	During the lesson	23	Providing a democratic learning environment	1
		24	Maintaining students' interest and motivation throughout the lesson	-
		25	Taking appropriate measures against disruptions and interruptions	2
		26	Utilizing praise and corrective measures effectively	2
	At the end of the lesson	27	Concluding the lesson effectively	1
		28	Providing information and assignments for the next lesson	-
		29	Preparing students for leaving the classroom	-
				7

When the table above is examined, 3 classroom teachers expressed their opinions about the skills of "taking appropriate precautions against interruptions and obstacles" and "benefiting from praise and sanctions". In addition, they made determinations regarding 3 items.

Teachers' opinions regarding the item "Taking appropriate precautions against interruptions and obstructions" are given below.

> *"One day one of the students eagerly raised his hand to ask a question to the trainee. The student who took the floor asked the meaning of the word he did not understand. The intern could not explain it. Then he said, 'Children, I am a student too, don't push too hard.' The student teacher could not give an appropriate answer to the student's question."* (Teacher Y.)

> *"Candidates need time to listen to the students, or rather to understand what they want to say. The student raises hand, insistently wants to ask a question. The student teacher does not give the opportunity to have his say in order not to interrupt his own speech. The student may want to correct a mistake or complete a deficiency, which he wanted to complete that day."* (Teacher Y.)

When the opinions on the above article were examined, it was seen that teacher candidates did not take sufficient precautions against interruptions and obstructions or that the precautions they did take were ineffective. It was stated that candidates preferred not to give students the right to speak in order to prevent interruptions.

Teachers' opinions regarding the item "Being able to benefit from praise and sanctions" are given below.

> *"Candidates did not benefit from rewards and sanctions."* (Teacher H.)

> *"Rewards and sanctions were like a weapon, they couldn't use it. But it develops over time. Some things are learned through experience."* (Teacher Y.)

When the opinions on the above item are examined, it is understood that teacher candidates are inadequate in terms of benefiting from praise and sanctions.

Teachers' opinions on other items in the table are given below.

> *"Pre-service teachers are good at attracting attention and interest in lessons, they do not have many problems."* (Teacher H.)

> *"Candidates have problems in providing a democratic environment in classrooms and each educator has his/her own style."* (Teacher Y.)

> *"Pre-service teachers who cannot control their time are not able to summarize the lesson at the end of the lesson. If they had time control, they would not encounter problems in this issue."* (Teacher Y.)

When the opinions on the other items above were examined, it was understood that the candidates had problems in providing a democratic environment due to the variable individual

differences. On the other hand, it was seen that the candidates were quite sufficient in attracting interest and attention in the lessons.

When the opinions of three classroom teachers were examined, it was stated that teacher candidates would learn as they gained the necessary experience in classroom management and it was seen that the time control encountered in the teaching process also created a disadvantage in the field of classroom management. It was understood that the teacher candidate who could not control the time did not give feedback and could not collect the lesson. In addition, it was stated that the teacher candidate who could not yet create his own "style" could not provide a democratic environment in the classroom.

4.5. Findings Regarding Communication Skills of Prospective Teachers

This section includes the findings regarding the opinions of three classroom teachers interviewed regarding the communication skills of prospective teachers. The three teachers interviewed expressed their opinions mostly about the first two of the 6 interview items in this section. The table for this is given below.

Table 8.

Teachers' Opinions on the Communication Skills of Teacher Candidates

Criterion	Question	Question Text	f
Communication	30	Communicating effectively with students	6
	31	Giving clear explanations and instructions	5
	32	Asking throught-provoking questions relevant to the topic	-
	33	Using tone of voice effectively	1
	34	Listening to students with genuine interest	2
	35	Using verbal and body language effectively	1
			15

When the table above is examined, 3 classroom teachers expressed their opinions intensively about the items of "being able to communicate effectively with students" and "being able to give understandable explanations and instructions". In addition, they also made observations about the other 3 items.

Teachers' opinions regarding the item "Being able to communicate effectively with students" are given below.

> *"I liked the interaction and interest of the candidates. It was very nice that they memorized the names of the students from the 2nd week onwards."* (Teacher H.)

"My students beg for the trainees to come." (Teacher H.)

"The candidates' respect for individual differences and their love for students with special needs stem from Turkish sentimentality." (Teacher Y.)

"The candidates' respect for individual differences and their love for students with special needs stem from their professional characteristics. But this feature is formed a few years after you enter the workforce." (Teacher F.)

When the opinions on the above item were examined, it was understood that the candidates' effective communication skills were sufficient, but they sometimes got excited.

Teachers' opinions regarding the item "Providing clear explanations and instructions" are given below.

"One of my first grade students asked a question: 'The sun illuminates us, but why is space black?' The prospective teacher could not give a satisfactory answer. Trainees sometimes have difficulty in bringing the terms they use to the classroom level." (Teacher F.)

"Trainees sometimes find it difficult to adapt the vocabulary they use to the class level." (Teacher F.)

"...unlike the rote memorization system, we teach that this is repetitive addition and in the first place, we teach by using the terms grains or times nicely in sentences. So we do not immediately say '2 times 1 is equal to 2'. The materials provided by the pre-service teachers while explaining this subject are more prone to the rote memorization system. This causes mistakes in the language of instruction, in other words, in the field." (Teacher F.)

"One day one of the students eagerly raised his hand to ask a question to the trainee. The student who took the floor asked the meaning of the word he did not understand. The intern could not explain it. Then he said, 'Children, I am a student too, don't push too hard.' The student teacher could not give an appropriate answer to the student's question." (Teacher Y.)

"Candidates try to form long sentences and cannot use their voices very well. As they adapt to the traineeship, they cannot control their voice even if long sentences start to become shorter." (Teacher Y.)

When the opinions on the above item were examined, it was understood that the teacher candidates' skills in making understandable explanations and giving appropriate instructions were inadequate. It was observed that the language used by the candidates in the classroom sometimes did not reach the student level and there were problems in the language of expression.

Teachers' opinions regarding the item "Listening to students with interest" are given below.

"Candidates need time to listen to the students, or rather to understand what they want to say. The student raises hand, insistently wants to ask a question. The student teacher does not give the opportunity to have his say in order not to interrupt his own speech. The student may want to correct a mistake or complete a deficiency, which he wanted to complete that day." (Teacher Y.)

"As the trainees get to know the students, they take initiatives and do this (listening to the student) when they have the opportunity. For example, one intern wanted to support a student with slow reading skills by giving him a book as a gift." (Teacher Y.)

When the teachers' opinions on the above item were examined, it was understood that the candidates listened to the students with interest. However, it was seen that these aspects of the teacher candidates who thought that listening to the students during the lesson would be "interrupted" needed to be developed.

The teacher's opinion on the items "Being able to use verbal language and body language effectively" and "Being able to use tone of voice effectively" is given below.

"Trainees show different approaches in using and conveying body language and this varies from student to student. Especially the candidates who stand still when they first arrive can make more movements and observations in the following process, but this is not the case at first." (Teacher H.)

When other opinions about the above-mentioned items were examined, it was understood that teacher candidates' effective use of verbal and body language varied individually and they became more conscious after the adaptation process.

When the views of three class teachers were examined, it was seen that the teacher candidates listened to the students with interest and showed love and respect for individual differences. While long sentences were made at the beginning of the internship, towards the end of the internship, it was seen that the teacher candidates who gave up this method of expression and switched to short and meaningful sentences, unfortunately could not learn to control their voice during the internship. It was seen that the ability to express oneself showed individual differences in other teacher candidates.

4.6. Problems Originating from the System

This section includes the problems originating from the system expressed by three teachers who were interviewed, independent of the interview items presented by the researchers. The three teachers interviewed expressed their opinions about 6 items -which were grouped later- in this section. The table regarding this is given below.

Table 9.

Teachers' Views on Problems Originating from the System

	Issues	f
1	Lack of experience due to insufficient internship duration	8
2	Real teaching roles (not as an intern; salary during the internship, parent-teacher meetings, special organisations during the school year, communication with the public etc.)	5
3	Issues arising from the Teaching Practice course	5
4	Issues arising from the training provided in the faculty	4
5	Continued cooperation after taking assuming office	3
6	Other (being free to choose reference books, different skills and abilities to promote education etc.)	2
		27

When the table above is examined, 3 class teachers expressed their opinions on "lack of experience due to insufficient internship period", "real teaching roles" and "problems arising from teaching practice courses". In addition, they made determinations regarding other items. Teacher opinions regarding the items grouped in the table are given below.

Lack of experience due to insufficient internship duration:

"During the lesson planning process, it is important for the candidates to associate the subjects and achievements with specific days and weeks in order to reinforce the teaching. It is difficult for them to learn this with only 6 hours in 14 weeks." (Teacher H.)

"Candidates gain the habit of giving feedback over time, mostly towards the end of the traineeship. However, a subject that should not be forgotten in any lesson can only be fully learned if the traineeship practice is spread over 4 years." (Teacher Y.)

"The problems experienced by pre-service teachers in the implementation of methods and techniques stem from inexperience. In order to solve this problem, candidates should take internship courses starting from the year they come to classroom teaching, that is, from the first grade. There should be a 4-year, piece-by-piece teaching practice program. Thus, teacher candidates who gain experience will be much more productive in the last year of their undergraduate program." (Teacher Y., H., F.)

"We should observe the pre-service teacher's subject knowledge through the lectures in each lesson and each candidate should teach the lessons equally. We cannot do this in the current system." (Teacher H.)

"Teacher candidates go to schools for a total of 6 hours of internship in one day, but this time is not enough for us, the classroom teachers who will observe and evaluate them. Because it is not possible

to determine a candidate's subject knowledge in one day. Observation is needed in many situations, in many subjects." (Teacher H.)

"Another example occurred when the pre-service teacher was explaining the subject of hours in the mathematics lesson. The candidate had difficulty in explaining this topic. Actually, he knows the subject, but he does not know how and how much to explain. He cannot have time control. After teaching the full hour, half hour, he teaches the quarter hour. Then he immediately asks for hour problems. This is not the way to do it. You cannot move on to the problem before the hour is fully learned. In addition, the student's previous knowledge should be refreshed first. The clock narration was a problem not only for one candidate but for more than one candidate. These deficiencies stem from inexperience." (Teacher Y.)

"You need to be in the classroom to relate the subject to life. They see that this can be done in our classrooms and they can apply it when they are assigned. Thus, they learn that teaching is learned after they start working. But I do not defend this idea, it should change. The courses in the undergraduate program provide academic knowledge, but there are problems in the process of applying the knowledge." (Teacher Y.)

When the above teacher opinions are examined, it is stated that the internship period should be revised so that the candidates can gain a professional understanding and have a full teaching experience. It is stated that the experience of the Teaching Practice course will be more effective and efficient when the teacher candidate starts working by spreading from the 1st grade to the 4th grade. It is stated by the teachers that the mutual observations of both the practice teacher and the teacher candidate in the current system are insufficient.

Real teaching roles (not as an intern; salary during the internship, parent-teacher meetings, special organisations during the school year, communication with public etc.):

"The candidate comes for 14 weeks, but can only show their skills in the last weeks. If they spread the internship practice over 4 years, the situation would be different. The pre-service teacher who comes to school should see himself as a real teacher, he should say 'I am a teacher! They should also be given pocket money. The state should pay these candidates a small remuneration." (Teacher F.)

"The internship should not only be perceived as giving something to the student. Parent-teacher, teacher-teacher, teacher-administration, teacher-student. He/she should see himself/herself as a staff member here. The pre-service teacher should be in the school environment to gain experience in all kinds of subjects. It should not be like a reliance." (Teacher Y.)

"Student teachers avoid communicating with other teachers and staff in the school. Candidates are hesitant and afraid to enter the teacher's room. This situation is similar to the teachers' hesitation when an inspector comes to the school. Everyone is afraid that an inspector will come and there will be an investigation." (Teacher H.)

"A young person who does not know how to earn money should be shown how to get money from 30 families from every socioeconomic level. Because he will do it. That's his job." (Teacher H.)

"Inexperience is at the root of the problem in field education knowledge. This can be solved by conducting this practice over a wider period of time. The main problem is that there is no feeling of

belonging. Candidates do not feel that they belong to the school, and technical knowledge remains in the background." (Teacher Y.)

When the above views are examined, it is stated by the teachers that the teacher candidate should be paid a salary so that he/she can feel like a "real teacher" and that a white coat ceremony should be organized when he/she enters the faculty of education, just like it is done for doctoral candidates. In addition, the teacher candidate's presence at parent meetings, being at school on special days and holidays, learning to fill out official documents and communicating with the staff at school are shown as requirements of a real teaching practice throughout the internship. It is stated that various problems will be solved when the teacher candidate feels like he/she belongs to the internship school.

Issues arising from the Teaching Practice course:

"In addition, the necessary planning for the teaching practice course should be carried out together with the teacher candidate and the mentor teacher before the internship starts." (Teacher H.)

"Teacher candidates should be assigned in the context of master-apprentice." (Teacher Y., F., H.)

"You need to be in the classroom to relate the subject to life. They see that this can be done in our classrooms and they can apply it when they are assigned. Thus, they learn that teaching is learned after they are in service. But I do not agree with this idea, it should change. The courses in the undergraduate program provide academic knowledge, but there are problems in the process of applying the knowledge." (Teacher Y.)

"For example, a teacher was appointed in the past, he was assigned to Mardin. But first he came to our school and learned many things from the apprentice-master relationship like an intern in our school for 6 months. If you want to strengthen them and make them productive, you need to revise the teaching practice program first." (Teacher F.)

"The fact that they are with you as an apprentice actually allows you to design activities that you want to do but cannot do because of time, which both provides what you want during the lesson and teaches the candidate the lesson." (Teacher F.)

When the above views are examined, it is stated that the teaching practice course should be like a master-apprentice relationship. It is understood that the "dedication" of teacher candidates to the practice teacher from the 1st year will be effective in the candidate's gaining teaching skills. It is also stated that it is important for the candidate to come and make the necessary plans before the internship before entering the 14-week internship period in the old classroom teacher training program. It is understood that the activities and studies carried out during the teaching practice support both the candidate and the teacher academically.

Issues arising from the training provided in the faculty:

"The duties given by the lecturer at the university should be appropriate to the course content and the candidate should learn how to use these assignments within the scope of his/her teaching." (Teacher Y.)

"When the homework assignments given to the pre-service teacher by the lecturer at the university are compatible with the course content, they are useful for the pre-service teacher in the internship, that is, in the classroom practice." (Teacher Y.)

"Candidates have developed knowledge and skills in methods and techniques. But they have some problems in the application phase. Having technical knowledge does not give an idea about which lesson, how to use it, which methods to benefit from. This is only understood by the teacher candidates in time when they come to the implementation stage." (Teacher Y.)

"Candidates have knowledge, but they have problems in applying it. In other words, he does not know in which part he should teach the content knowledge. This shows that content knowledge teaching needs to be revised." (Teacher Y.)

When the above views are examined, the organization of the content of the assignments and tasks given in the education faculties and the compatibility of the assignments with the course content in the internship indicate the changes that should be made by the classroom teachers in the faculties. It was also stated that during the undergraduate education, there should be more hours of practical courses as well as theoretical courses.

Continued cooperation after taking assuming office:

"Now, when a candidate is employed, he/she goes through an investigation for a year; instead, he/she should learn everything from an experienced teacher. Both the trainee and the school administration should know the trainee's place in the school." (Teacher H.)

"From the moment pre-service teachers take the teaching internship program, they should plan the semester in cooperation with the practicum teacher, and the courses and outcomes to be taught should be determined in advance. During the lesson planning process, candidates need to associate the subjects and outcomes with specific days and weeks. It is important in terms of reinforcing the teaching." (Teacher H.)

"Not everything should be seen as a mistake. We started with lecturing, but then we realized that this was not working. We immediately started looking for something else, and we abandoned lecturing and turned to different methods and techniques. For example, when prospective teachers who have graduated start working, they contact us. From the feedback, they understand that a topic can be easily explained even with a song. They learn this by experiencing it." (Teacher Y.)

When the above views are examined, it is stated that it is necessary for teacher candidates to be in communication with their practice teachers even after they start their duties. It has been understood that cooperation is important in terms of feedback both during the internship and after the internship.

Issues arising from the training provided in the faculty:

"I used to make students buy books. They say, 'Why do you use this? When the doctor doesn't prescribe the medication you need, you have to take some medicine. This job is similar to that. As the teacher of the class, I should have the right to choose." (Teacher H.)

According to the above view, it is stated that the classroom teacher should have the right to choose the source books and should be given the right to choose according to his needs.

Other (being free to choose reference books, different skills and abilities to promote education etc.):

"Candidates should learn folk dance skills and the art of Ebru art as part of a course at the university. The two trainees who learned enlightened the students by talking about these issues in class. Every candidate should learn a skill." (Teacher H.)

According to the above view, it is stated that it is necessary for teacher candidates to acquire a skill such as art, music, etc. in addition to the teaching profession and that it can be used in the classroom.

When the opinions of three class teachers were examined, it was suggested that since the teaching practice course did not provide the teacher candidate with experience, belonging and observation skills in 14 weeks, this course should be divided into 4 years and an internship experience should be provided every year. Primary class teachers stated that it would be a good idea to give the candidates a small salary covered by the state and to provide the necessary status so that they can enter the real teaching role. In addition, attention was drawn to the teacher candidate's participation in parent meetings, special day and week events and social environment during the teaching practice. The place of internship practice in education faculties should be reviewed, candidates should be "assigned" to a practice teacher starting from the first year and the necessary conditions for the master-apprentice relationship should be provided. In the education that the candidate receives at the university, importance should be given not only to the theoretical part but also to the "practice" part and candidates should be taught "how and to what extent" to use their knowledge. During their undergraduate education, the candidate should be provided with an additional skill and care should be taken to encourage them to participate in social activities.

Teachers were asked to grade the prospective teachers considering the first week they arrived and the past 14 weeks. The grades given at the beginning and end of the semester are shown in Table 10.

Table 10.

The Beginning and end of Term Scores Given by Teachers to Candidates

	Score at the beginning of the semester	**Score at the end of the semester**
Teacher H.	80-90	90-100
Teacher F.	65-70	85
Teacher Y.	50	100

"I would give 100 to some of them, but I have never said 'this person or these people should not be a teacher' among those who come here." (Teacher Y.)

"There may be a few people I think should not be a teacher." (Teacher F.)

"I think teaching is like clowning. A clown paints his face, puts on his unique outfit and entertains people to showcase his art. He performs and so do I. He performs as a clown, I perform as a teacher. His salary is paid by his sector, mine is paid by the state. As a system, we are the same. I am the clown of my class." (Teacher H.)

Teaching is a profession that requires the art of performing and the ability to teach in front of the public. The participants in the study hope that with experience, time and opportunities, pre-service teachers will become better teachers.

Discussion and Conclusion

The quality of education provided to children who are the owners of tomorrow in the early years is important for them to develop positive attitudes and behaviors as autonomous individuals who can manage school and social responsibilities in the future in order to develop and realize themselves. For this reason, it is an important part of education that especially preschool and primary school years are spent with qualified teachers in the development of children. For the purpose of this study, the opinions of teachers who guide the candidates regarding teaching skills in order to raise competent and virtuous people according to the education and training program of primary teacher candidates and currently the Maarif Model were determined. It is very important for teachers to know the basic principles and concepts related to the subject area in the field of classroom teaching. However, in this study, although individual differences were seen in the skills of teacher candidates, it was seen that there were deficiencies in their knowledge of primary reading and writing teaching, and the inadequacy in the candidates could be due to lack of knowledge of the subject area. In addition, the difficulty of candidates in teaching, forgetting the subject, and feeling excitement and anxiety are similar to the findings of similar studies (Demir, 2023a; Durmuş & Baş,

2016; Tolun&Aktay, 2020). These situations are directly related to speaking and therefore communication skills. Because it is known that speaking skills are related to the person's attitude towards public speaking, self-belief and self-efficacy perception (Demir, 2023b). Therefore, teacher candidates need to gain experience in public speaking and teaching practice before starting the profession regarding their development in the subject area and field education. The finding that candidates are not able to apply the method and technical skills they have on how to use this information effectively, even if they have knowledge about some course topics, is also prominent (Batmaz&Ergen, 2020). For example, it is striking that even if a classroom teacher candidate has mastered the knowledge of the order of letter groups, he cannot stick to this order during the application phase. Nevertheless, it has been the finding of another study that candidates' technological knowledge and designing teaching materials and producing new materials are sufficient (Uzunöz, 2017).

Teacher candidates should see the teaching process skills as a process in which they will achieve “meaningful learning for the interests and needs of all students” according to their learning and teaching experiences, as stated in the Turkey Century Maarif Model Program (MEB, 2024). Candidates have difficulty in associating topics with previous and subsequent lessons, using time efficiently and wrapping up the lesson (Batmaz & Ergen, 2020). However, it was observed that the classroom teachers in the study were hopeful that these and similar deficiencies will be eliminated with experience, sharing and experience in the field. The contribution of teaching practices to the development of positive professional attitudes of candidates is also encountered in other studies (Baş & Nural, 2023; Batmaz & Ergen, 2020; Ramazan & Yılmaz, 2017). Similarly, although teacher candidates have difficulty in using time efficiently, giving feedback and making interim summaries regarding classroom management and teaching process skills, it is thought that these deficiencies will be eliminated with time and experience. The view that teaching is learned after starting the job and gaining experience is among the findings of another study (Zeki, 2022).

Although it is thought that some teaching skills will be learned after being appointed and when starting the profession, it can be expected that candidates' communication skills will be at the best level as a student of an education faculty (Dilber & Akhan, 2019; Dilekman et al., 2010). Because the teaching profession requires skills such as teaching what you know, explaining information, giving examples, summarizing, defining, and giving a meaningful answer to the question asked. It should also be kept in mind that teaching is a type of profession that requires speaking in front of a crowd, and it may be difficult for people who have difficulty expressing

themselves in front of a crowd to control their feelings such as anxiety, excitement, fear, etc. (Demir, 2023a; Sarıkaya, 2020). For this reason, the development of communication skills of teacher candidates studying in education faculties will positively affect their classroom management skills and therefore their communication with their students. Because according to research, it is seen that teachers become more competent in both classroom management and student communication as they gain experience in the teaching profession (Zeybek & Karataş, 2022). As seen in this study, the problems encountered by classroom teacher candidates during their internships are establishing dominance in the classroom, reaching the communication level of students, being monitored by an experienced teacher and being anxious. Therefore, in terms of teacher training, the quality of the programs and the instructors who teach the programs to the candidates are as important as the cognitive and emotional readiness of the teacher candidates for learning (Çakmak & Kayabaşı, 2023). Although the opinions of classroom teachers about the candidates are categorized under the subheadings of subject area, field education and teaching process, classroom management, and communication skills of the candidates, it has been concluded that some problems are evaluated systematically. Lack of experience due to insufficient internship period, implementation of responsibilities assigned for the real teaching role, problems arising from the teaching practice course, problems that may arise from the education provided in faculties of education, progress towards continuing cooperation after starting teaching and additional skills that may be useful in the teaching profession are among the system-based problems in the research. Since teacher training programs are closely related to the education of children, who are the future of the society, and play an important role, they should be evaluated in terms of their quality and efficiency. Findings regarding teacher training programs to increase the quality of the teaching practice course have also been seen in other studies (Bay et al., 2020; Gündoğdu et al., 2018). The suggestions of teachers who share their views on candidates within the scope of teaching practices should be taken into consideration and internship practices should also be evaluated within a common framework. Because the classroom teacher training program and its content should be in a quality that meets the needs of the age, requires the development of complex skills and enables candidates to take more confident steps with their teaching experience (Gültekin, 2020; Gündoğdu et al., 2018; Yücel & Mızıkacı, 2023; Zeki, 2022; Zeybek & Karataş, 2022). Based on the data from this study and field research, it is recommended that the teaching practices included in the teacher training program should be carried out over a longer period of time in terms of internship and practice, that institutions that train teachers should be more selective, and that the quality of in-

service training practices for teachers should be increased (Akçaoğlu et al., 2020; Aykaç et al., 2014; Bay et al., 2020; Çimen, 2021; Şahin & Kartal, 2013; Tosun, 2019; Yazçayır & Yıldırım, 2021; Zeki, 2022).

Recommendations

Teaching is one of the professions that requires experience and raising self-performing learners. Pre-service teachers, whom we aim to train self-actualized individuals, must pass the necessary criteria before being selected for departments of teacher training at universities. Therefore, first of all, it can be suggested that exams should be selective and qualified candidates should be selected before placing teacher candidates in education faculties. In order to increase the classroom experience of pre-service teachers during their education in these institutions, it is recommended to increase field observation opportunities, to spread the internship period over four years (as an undergraduate year), to ensure that the pre-service teacher feels a sense of belonging to the affiliated school during the internship period, to provide pocket money or some salary during the internship period, and to provide feedback to the affiliated school for guidance, counseling and sharing after the actual assignment. In particular, there may be more research on pre-service teachers' needs and requests for help during their internship and first years of teaching.

It is important that the training received by the selected teacher candidates ensures that they become self-confident adults who have the communication skills to address the public, who aim to develop their students with different skills throughout their teaching, and who have different skills, hobbies and interests.

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Implementing Mathematical Modelling with Calculus of Variations to Design a Disaster Tent

*** Fatma Aslan-Tutak, ** Ozan Güven**

Abstract. This manuscript shares results from a mathematical modelling project developed by a mathematics educator and a high school student to solve a real-life problem; durable disaster tents. The authors worked together to first design a tent, CaTent, by implementing biomimicry with design thinking. Through the process of mathematical modelling, the authors mathematise the problem with catenary which can be obtained by solving a calculus of variations problem. Then, reaching the equation for catenary curve modelling the poles of CaTent, the length of a pole is obtained, approximately 7.2834 meters. The total length of three poles necessary for a CaTent would be 21.8503 meters approximately, while the total amount of poles needed for a common disaster tent would be approximately 40.32 meters.

Keywords. Mathematical modelling, calculus of variations, catenary, design thinking, biomimicry.

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This manuscript describes the process of development of a mathematical modelling project with a design thinking approach. The project is completed by a team of a high school student and a mathematics education scholar. The scholar guided the team in design thinking, mathematical modelling and the underlying mathematical topic of calculus of variations. In this manuscript the design created, CaTent, will be introduced with mathematical underlying explanations to reach the CaTent Design.

As part of mentoring the high school student, the mentor scholar adopted a design thinking approach. The purpose of this collaboration was to enhance a talented high school students' proficiency in STEM (Science, Technology, Engineering and Mathematics) through completing a mathematical modelling project. The definition of STEM has been a focus of attention for years (Akaygun, Aslan-Tutak, & Özel, 2020). There may be different approaches to STEM education, yet the central idea is to integrate at least two disciplines to create a solution for a complex problem. The nature of STEM education allows for an interdisciplinary perspective for examining real-life problems and designing solutions for them. The Turkish High School mathematics curriculum has emphasised mathematical modelling but provides limited opportunities for STEM education applications. The second author of this project is a science high school student who is very interested in mathematics but has limited experience in STEM education projects. Through the mentoring of the first author, a scholar in mathematics education, the team was able to adopt a STEM education approach to design a real-life object using mathematical modelling.

Design Thinking and Mathematical Modelling

The literature on design thinking provides various approaches. The chair of the innovation company IDEO, Brown (2008) identifies three stages of design thinking: inspiration, ideation and implementation (p. 5). Brown discusses the iterative nature of this process while need for following some steps for a fruitful design thinking process. Girgin (2021) summarizes design thinking as an interdisciplinary approach of Brown's five steps of design thinking: empathize, define, ideate, prototype and test. Even though these steps are considered as part of a process to follow, at the same time they are non-linear and dynamic (Scheer, Noweski & Meinel; 2011). The designer would use the information gathered at empathize stage to define problem while the last stage (test) would inform both empathize and define stage for the designer to understand the situation further. Also, the designer may experience an iterative process for ideate stage and prototype stage. Upon producing a prototype based on an idea, a designer may create new ideas. This iterative nature of design thinking may seem

challenging for many novice designers. Considering educational settings, students might find the work of design daunting task, thus having steps to define the design process helps educators to make design thinking accessible for many students. For this study, the authors implemented design thinking process for a real life problem that incorporates STEM approach. There are various educational approaches to implement design thinking with students such as Double-Diamond Model by British Design Council, Hynes, Stanford d. School.

When these models examined, the iterative nature of design process as well as the process of understanding to implementation stay same (Karatas & Aslan-Tutak, 2023). For this study, the authors used Stanford d. School Framework which provides flexibility to be used in or out of school context as well as well-defined steps to be followed. As in their own website, Stanford d. School has vision of "A place for explorers & experimenters at Stanford University." The d. school can be considered one of the maker spaces that were spreading through many engineering universities. While working on various projects, the experts at d.school incorporated a systemic way of guiding students in design projects. For the current study, Stanford d. School approach is adapted to lead the second author, a high school student, into designing a solution for shelter problem in disasters. This framework can be considered in six steps: empathise, define, ideate, prototype, test, and assess. In this manuscript, the authors describe a project they used in a mentoring context instead of a school setting.

Mathematical models represent complex real-world systems mathematically, thus leading to solutions for them. "A mathematical model is a mathematical structure that approximates the features of a phenomenon." (Swetz & Hartzler, 1991, p.1). Mathematical modelling has been the centre of many national curricula and the Turkish Mathematics curriculum. Teaching mathematics with mathematical modelling tasks has a promising effect on students' achievement and process skill development. While a student completing a mathematical modelling task, it can be considered to have cyclical process with four steps: description, manipulation, translation (or prediction), and verification (Lesh, & Doerr, 2003). This four step process starts with learners to describe the real-life phenomena as transformed in mathematical word problem which can be done through considering variables with their relationships. Then mathematical concepts are used to solve the problem in manipulation step. This leads to translation step in which learners make interpretations of the results for real-life phenomena. Sometimes learners may stop this stage but it's crucial to complete the final step of verification as learners reflect on their interpretations to check for errors. This last step allows

learners to have a chance to revise and repeat the modelling process, thus making the task of mathematical modelling dynamic rather than finding a single solution.

Even though the process can be considered in four steps to complete, this task is not an easy one for many learners (Schaap et al., 2011; Sol et al., 2011). When a learner lacks the necessary mathematical knowledge, conceptual or procedural, both description and manipulation steps becomes difficult for the learner. Also, managing the process of the mathematical modelling turns into a challenge for a novice leaner. Teachers need to support learners in the process of mathematical modelling from mathematical aspect as well as guiding through the steps of the modelling.

It should be noted that mathematical modelling is not limited with classroom settings. Indeed, mathematical modelling plays a central role in various STEM education tasks (Aslan-Tutak, 2020). STEM education calls for integration of two or more disciplines from science, technology, engineering and mathematics. Biomimicry is defined as "a design method that draws on the inspiration of Nature for more sustainable solutions to human challenges." (Chen, Klotz & Ross, 2016, p. 497). The aim of adopting biomimicry approach in designs is to look for patterns in nature that can be utilized for engineering problems. Biomimicry is based on the assumption of nature presenting efficient solutions to various problems that humans face (Biomimicry Institute, 2019). Sanne, Risheim and Impelluso (2019) conducted a project with primary and lower secondary school students from Norway. Researchers aimed to incorporate sustainability in the four-module program that was prepared to use biomimicry to integrate science, engineering and mathematics to provide learning opportunities to students. The findings show that "It had positive affect on student understanding of the role of mathematics. It inspired some students to study engineering. It enabled them to see the value of sustainable engineering design."

Within the scope of the project presented in this manuscript, a tent has been designed to meet the sheltering needs of people in natural disasters and emergencies in a fast and safe way. Mathematical modelling and biomimicry principles, which are effective methods in proposing solutions to many problems in real life, were used together to design these tents that will be fast and safe to install. In this way, a solution has been produced / provided for the design of the tent model away from aesthetic concerns and suitable for different climatic and real life conditions. This manuscript aims to share the mathematical modelling process of a scholar and a high school student with a design thinking and mathematical modelling approach.

Method

The methods section of the manuscript consists of a real-life problem that provides the basis, and mathematisation of the problem by using definitions from calculus of variations, an advanced branch of mathematics.

The Real-life Problem: Sheltering During Natural Disasters

Due to natural disasters and emergencies, many people become homeless and live in tents. Especially in earthquake-prone regions such as Türkiye, it is imperative to find fast and safe solutions in emergencies. In the earthquake on 6 February 2023, many people lost their homes, and in this process, people's urgent need for shelter arose, so many tents were needed. One of the most challenging factors in using tents is the *rapid* construction of safe and *durable* tents.

Mathematising the Problem through Biomimicry

Biomimicry briefly means finding solutions to various problems inspired by nature and imitating nature. Examples of biomimicry are swimming flippers and ducks. Ducks' feet push water more easily due to their structure. This inspired some designers to develop products by examining the feet of ducks. Designs found in nature have survived to the present day with their durability. People use these designs to solve problems in daily life.

A chain of infinitesimally small identical links, fixed at both ends, will take the shape of a certain geometrical curve under gravity. This curve is called catenary. *Catenary* is a mathematical curve. It is the natural shape of a chain in equilibrium when held at both ends. The algebraic equation of the curve was first revealed with the answers given by Leibniz, Huygens and Johann Bernoulli to the question posed by Jacob Bernoulli in 1691. Through the study of "calculus of variations", it was found that this shape is actually related to cosh, a hyperbolic trigonometric function (Çağlar, 2023).

The curve of the catenary is widely observed in nature, naturally providing an optimal balance with gravity, it is therefore used in the design of some organisms or structures. Some examples of catenary in nature are as follows:

- Spider Web: The webs spun by spiders usually follow the chain curve. This curve helps the spider web to provide the best balance and to be resistant to external factors such as wind.

- Catfish web: Underwater, catfish weave a web similar to a chain curve. This structure provides optimal stability and resistance underwater, helping them to catch their prey more effectively.
- Mushrooms with large forks: Some mushroom species mimic the chain curve with their large forked structures. This helps the cork to cover a large area and provide the best durability.
- Load Bearing Cable Systems: In the transport or telecommunications industry, the chain curve is used to balance the loads carried by cable systems and distribute the tension evenly. This principle is particularly common in suspension bridges and cable car systems.

Mankind has encountered various natural disasters since its existence and natural disasters have left deep traces on people. For this reason, various structures have been built to meet the needs for shelter and protection. Among the designs in these structures, igloos and dome-shaped structures have come to the fore with their durability (Handy, 2018). The name of the shape that forms the dome in these structures is defined as 'catenary'. The catenary shape adds strength/durability to the structure by effectively distributing the forces and providing a perfect balance. The tent design is called *CaTent*. For the real-life problem of this project, designing a durable tent with *rapid* construction, the authors first determined the tent's specifications, which were chosen based on the common disaster tents from Kızılay.

The CaTent design principles:

1- For the tent frame, 3 poles and a durable fabric would be used to cover the poles.

2- Two points at a certain distance are joined by poles to form the skeleton of the tent. These poles will be placed at equal intervals and 60 degree angles around a circular axis and all of them are designed to have a chain curve shape.

3- The roof height of the poles of this tent, which is a hemispherical shape, is 2.55 metres, the same as the existing disaster tents. The diameter of the circular axis will be 4.6 metres.

4- After the skeleton of the tent is formed, the skeleton will be covered with a durable fabric.

This design will enable the tent to be set up quickly and easily and to be more durable than other tents. The visual representation of CaTent is given in Figure 1 that is produced by using ThinkerCad.

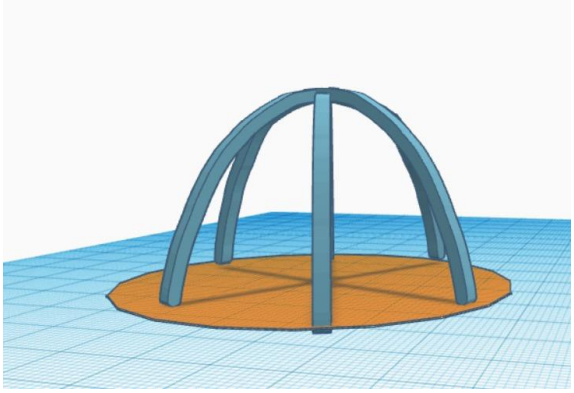

Figure 1. CaTent Design.

This design requires the production of poles with a certain length. When the length of the poles and the distance between the two ends of the poles are predetermined, the poles will take a unique shape. In our case, the aim is to determine the length of the poles in order to create the shape of the catenary. This requires solving an arc length problem for the catenary curve.

Solving Arc Length Problem with Calculus of Variations

Functionals constitute the basic building block of variation calculus. Functionals can be defined as a relation from one set of continuous and differentiable functions to another set. In applied mathematics, in the calculus of variation, functionals are used to determine the maximum/minimum functions. The simplest example of using functionals in this way is to prove that the linear function is the function that gives the shortest distance between two points in the same plane. Euler-Lagrange equations are needed to find the maximum and minimum problems where functionals are employed. This theorem originated as an equation developed by two famous mathematicians, Euler and Lagrange, while working on a problem in the 1750s. The Euler-Lagrange equation allows to find the function that gives the minimum/maximum value when the functional derivative is equal to zero (Forsyth, 1960). The Euler-Lagrange equations are expressed by the formula

$$\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$$

For example, when finding the equation of a curve that has the shortest distance between two points, the functional is defined based on the arc length integration formula.

$$S = \int_{x_1}^{x_2} \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$$

$$The\ Functional: F = \sqrt{1 + (y')^2}$$

Solving the Euler-Lagrange equation for this functional would result into

$$m = \frac{dy}{dx}$$

This means the solution is a linear function.

In the design of the tent, which is the subject of this project, the Euler-Lagrange theorem will be used to find the equation that gives the curve equation between two points. In this project, the pillars of the tent design can be considered as 'durability according to natural conditions'. The equation giving the surface area of the 3D object formed by rotating a curve is as follows:

$$Surface\ Area = \int 2\pi\, y\, ds$$

This equation can be written as follows

$$Surface\ Area = \int_{x_1}^{x_2} 2\pi y \sqrt{1 + (y')^2} dx$$

This equation can then be used to define function, which would be examined to find the curve that minimises the surface area.

$$F = 2\pi y \sqrt{1 + (y')^2}$$

Solving Euler-Lagrange equation for this functional would provide the equation for the curve which would be a durable tent design.

Results

Mathematical Model for CaTent

Since the application of the Euler-Lagrange Theorem involves differentiation with respect to x and since the functional we are studying does not include the variable x, the Euler-Lagrange equation can be solved as follows

$$f - y' \frac{\partial f}{\partial y'} = c$$

Thus in order to reach the equation for CaTent poles, the following equation needs to be solved:

$$2\pi y \sqrt{1 + (y')^2} - y' \frac{\partial (2\pi y \sqrt{1 + (y')^2})}{\partial y'} = c$$

Dividing both sides with 2π

$$y\sqrt{1+(y')^2} - y'\frac{\partial(y\sqrt{1+(y')^2})}{\partial y'} = K$$

Completing the partial derivative in the second expression

$$y\sqrt{1+(y')^2} - (y')^2 y\frac{1}{\sqrt{1+(y')^2}} = K$$

$$\frac{\left[y\sqrt{1+(y')^2}\right]\left[\sqrt{1+(y')^2}\right] - (y')^2 y}{\sqrt{1+(y')^2}} = K$$

$$\frac{y\,(1+(y')^2) - (y')^2 y}{\sqrt{1+(y')^2}} = K$$

Thus,

$$\frac{y}{\sqrt{1+(y')^2}} = K$$

The aim is to reach a differential equation to solve

$$\sqrt{1+(y')^2} = \frac{y}{K}$$

$$1+(y')^2 = \frac{y^2}{K^2}$$

$$y' = \sqrt{(\frac{y^2}{K^2} - 1)}$$

Thus,

$$\frac{dx}{dy} = \frac{K}{\sqrt{y^2 - K^2}}$$

Separating the variables

$$dy\frac{K}{\sqrt{y^2 - K^2}} = dx$$

Solving the equtaion

$$\int dy \frac{K}{\sqrt{y^2 - K^2}} = \int dx$$

This problem was solved by Hass (2000) as follows:

$$x = K\ cosh^{-1}\left(\frac{y}{K}\right) + C \ \ where\ C\ is\ integral\ constant$$

Thus,

$$y = K\ cosh\left(\frac{x - C}{K}\right)$$

$$when\ the\ integration\ constant\ C = 0$$

The result is the hyperbolic trigonometric cosine function (cosh). It was previously discussed that the catenary, with its biomimicry, is a possible design element for CaTent. With the equation obtained above, it is seen that the catenary is the solution.

This equation needs further manipulation to model CaTent poles. C in the equation comes as integration constant. It can be assumed to be zero. In order to depict the influence of this constant, graphs of different equations can be examined. The authors used Desmos to sketch two catenary equations as shown in Figure 2.

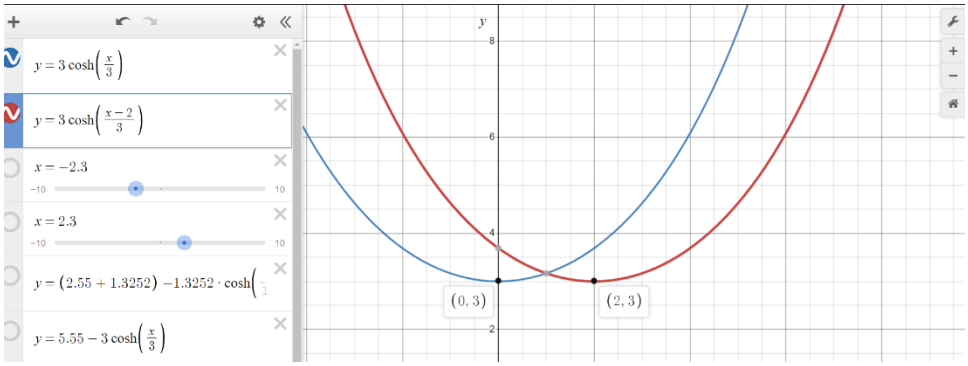

Figure 2. Graphs for c=0, c=2, and k=3.

The value of c would not influence the solving for the CaTent pole design. So, after this point, it will be assumed that c = 0. However, as shown in Figure 2, the curve has concave-up shape while the design of CaTent requires the shape to be concave-down. Also the intersection of the curve with y-axis needs to be a positive real number which will model the height of the CaTent. Thus the equation for CaTent pole design would be

$$y = a - K\ cosh\left(\frac{x}{K}\right)$$

Calculating Pole Length of CaTent

In order to calculate the lengths of the metal rods to be used for the CaTent, it is necessary to calculate the length of the chain curve equation. The values of the Kızılay Tent were used to interpret the CaTent design. Based on the Kızılay Tent, the centre height should be 2.55 m, and the diameter should be 4.6 m (the radius being 2.3 m) in order to have a similar floor area to the Kızılay Tent. In order for the graph of the catenary to fulfil these conditions, it must intercept the y-axis at (0, 2.55), and the zeros of the function must be (2.3,0) and (-2.3,0). In order to find the mathematical equation that gives the CaTent design, constants (**a** and **k**) must be determined.

- Catenary intercepting (0, 2.55) means that $2.55 = a - k \rightarrow a = k + 2.55$
- Catenary intercepting (2.3,0) means that $0 = k + 2.55 - kcosh(2.3/k)$. Solving this equation requires advanced calculators. The authors used Wolfram Alpha to find the solution as $k \approx 1.3252$

Thus the equation becomes

$$\boldsymbol{y = 3.8752 - 1.3252\ cosh\ (\frac{x}{1.3252})}$$

This graph of this equation is produced by using desmos as shown in Figure 3

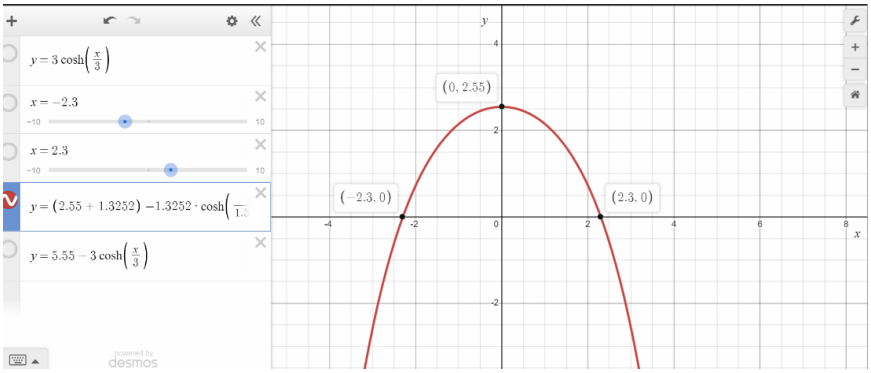

Figure 3. Graph Equation for CaTent Poles.

In order to calculate how much metal rod is needed in the CaTent design, the length of the curve between the points of the equation obtained must be calculated. Due to this catenary equation being symmetric according to y-axis, the integration will be calculated from x=0 to x=2.3.

$$\frac{S}{2} = \int_0^{2.3} \sqrt{1 + \left(\frac{d}{dx}(\boldsymbol{3.8752 - 1.3252\ cosh(x/1.3252)})\right)^2}\ dx$$

$$= \int_0^{2.3} \sqrt{1 + (sinh(x/1.3252)))^2}\, dx$$

$$= \int_0^{2.3} cosh\left(\frac{x}{1.3252}\right)\, dx$$

$$= 1.3252\ sinh\left(\frac{2.3}{1.3252}\right) - 1.3252\ sinh\left(\frac{0}{1.3252}\right)$$

$$= 1.3252\ sinh\left(\frac{2.3}{1.3252}\right)$$

$$= 1.3252 \cdot 2.7480$$

$$\frac{S}{2} \cong 3.6417$$

This result is for half of a pole. Since the CaTent design requires three poles, the necessary pole for this design can be obtained at approximately 21.8502 m.

Discussion and Conclusion

The authors also compared this length with the total length of poles for Kızılay tent design. It was calculated that the poles to form a tent with the given base dimensions should be 3.25 metres and 3.84 metres, respectively, and 40.32 metres of metal rods were needed for a total of 6 rods. As a result, the CaTent model requires less material for poles for the tent as well as maintaining the existing dimensions of the existing tent models. The CaTent model is faster and safer than the existing tent models, as well as durable and sustainable.

With this mathematical modelling project, authors proposed a tent design, CaTent, which then examined. The authors were able to merge concepts, calculus of variations and biomimicry through design thinking and mathematical modelling. This examination of CaTent may contribute to further designs of buildings as well as disaster tents by improving durability of structures. For example, this design may inspire more efficient energy production of solar panels and wind turbines.

Last but not least, one should not forget a key point, material selection. In order to ensure that the rods used in tent design do not break when bent and are even more durable, help from material science experts can be obtained during the design phase.

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Conflict of Interest

There is no conflict of interest.

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Ethical Standards

We have carried out the research within the framework of the Helsinki Declaration. The research does not include any harmful implementation, and the researchers do not obtain any special or sensitive information. There was no data collection with humans.

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Art Education in Türkiye during the Republican Period (1938-1950)

***Mehmet Karaoğlu, **Nadir Yurtoğlu**

Abstract. The subject of the article is the studies carried out on art education in Türkiye during the period from 1938 to 1950 when İsmet İnönü was the President. Under the main title of Art Education in the I. İnönü Period (1938-1950), this article focuses on decisions on art education in National Education Councils (1928-1949), Art Education in Curricula (1938-1950), Art Education in Primary School Curricula, Art Education in Secondary School Curricula, Village Institutes Curricula and Art Education. During the Presidency of İsmet İnönü (1938-1950), the reforms and structures implemented in education, the national education councils conducted by the CHP, and the reports prepared by foreign experts who were invited to Türkiye by the Ministry of National Education for their recommendations on art education formed the basis of this research. In addition, the curriculum programs of primary and secondary schools and Village Institutes are also included in the article's subject. Related documents from the Presidential Archive of the Republic, Official Gazette, minutes and law journals of the Grand National Assembly of Türkiye, various magazines, newspapers, books, and articles from periodical publications were used to collect data. These data were analyzed using the document analysis method.

Keywords. İnönü period, art education, national education councils, curriculum, republican people's party.

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Note: This article is derived from a master's thesis entitled Art Education in Turkey in the Republic Period in the Context of Educational Policy (1923-1950), conducted by Mehmet Karaoğlu under the supervision of Assoc. Prof. Dr. Nadir Yurtoğlu.

As it is known, art began with the existence of human beings. Even in primitive periods, they were engaged in arts, as prehistoric cave paintings have been shown. When we look at the primitive communities and their prehistoric way of life, we see that they were engaged in painting and sculpture (Yetkin, 2019). In this way, art has become a human work quality (Fischer, 1990).

Art often appeared as a religious form of expression in Mesopotamia and Egypt. Frescoes, sculptures, temples, and other works made in these civilizations were related to gods and religious rituals. Temples, pyramids, and sphinxes were built in Egypt to glorify the gods. In addition to these religious subjects, mythological characters, portraitures, and the natural world were also expressed in ancient Greek and Hellenistic artworks. Art continued to exist in various forms and purposes during the Roman period. These covered various disciplines such as sculpture, architecture, fresco, mosaic, and painting. The Architecture of this period is known for its monumental temples, large structures, amphitheaters, and monuments, while the sculpture styles have been recognized for their realism and portrait mastery. On the other hand, state-owned frescoes and mosaics have shown themselves with rich and comprehensive compositions. Art in the early Christian era was important in spreading and expressing faith (Gombrich, 1997).

After 19. Century, the interest in art education has continued to increase among the developing and industrialized states. The commercial craft aspect, which started in England for the first time, was also seen in Austria, Germany, the USA, and Northern European countries, and it has turned into workshops and business education in art and craft. Furthermore, Maria Montessori established a liberal educational environment by implementing the first kindergarten in Rome in 1907 (Aykaç, 2019).

This study is important for courses like Social Studies, which aims to develop knowledge, skills, and values for art education students. It is a study that shows how art education developed during a historical period and how art education is constructed based on decisions made by National Education Councils, texts of curricula, primary and secondary school programs, and practices of Village Institutes. As it is seen in the Curriculum of the Social Studies Course (2023), art education is vital to gain the competence of “cultural awareness and expression”, to learn “culture and heritage”, and to transmit aesthetical aspects of culture. As stated in the curriculum (2023), art education and art-related materials should be used to transmit values and skills.

Method

Research Model

This research aims to reveal how "Art education in Türkiye during the Republican period (1938-1950)" is organized and run. To do this, the qualitative research method, which is considered appropriate to the nature of this study, was applied. Qualitative research is considered a method that aims to clarify events, situations, and narratives by defining them through concepts (Wiersma and Jurs, 2005).

Study Group

The data source of this study, "Art education in Türkiye during the Republican period (1938-1950)", comes from the related reports prepared by the Ministry of National Education.

Data Collection Tools

The data sources of the research consist of the educational reforms and structures carried out during İsmet İnönü's Presidency (1938-1950), the national education councils which the CHP conducted, the reports prepared by foreign experts invited to Türkiye by the Ministry of National Education for their recommendations on art education. For this reason, the document analysis method was used in this research. Document analysis can be explained as gathering documents, reports, annuals, minutes, etc., to clarify a situation, issue, or event by analyzing these materials (Hancock, Ockleford, & Windridge, 2009). In this context, the main research question of this article is how art education in Türkiye during the Republican period (1938-1950) was constructed. The main problem of the research has been examined through the following questions:

1. What was the art education of the İnönü period (1938-1950) like?
   1.1. How did the Decisions on Art Education in National Education Councils (1938-1949) affect art education?
   1.2. How was art education in the curricula (1938-1950)?
   1.3. How was art education in primary school programs?
   1.4. How was art education in secondary school programs?
   1.5. How was art education in the curriculum of Village Institutes?

Data Analysis

In this research, the data were analyzed using content analysis. Content analysis is a technique that aims to systematically present unbiased results from the relevant document/text (Cohen, Manion,

& Morrison, 2007). In this study, the reports prepared by the Ministry of National Education were examined from an impartial point of view, and the findings obtained were systematically revealed.

Results

1. Art Education of the İnönü Period (1938-1950)

İsmet İnönü, as a statesman and soldier, was always interested in the cultural and artisan world at every stage of his life. In addition to being interested in music and literature, he ensured stability in the field of art and culture by continuing the activities initiated during the reign of Atatürk. In this way, he contributed to the process of preservation and development of culture. İnönü was interested in art and artists and had a close relationship with authors. When answering a question about Türkiye's problems, he said, “Türkiye has several important issues. However, social and national economic development is our priority issue. Furthermore, scientific and cultural developments are also important. These areas are intertwined with interconnected results”. İnönü also got help from Public Houses (Halkevleri) for the development and dissemination of art and paid attention to their cultural functions. The cultural changes in this period also covered various works to make Western arts accepted by the public, and efforts were made to popularize branches of art such as ballet and opera. In addition, the characters of Hacivat, Karagöz, and Meddah, important national cultural elements, were also used to adopt a humanist cultural policy. However, not enough studies have been carried out on the publicity of national arts at the international level (Koç, 2012).

Another area of cultural development was formed by Village Institutes, to which İnönü attached importance (Ezer, 2020). Folk songs and folk dances were brought to the fore in the successful works performed at these institutes. However, in cultural studies, the Western basis and the ancient Greek-Latin influence made themselves felt. In addition, the performances of polyphonic folk songs were also accepted as a product of the humanist point of view (Koç, 2012).

One of the developments realized in the cultural field during the İnönü period was the establishment of the Ankara State Conservatory. The conservatory, established for the first time in 1936, was reconstructed with Law No. 3829 dated May 20, 1940 and was structured into two different branches: music and representation (performative arts). (TBMMKD, 1940; RG, May 24, 1940) While opera activities were continuing during this period, regular representations (performative arts) were tried to be realized with the commissioning of the Grand Theater building in Ankara in 1948. In the same way, as it is seen, the ballet school, which started its activities in Istanbul in 1948, was reorganized as a department of the Ankara State Conservatory (Koç, 2012; Çakar, 2015).

In addition to the Atatürk monuments, İnönü monuments also started to be built during this period. However, while the number of these monuments is limited, they aimed to express the change of power. The İnönü Monument at the Faculty of Agriculture in Ankara University and the Equestrian İnönü Monument in Istanbul Taksim Park reflect the character of the period. (Koç, 2012; İnce, 2024).

When İsmet İnönü became President, he continued the reformist and modernization actions despite the difficult conditions of the Second World War. During this period, developments were made in writing, publishing, education, training, science, and art. A movement called "Turkish humanism" also manifested itself in this period. İnönü's cultural studies have ensured that Türkiye is recognized at the international level. (Koç, 2012).

1.1. Decisions on Art Education in National Education Councils (1938-1949)

In the National Education Councils during the İnönü period (1938-1950), decisions were also made about art education. For instance, during the reign of Minister of National Education Hasan Ali Yücel, the main agenda of the first National Education Council, held between July 17 and July 29 1939, was based on three main items.

- Republican education and training plans and principles,
- Examination of the instructions of institutions at various educational levels,
- Examination of all curriculum programs.

In his opening speech of the First Education Council in 1939, Hasan Ali Yücel said, "The spirit of humanism towards the positive scientific approach of the national culture will be formed in the high schools of the future, and Latin and Greek are taught as foreign languages in many countries" (Birinci Maarif Şûrası, 1939, p.XI). Following this, in 1940 and 1941, Latin and Greek courses were included in the curriculum besides other foreign languages in Ankara Girls, Ankara Atatürk, and Galatasaray High Schools (Batır and Meşeci Giorgietti, 2008).

In the First National Education Council, the following decisions were made regarding art education:

- The activity of issuing the Instructions for the State Painting and Sculpture Exhibition started.
- Compiling printed texts and works was initiated.

- The proposal to take sports and art activities before noon and organize free and joint activities under the guidance of teachers at the end of lunch as optional in secondary schools and as compulsory in high schools was accepted.
- The decision, “a plan will be prepared according to the provincial needs of secondary education institutions", also affected the teacher training requirement. The idea of expanding the transformation of village teacher's schools into Village Institutes also emerged at this time (Birinci Maarif Şûrası, 1939, p. 3-20).

February 15-21, 1943, during the Prime Ministership of Şükrü Saracoğlu and Hasan Ali Yücel's Ministry of National Education, the Second National Education Council was composed of the following agenda items (BCA, Dec. 30-1-0-0 / 11- 63-6, 1943):

- Development of moral education in schools,
- Increasing the efficiency of mother tongue activities in all educational institutions,
- Examination of history teaching in Turkishness education regarding methods and tools (İkinci Maarif Şurası, 1943).

The subject of fine arts as Art Education was not mentioned in the National Education Council. However, "The proposal to introduce an Art History course to high schools” was important for visual art education. This proposal included "Art History" as an independent course in the high school program in 1952.

Between 02-10 December 1946, during the period of Reşat Şemsettin Sirer's Ministry of National Education, the Third National Education Council convened and took the following Decrees:

- Program and regulation of secondary schools and institutes of art for boys,
- Programs and regulations of secondary and high schools of commerce,
- Istanbul Technical School regulations,
- The program and regulation of girls' institutes,
- Regulation of the legislation on teachers and tutors of secondary and secondary technical education schools according to current needs,
- Taking the necessary measures to ensure cooperation between the family and the school.

The “concept of art” mentioned in the Boys' Art Secondary Schools and Industry Programs and Regulations, which were considered in the decisions of the Council, referred to the field of education

and vocational high schools related to craft in a professional state. The fine arts subject was not mentioned in the Third National Education Council (MEB & TTKB, t.y.)

During Dr. Tahsin Banguoğlu's Ministry of National Education period, the following are the agenda items of the Fourth National Education Council convened between August 23 and 31, 1949 (Dördüncü Milli Eğitim Şurası, 1949):

- Consideration of the primary school program, which was implemented from 1948-1949,
- Examination of the new secondary school program,
- Determination of high school subjects according to the four-year system,
- Organization of secondary schools, high schools, educational institutes, and higher teacher's schools according to needs,
- Review democratic issues related to education and training (MEB & TTKB, t.y.).

At the Fourth National Education Council, fine arts education was not brought up, and it was accepted that painting work and physical training should be considered separate branches in teacher-training institutes (MEB & TTKB, t.y.).

1.2. Art Education in Curricula (1938-1950)

During the Presidency of İsmet İnönü, the 1948 Primary School Program and the 1949 Secondary School Program were published by the Ministry of National Education. Before the announcements of these programs, the 1936 Primary School Program and the 1938 Secondary School Program were implemented (Dördüncü Millî Eğitim Şûrası, 1949). At the Fourth National Education Council, the “Work Principle" was added to the primary school program as the 18th item was decided. According to this principle, “elementary school students will personally learn their studies by making and living; teachers will evaluate students through various experiments and observations.” (Budak, 2010).

1949 writing practices were included in Work Knowledge and Turkish Language courses in secondary school programs (Budak, 2010). Painting and work courses were applied separately in teachers' schools, and their duration was longer than in other schools (Telli, 1990).

Vocational painting, technical drawing, decorative painting, history of painting and clothing, and drawing pictures (workshop) courses were seen in the program of schools conducting vocational and technical education. Between 1940 and 1948, vocational painting and decorative painting took part in education programs in the woodworking department of regional art schools (Telli, 1990).

1.3. Art Education in Primary School Programs

The 1936 Elementary School Program was transformed into the 1948 Program and started to be implemented. For the first time in the history of school programs, the 41st article of the CHP was removed from the aims of the primary school section. In this way, the making party (the CHP) policy determined the state education policy was eliminated (Kayalıoğlu et al. 2021).

In 1946-1947, the painting, work, and music seminar was put into effect at the Istanbul Teacher's School. The first-grade students of the teachers' schools were taken to this seminar by examination. The seminar aimed to place students in the painting and work department of the Gazi Institute of Education and to prepare trained teachers for primary schools (Telli, 1990).

Table 1.

Elementary School Program Weekly Lesson Distribution Schedule (1948)

Lessons	**1. Class**	**2. Class**	**3. Class**	**4. Class**	**5. Class**
Social Studies	5	6	7	-	-
Turkish Language	10	7	7	6	6
History	-	-	-	2	2
Geography	-	-	-	2	2
Civics	-	-	-	2	1
Nature Studies	-	-	-	3	3
Mathematics	4	4	4	4	5
Family Studies	-	-	-	2	2
Painting and Work	4	4	4	2	2
Writing	-	2	1	1	1
Music	1	1	1	1	1
Physical Training	2	2	2	1	1
Total	26	26	26	26	26

According to the 1948 elementary school weekly lesson distribution schedule in Table 1, there were 26 teaching hours for the students. Among these courses, painting, writing, and music classes were included within the scope of art education. During the 1. 2. and 3. grades, the duration of painting lessons in classrooms increased by 4 hours per week, and for the 4. and 5. grades painting lesson was 2 hours. Music lesson was taught 1 hour in all classes. The writing lesson was 2 hours for second-grade students. During the 3. 4. and 5. grades, it was 1 hour.

The program was prepared separately for the village and the city schools. There were 4 hours of painting lessons in the first term and 2 hours in the second term in the city elementary schools. In village elementary schools, this lesson was given as 1 hour in all classes (Kayalıoğlu et al. 2021).

The objectives of this course were shown in the Painting and Work Curriculum of 1948 as follows: "To instill in children the ideal of service to the homeland and the nation, to make students love work, to give them the awareness that they should serve and work for the welfare and happiness of their environment, to increase feelings of love and respect for the employee, to give students the habit of doing work by cooperating in the consciousness of planned programmed responsibility at a young age" (Kayalıoğlu et al. 2021).

This program was named the "1949 Program" since it was adopted and implemented in secondary schools in 1949. The defined objectives of the painting-work course were as follows:

- To be able to describe impressions, observations, feelings, designs, and images through painting,
- To be able to develop aesthetic feelings by seeing the beauty in works of art and being motivated to understand their values,
- To gain the ability to distinguish the value of works of art,
- To be able to gain the technique, skills, methods, and knowledge of painting,
- Besides ensuring that painting is an expression tool in learning different courses, make it an occupation in which students will evaluate their free time (Maarif Vekilliği Tebliğler Dergisi, 1947, s.88-89).

The painting-work course covers the following topics:

- Imaginary picture,
- Painting from nature (Maarif Vekilliği Tebliğler Dergisi, 1947, p. 483-484).

For the first time in the 1948-1949 Program, the assessment process was stated in a general and clear expression. It was stated that the socio-economic level, individual differences, and learning deficiencies of students should be taken into account in the assessment, and their self-assessment was also included in the program for the first time (Maarif Vekilliği Tebliğler Dergisi, 1947, p. 483-484).

1.4. Art Education in Secondary School Programs

The 1949 Middle School Program was organized comprehensively. The program detailed the teaching principles of secondary school and the education objectives. The objectives of national education were defined based on the behaviors acquired by the child, such as personal, social, human intercourse, and economic life, as four principles (Etike, 2001).

In the 1949 Secondary School Program, there was a decision that "students are made paintings or models of various substances of an event that they have read, seen or told themselves" (MEB, 1949, p. 20).

Another principle included in the program was that "school should arouse love and dependence on beautiful things in students". This principle wanted the child to feel excited and participate in activities, allowing positive and appropriate changes to their age experience. In these activities, teachers were asked to stop imposing their tastes on students, and students were asked to respect good work (MEB, 1949, p. 5-6; Etike, 2001, p.130).

Table 2.

The Schedule of Art Education in the Secondary School Program (1949) (Etike, 2001)

Lessons	**1. Class**	**2. Class**	**3. Class**
Painting-Work	1	1	1
Music	10	7	7
Long Working	-	-	-

Table 2 shows the weekly course distribution of art education according to the 1949 Secondary School program. Music and painting-work lessons were applied as 1 hour per week in each grade, while lone working hours for 1. 2. and 3. grades were planned as 3 hours each.

According to the 1949 Secondary School Program, the purpose of the music lesson is to gain the ability to sing, play, and write, along with the development of the sense of rhythm and taste, which was narrowed according to the previous program (Etike, 2001).

In the Directives title of the program, the following statements were included:

- Students should finish school having learned to play a musical instrument.
- Students are encouraged to learn music by living and practicing it.
- It aims to develop students' musical cooperation skills and their choral experiences.
- Music was broadcast at the school, and concerts were encouraged.
- It was important for students to do personal music study at appropriate hours.

According to the 1949 Secondary School Program, the purpose of the music lesson was to gain the ability to sing, play, and write, along with the development of the sense of rhythm and taste, which had been narrowed according to the previous program (Etike, 2001).

In addition, the subjects were determined according to the grades as follows:

- In 1. and 2. grades: Teaching and playing songs, anthems, and folk songs to students in classrooms,
- In 3. grade: Students' examination of folk songs in classrooms in terms of rhythm,
- In 4. grade: Examination of song forms in classrooms,
- In 5. grade: Arranging folk and other songs in the classrooms according to the children's voices and providing information about well-known composers.

1.5. Village Institutes Curriculum and Art Education

It is known that Village Institutes gained an important place in art education in Türkiye. Education in these Institutes was based on the principle of "Education through Art" as well as the principle of "Education in Work" (Kurtuluş, 2001).

Painting-work teachers were selected by the "Establishment of the Painting-work Department of the Institute of Fine Arts". The fact that the institutes provide boarding education and teachers stay at schools gave rise to the possibility of caring for students even in their free time (Telli, 1990).

Village Institutes also conducted folklore studies. Importance was given to folk music, dance, theater, and classical music. The students also learned to play instruments by taking part in multi-voice choirs. In addition, the artworks produced in classes in sculpture and painting were exhibited at the Institutes (Zeytinoğlu, 2014).

Ismail Hakkı Tonguç arranged the Art Education Program of the Village Institutes in such a way as to meet the requirements of daily life. A system based on work and production formed the backbone of education (Tunç, 2009).

Art history and civilization courses were given in the construction, fine arts, and crafts departments of Village Institutes. In the field of construction, decorative and technical drawing courses were taught. Classes such as embroidery, weaving, form-sewing, and knitting were given as handicrafts (Elpe, 2014).

Graduated students from Village Institutes trained their students as a teacher who accepted the principles of flexibility and freedom with the aesthetic skills and art education they had received (Elpe, 2014).

In the Village Institutes Program of 1943, music, painting, work, handwriting, physical training, and national game classes were given in the weekly curriculum as follows:

Table 3.

1943 Village Institutes Program

Lessons	**1. Class**	**2. Class**	**3. Class**	**4. Class**	**5. Class**
History	2	2	1	1	1
Geography	2	2	1	1	-
Civics	-	1	1	-	-
Mathematics	4	2	2	3	2
Physic	-	2	2	1	1
Chemistry	-	-	2	2	-
Nature and School Health Studies	2	2	2	1	1
Foreign Language	2	2	2	2	1
Handwriting	2	-	-	-	-
Painting-Work	1	1	1	1	1
Physical Training and National Games	1	1	1	1	-
Music	2	2	2	2	2
Military Service	-	2	2	2	2
Home Administration and Child Care	-	-	-	-	1
Teaching Studies	-	-	-	2	6
Agricultural Business Economics	-	-	-	-	1
The Sum of the Other Courses	18	19	19	19	19
Turkish Language	4	3	3	3	3
The Sum of All Courses	22	22	22	22	22

In Table 3, it is seen that according to the program of Village Institutes in 1943, the institutes had 5 grades. In each grade, 22 hours of lessons were taught per week. The program included music, painting, work, handwriting, physical training, and national games courses within the scope of art education. The painting-work lesson was 1 hour per week in all classes. The music lesson was 2 hours. The Handwriting was 2 hours for first-grade students. Physical training and national games lesson was 1 hour for 1.2. 3. and 4 grades, except 5. grade.

In 1947, the painting, business, music, handwriting, and physical training and national games lessons in 5- Grade Village Institutes Program within the scope of art education are shown as follows:

Table 4.

Village Institutes Program (1947)

Lessons	**1. Class**	**2. Class**	**3. Class**	**4. Class**	**5. Class**
General Psychology	-	-	-	2	-
Child and Youth Psychology	-	-	-	-	1
Pedagogy	-	-	-	1	1
General Teaching Model	-	-	-	2	-
Special Teaching Method and Practice	-	-	-	-	6
Social Science	-	-	-	-	2
History Education and Organizations	-	-	-	-	1
History	2	2	1	1	1
Geography	2	2	1	1	1
Civics	-	1	1	-	-
Mathematics	5	3	3	3	-
Physic	-	2	2	2	-
Chemistry	-	2	2	1	-
Nature Studies	2	2	2	2	-
School Health Studies	-	-	-	-	1
Handwriting	1	1	1	-	-
Picture	1	1	1	1	1
Work	-	1	1	1	-
Physical Training and National Games	1	1	1	1	1
Music	2	2	1	2	1
Military Service	-	-	1	1	1
Home Administration and Child Care	-	-	1	1	1
Cooperativism and Cooperative Account	16	20	19	22	20
Total of General Studies Courses	16	20	19	22	20
Agricultural Courses and Practices	12	10	11	9	10
Art Classes and Workshops	12	10	11	9	10
Turkish Language	4	4	4	4	4
The Sum of All Courses	44	44	44	44	44

Table 1.6 shows the curriculum of Village Institutes with 5 grades in 1947. The weekly lesson intensity was increased to 44 hours. The courses were divided into three: ability and skill courses, general courses, agriculture courses, and practices. The Handwriting lessons within art education in 1., 2. and 3. grades were 1 hour per week. Again, the Painting lesson was applied as 1 hour in all grades. The Work lesson in 2., 3., and 4. grades was 1 hour. Physical training and national games were taught for 1 hour per week in all grades. Music lessons in 1., 2. and 4. grades were 2 hours, and for 3. and 5. grades, it was 1 hour.

As is seen in Table 1.6, handwriting, painting, and work courses can be given to group or classroom students at certain times of the week (MEB, 1943). It was also stated that physical training would be performed every morning, and various music, competitions, exhibitions, and sports activities would be carried out in the context of the Institute's Regional Races (Kurtuluş, 1999).

The purpose, methods, and techniques of the courses studied in the framework of art education in the 1947 Program were also determined under the heading of directives. The purpose of the Handwriting lesson was expanded according to the 1943 Program and stated as "to increase the aesthetic pleasure of children by using color depending on the related subject in decorative writings" (MEB, 1947).

The students at the Village Institutes, where Ismail Hakkı Tonguç made efforts to develop, were raised as children who could understand civilization rather than those who drew pictures. It is planned that the students' bed, the table where they eat, and the school garden would be aesthetic and harmonious. The students acquired their first painting experience and brush-holding habits while beautifying the environment in which they lived (Türkoğlu, 1997).

Painting and work studies in Village Institutes are not considered only depending on the school time. The availability of tools and the abundance of the painting workshop resulted in efficiency and free work that exceeded the program schedule. Students skilled in painting and handicraft went to the workshops whenever they wanted and carried out their studies. (Türkoğlu, 1997).

In the Curriculum Program of Village Institutes, the principles that had priorities in terms of teacher training for painting and work studies, which were processed as an hour per week but had no time limit in practice, are as follows:

- To give the student the ability to express his/her observations with sketches, pictures, and various materials,
- Teaching types of work and painting,
- By examining the national motives, teaching students to distinguish them from foreigners, and motivating them to use the national motives,
- Teaching elementary school painting methods to children (Türkoğlu, 1997).

Model studies, information about art history, printing techniques, and graphic studies were also added to the subjects of the painting course. In preparing the program, teachers were free to decide

by considering the differences in local conditions. Knitting, woodworking, and sculpture modeling were also added to the work course (MEB, 1947).

Various reliefs from the Academy of Fine Arts of the period were brought to the sculpture and collage course, conducted as a Fine Arts Branch at the Hasanoğlan Village Institute, and students were provided to make fiber and plaster copy studies. The works produced on this occasion, exhibited in various places in the school, gave the Institute visual beauty (Tunç, 2009).

When music education training started in the history of the Turkish education system with Village Institutes, it was desired to access universal and contemporary music based on folk songs. To achieve this goal, orchestras and choirs were established, where contemporary and folk songs and school anthems were played and sung. Folk dances were taught and played in aesthetic and technical forms in Village Institutes (Kurtuluş, 1999).

Important educational musicians were once unaware of music theory and instruments in their villages but received their education at Village Institutes and became professionals. For instance, Prof. Dr. Feridun Buyukaksoy, Prof. Dr. Ali Uçan, Prof. Dr. Ayfer Kocabaş, Prof. Dr. Nezihe Şentürk, Prof. Dr. Selahattin Yaldız, Prof. Dr. Necati Gedikli and Emin Dedeköy (Pekmezci, 2023).

The most popular anthems and folk songs that the institute students learned and performed in Village Institute were the Agricultural Anthem, National Anthem, Youth Anthem, Ankara Anthem, Dumlupınar Anthem, Tenth Year Anthem, Köroğlu, Barley and Wheat, Partridge, Violet, Edremit Efesi, Meşeli, My Ayşe, Her Broom is Made of Clover (Tunç, 2009).

Another branch of art education performed in Village Institutes was theater, taught as a lesson. The theater provided both socialization for students and education to the public. Initially, the lack of public interest in the school theaters made Ismail Hakkı Tonguç decide to open theater lessons in Village Institutes. Comedy plays in traditional improvised theater were used in entertainment and festivals organized by the institutes. These plays' styles were originally improvised, but later, they were developed and became socially educational for the public (Elpe, 2014).

Since the establishment of the Village Institutes, folk dances started to be performed as in other branches of art. At first, the dances aimed to take advantage of the opportunities at hand, and the dances of the different regions where the schools were located were tried to be performed. The dances that students learned from the public became more delightful by combining the local figures with the teachers' interpretations. These folk dances have also started to be exhibited in the festivals organized by the school (Elpe, 2014).

Starting school with folk dances every morning in Village Institutes became a tradition. The students who started the day with joy managed to overcome the difficulties of the school easily. Folk dances enabled students to have a healthy body by supporting their spiritual and physical development. Although the games in this context were considered a part of physical training lessons, they were also an important element of art education. Initially, the local folk dances in the Village Institutes developed over time and included different regions. Thus, the different local dances enriched and spread among the people. The institutes ensured that the public knew about the traditional dances through the competitions they held and took these dances to the cities through public houses (Elpe, Jul 2014).

Discussion and Conclusion

With the death of Atatürk, İsmet İnönü's becoming President marked the beginning of a new era in Türkiye. It is known that important decisions were made about the National Education Councils and the education system during this period. On the other hand, the courses given about art education were accepted as activities carried out to relieve the fatigue of the students.

In the history of Turkish education, during the İnönü period, the Village Institutes were established in 1940 and continued their education and training until 1946. They are considered to be schools with revolutionary values. Hasan Ali Yücel, the Minister of National Education, performed an important function in constructing these schools, aimed at developing villages by acting with the idea of humanism. In this direction, a large-scale primary education mobilization was carried out during the establishment process of Village Institutes.

Art education, which also served Village Institutes's mission to strengthen society's social and cultural structure, provided support for students to claim their roots and cultural values through art. Art activities also increased the cultural interaction of the village people and kept their interest in this area alive.

Art education has fulfilled the task of an important milestone for children's progress in science, technique, and art. On the one hand, the developments seen in science and technology, and on the other hand, the need to raise children as sharing and caring individuals have made the indisputability of art education obvious. Moreover, the insight of the industrial period has revealed the need to raise contemporary and modern citizens, and so it has made art education more necessary to provide aesthetic sensitivity for the public to adapt countries to modernity.

Although it is considered an important development for art to find value by taking part in education, it is known that tart education in the country also faces various difficulties from time to time. The most important reason art education remains in the background from preschool to primary and secondary education is that policymakers cannot adequately support fine arts. While disciplines such as Science and Mathematics are considered a priority, art education has been left in the background. As a result, it is deemed necessary for a qualified art education to ensure the development of a person and adapt them to contemporary life in terms of the emergence of the importance of this field.

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