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Editor's Note

Dear Readers of Bartın University Faculty of Education Journal,

We are glad to bring you our first 8 articles in the first issue of 2021 in an early view. This issue presents a very rich view in terms of subject variety and number of publications just as in our previous issues.

I would like to thank our authors who conducted research by putting a lot of effort and prepared them to report and present to the you, our readers, and thus contributed to the literature, and our referees who worked hard to make the articles better by carefully evaluating them, and lastly; I would like to thank my dear colleagues for their efforts to make the articles ready for publicatio.

This first issue of 2021 also points towards an innovation in another aspect. With this issue, we planned to use our new template in articles which will be published in our journal as of February, 2021. In addition, since 2020 February, our journal has only been accepting publications in English, and this practice will continue in the same way in 2021. Our esteemed board has decided to continue this practice in order to reach a wider audience. We are excited to announce these developments regarding the next process to the relevant authorities.

Hoping to contribute to our field….

Editor-in-chief

Assist. Prof. Dr. Burcu ŞENTÜRK

02 December 2020

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Contact
Faculty of Education, Bartın University, 74100 BARTIN – TURKEY
e-mail: buefad@bartin.edu.tr Tel: +90 378 223 54 59

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A Study of Eight-Grade Students' Science Learning Styles in Terms of Some Variables

Nazlıcan Durukan [a], Oktay Kızkapan [b*], & Oktay Bektaş [c]

a, Science Teacher, Ministry of National Education, (http://orcid.org/0000-0001-7865-458X)
b, Asst. Prof. Dr., Nevşehir Hacı Bektaş Veli University, (http://orcid.org/0000-0001-6781-9879) *okizkapan@nevsehir.edu.tr
c, Assoc. Prof. Dr., Erciyes University, (http://orcid.org/0000-0002-2562-2864)

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Abstract

The aim of this study is to examine the science learning styles of eighth grade students in terms of gender, having a study room, having internet access and future expectation variables. For this purpose, survey design was used. The sample of the study consisted of 584 eighth grade students in Kayseri. Grasha Reichmann Learning Styles Scale developed in 1996 and adapted to Turkish by Vural (2013) was used as a data collection tool. In the analysis of the data, descriptive statistical techniques and cross-table analysis were performed. It has been found that the students use collaborative and competitive learning styles at a high level and they use independent, dependent, avoidant, and participative learning styles at moderate level. In addition, while the dominant learning style of most of the students is dependent learning style. In terms of demographic variables, students' learning style preferences differ in terms of gender, having internet access, and future expectation, but it does not differ in terms of having an independent study room variable.

Keywords: Science learning styles, science education, elementary students.

Sekizinci Sınıf Öğrencilerinin Fen Öğrenme Stillerinin Bazı Değişkenler Açısından İncelenmesi

Öz

Bu çalışmanın amacı sekizinci sınıf öğrencilerinin fen öğrenme stillerini bazı değişkenler açısından incelemektir. Bu amaçla tarama deseni kullanılmıştır. Araştırmanın örneklemini Kayseri'deki 584 sekizinci sınıf öğrencisi oluşturmuştur. Veri toplama aracı olarak Grasha Reichmann Öğrenme Stilleri Ölçeği kullanılmıştır. Verilerin analizinde tanımlayıcı istatistiksel teknikler ve çapraz tablo analizi yapılmıştır. Öğrencilerin işbirlikçi ve rekabetçi öğrenme stillerini yüksek düzeyde kullandıkları ve bağımsız, bağımlı, çekingen ve katılımcı öğrenme stillerini orta düzeyde kullandıkları bulunmuştur. Buna ek olarak, öğrencilerin çoğunun baskın öğrenme stili bağımlı öğrenme stilidir. Demografik değişkenler açısından öğrencilerin öğrenme stili tercihleri cinsiyete, internet erişimine ve geleceğe yönelik beklentilere göre farklılık gösterirken, bağımsız bir çalışma odası değişkenine sahip olmaları açısından farklılık göstermemektedir.

Anahtar kelimeler: Fen öğrenme stilleri, fen eğitimi, ortaokul öğrencileri.

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1 | INTRODUCTION

Education plays many important roles for a country to develop and reach the level of contemporary civilizations. Today's education systems are expected to bring up individuals who know how to learn in the information age. If this expectation is not met adequately, the contribution of education to the development of the country may decrease. In other words, as expressed in the Alvin Toffler's famous phrase "The illiterate of the 21st century will not be those who cannot read or write, but those who cannot learn, unlearn and relearn" (as cited in Bennett, 2015:389), if people are not learned how to learn, the contribution of education to development will reduce significantly (Balay, 2004; Toffler, Toffler, & Gibson, 2011). The first question that comes to mind in terms of how learners will learn is whether people have different learning styles. Since each person is unique, people's learning styles may also differ from each other (Pashler, McDaniel, Rohrer & Bjork, 2008). At this point, it is important to understand the learning styles of individuals (Boydak, 2015).

Knowing how to learn is also necessary for students to eliminate the obstacles they may face in their lives (Pashler et al., 2008; Toffler et al., 2011). At this point, it is very important what kind of learning philosophy students will be adopted at schools. Considering the Turkish education system, constructivist philosophy is taken as a base for active learning (Çelik, 2006). In this learning approach, considering the individual differences, knowledge is expected to be created actively by students. At the same time, teachers are expected to know their students' learning styles and plan their teaching processes accordingly (Pritchard, 2013). In parallel to this, number of researches conducted on learning styles has increased in Turkey after adopting constructivist learning approach in 2004. The reason of this increase is that constructivism puts forward an understanding that takes into account the learner characteristics. Learning style is one of these characteristics (Cevher & Yıldırım, 2020). Therefore, this study is important as it will provide information to teachers who want to apply the constructivist philosophy in their lessons effectively. According to the constructivist philosophy, students must functionalize their brains to be active in learning processes because the right and left lobes of the brain affect learning and learning styles. The right and left lobes of the brain are interconnected, and these lobes instantly know what each other is doing. These lobes generally have different tasks such as speaking, understanding, counting, reasoning, imagining, finding complex connections, and perceiving patterns. Thus, an education system should not prioritize a teaching process in such a way as to activate only one lobe. When this happens, students' differences are ignored. Also, studies show that teaching based on learning styles increases the academic success of students more than teaching without considering learning styles (Dikmen & Tuncer, 2020). For this reason, lessons should be planned according to students' learning styles to support brain development and increase achievement (Çift & Canan, 2017; Santrock, 2018). Therefore, this study is expected to shed light on the teachers who want to carry out their teaching effectively.

It is believed that learning styles of individuals will provide them with lifelong contributions that will not only be limited to school. Individuals who are aware of their learning styles can construct knowledge and make effective plans for their goals (Carroll, 2001). However, at the point we have reached today, students cannot recognize themselves. They go to schools that are not suitable for them and become unhappy individuals who do the jobs they do not like. If this cycle can be prevented, efficient, productive, and happy individuals can be brought up (Güven & Kürüm, 2006; Toffler, Toffler, & Gibson, 2011). In this respect, this study is expected to guide parents, teachers, and researchers who want to raise effective and happy individuals.

In the literature, some different models and approaches explain the learning styles of individuals (Bayırlı, Orkun & Bayırlı, 2019). Some of these are Dunn and Dunn (1978) model, Honey and Mumford (1986) model, Felder and Silverman (1988) model, Grasha and Reichmann (1982) model, Gregorc and Butler (1984) model, and Kolb's (1984) model. This study was carried out based on the Grasha-Reichmann model as it is more suitable for the target population of the research. Grasha and Riechmann

(1982) have identified six different learning styles. These styles were named as "independent", "dependent", "avoidant", "participative", "collaborative" and "competitive" (Grasha, 2002). Students with the independent learning style prefer to study alone and to learn on their own. They want to do their lesson projects and activities independently rather than with other students (Diaz & Cartnal, 1999). They are good at directing themselves and maybe inadequate in group works (Koçak, 2007). Students using dependent learning style rely on authorities and guidelines. Instead of creating their own ideas, they want to search for specific answers and directions. Their curiosity is at a very low level. They cannot overcome the uncertainty. They only do what they are asked to do. However, they can cope with anxious and stressful situations (Öztekin, 2012). Students using avoidant learning style rarely participate in the activities (Amira & Jelas, 2010). Feedback to avoidant individuals may remind them of their failures. Since they do not set high goals for themselves, they cannot be in a productive position. They avoid stress (Öztekin, 2012). Students with the participative learning style want to take an active part in the learning process. They like to share their ideas and talents with their friends. They prefer to be in the group and cooperate with their teachers (McColgin, 2000). They want to take the highest level in activities and group work in the classroom. They are willing to succeed, respect authority. They can put their own needs in the background for others (Mete, 2013). Students who have the collaborative learning style believe that they can learn by sharing their ideas and opinions with others. They are in communication with their teachers. They can take part in small group works (Baneshi, Karamdoust, & Hakimzadeh, 2013). These students learn with fun and are aware of their responsibilities. They have difficulty in individual studies (Yılmaz, 2014). Students with competitive learning styles strive to perform better than their friends. They like to lead the discussions (Malik, Shaheen, & Aurangzeb, 2019). These students' motivation level and desire for success are high. It is difficult for them to work and collaborate with a group. They may have problems with non-competitive students (Koçak, 2007).

Learning styles of students may be affected by a variety of variables directly or indirectly. One of these variables is gender. It is seen in the literature that researches are conducted to examine the change of learning styles by gender. In these studies, there are some results reporting that learning styles differ according to gender (Aktürk, 2014; Mete 2013; Öztekin, 2012), as well as results showing that learning styles are gender independent (Alaçayır, 2011; Bagav, 2015; Kaleci, 2012; Koçyiğit, 2011 ; Köroğlu, 2015; Özer, 2008). According to results of a literature review conducted by Cevher and Yıldırım (2020), among 54 studies on the relation between learning styles and gender, 21 of them reported a relation between gender and learning styles and 33 of them reported no relation. Therefore, considering that differences such as perception and interest arising from gender will also affect learning style, it can be said that new studies are needed to eliminate the ambiguity in this issue. Another variable that may have an impact on learning styles may be socio-economic levels. The learning styles of students who continue their education life in an environment with rich educational opportunities may also differ. In some studies on this aspect (Keleşoğlu; 2011; Toğrul, 2014), it is stated that students who have an independent study room, for example, have improved learning styles. There are also results that there is no significant relationship between learning styles and socio-economic level (Kural; 2009). Another variable that may have an impact on learning styles is to have internet access. As a matter of fact, Keleşoğlu (2011) concluded that there is a significant difference in the learning styles of students with internet access in their homes compared to those who do not. In addition, individuals' future expectations may also be a variable that affects their learning styles because they plan and organize their work according to the goals they set. Future expectation can be defined as the thoughts, attitudes and concerns about the future that individuals expect to realize in their future lives (Güngör, 2020). Adolescents' future expectations of can be examined under three dimensions. These dimensions can be listed as career expectations, expectations for family and expectations for emotional relationships (Greene, 1986; as cited in Yavuzer, Demir, Meşeci & Sertelin, 2005). The focus of this study is educational expectations of eight grades students which is a sub-dimension of career expectation. It is stated in the literature that

students who aim to continue higher education have expectations about the choice of profession. However, others who do not aim to continue higher education are more concerned about finding a job and making money. Thus, whether students continue their higher education or not is very effective in shaping their perspective on life (Kandiko & Mawer, 2013; as cited in Güngör, 2020). Therefore, we think that future expectation in education can affect students' learning styles. However, no study investigating how the learning styles of students change according to the future expectation in education was found in the literature review. In addition, a study examining the learning styles of students in science classes has not been found with a measurement tools developed or adapted specifically for the science course. Therefore, it can be said that the study will contribute to the literature, as it will provide experimental evidence both for the different results in the literature and the learning styles used in the science course.

This study was carried out for the stated reasons. It was aimed to determine the science learning styles of 8th-grade students according to certain demographic variables (gender, having their own study room, having internet access, future expectation). For this purpose, answers to the following questions were sought.

1. At what level are science learning styles used by eighth grade students?
2. What are the dominant science learning styles of the eighth grade students?
3. Do the eighth-grade students' science learning styles differ by gender?
4. Do the eighth-grade students' science learning styles differ by having a study room?
5. Do the eighth-grade students' science learning styles differ by having internet access?
6. Do the eighth-grade students' science learning styles differ from their future expectation in education?

2 | METHOD

RESEARCH DESIGN

In this study, survey design, which is one of the quantitative research method designs, was used. In survey research, researchers are interested in distribution of a certain thought or a feature (Fraenkel & Wallen, 2006). Survey design is used in the research since the aim is to examine the eighth-grade students' science learning styles.

POPULATION AND SAMPLE

The accessible population of the research is the eighth-grade students studying in Melikgazi district of Kayseri. The sample of the study consisted of 584 eighth grade students who were determined by taking into account the 10% of the population and the number of items in the scale. The sampling unit in the research is the schools in the Melikgazi district, and the observation unit is the students studying in these schools. Therefore, cluster sampling was used in the research (Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2011). The reason for the study to be carried out with the eighth grade students is that they are in the transition phase from primary to secondary education. In this way, it is aimed to provide information about the science learning styles of students who are in the transition from primary to secondary education.

DATA COLLECTION TOOLS

Grasha-Reichmann Learning Style Scale was used. This scale was developed by Anthony F. Grasha and Sherly W. Reichmann (Grasha, 1996). The scale was preferred because this scale was used in studies conducted with similar age groups with the current research (Koçak, 2007). The adaptation studies of the Grasha-Reichmann Learning Style Scale to Turkish were carried out by different researchers (Cengizhan,

2006; Koçak, 2007; Sarıtaş and Süral, 2010, Vural, 2013; Zereyak, 2005). In this study, the form of the scale adapted to Turkish by Vural (2013) was used. The Grasha-Reichmann Learning Style Scale is prepared on six different learning styles and consists of six dimensions as independent, avoidant, collaborative, dependent, competitive, and participative. The original scale consists of a five-point Likert-type 60 item with ten items measuring each dimension (Sarıtaş & Süral, 2010). In an adaptation study conducted by Vural (2013), the six-dimensional structure of the scale was preserved, but some items were removed from the scale. Vural (2013) revealed a structure consisting of six dimensions and 32 items. Confirmatory factor analysis (CFA) was performed to verify the structure revealed by Vural (2013) before using it in the current study. As a result of the CFA, three items were removed from the scale and the scale structure consisting of 29 items was confirmed. The fit indexes of the scale (x2 / sd = 1.64; GFI = .912; AGFI = .893; CFI = .896; RMSEA = .039) are at an acceptable level (Seçer, 2018).

After the scale structure was confirmed, interviews were conducted with two experts who had scale development studies in science education in order to increase the content validity of the scale. In these interviews, it was decided to adapt the items in the scale to the science course. Thus, the word "in lessons" in each item has been changed to "in science lessons". After the adaptation, the scale was presented to the opinions of an expert in science education, two science teachers and one school counselor. As a result of the expert evaluation, it was decided that the scale is suitable for eighth grade students and can be used to determine the science learning styles. Thus, the face validity of the scale was also provided.

Within the scope of the criterion validity, the original version of the scale was applied to 186 individuals corresponding approximately to one third of the sample. Based on the data obtained, the correlation between the two scales was examined. As a result of Pearson correlation analysis, it was observed that there was a positive and significant correlation between the scale used in the research and the original scale ($r = 0.789$ and $p < 0.05$). Therefore, the criterion validity of the scale was provided.

After the validity studies, reliability was checked. In this context, the Cronbach Alpha coefficient was calculated as 0.780. Cronbach's alpha value varies from 0 to 1, and as this value approaches 1, the reliability of the scale increases (Fraenkel & Wallen, 2006). Accordingly, considering the value obtained in the study, it can be said that the scale is reliable. The scale dimensions in the final form and the items in each dimension are given in Table 1. Although there are 29 items in the scale, the original scale numbers were preserved in the item numbering for the researchers who wanted to compare the scale with the original form.

Table 1. Information about the data collection tool

Dimensions	Items
Independent	7, 25, 37
Avoidant	2, 20, 26, 32, 38, 50
Cooperative	3, 27, 39, 57
Dependent	4, 34, 46, 52, 58
Competitive	5, 11, 17, 29, 35, 47, 53
Participative	6, 42, 48, 54

DATA COLLECTION

In the research, firstly, the literature was reviewed and the purpose of the study was determined by a consensus of all three researchers. The measurement tool to be used in line with the purpose was determined as a result of the opinions of the first and third researchers. In the research, it was decided to use the Grasha-Reichmann learning styles scale. After choosing the scale, it was decided to adapt the scale to the science course. For content validity, researchers consulted science education expert, two science teachers, and one school counselor.

The accessible population of the study has been determined as 4th educational region of Melikgazi District in Kayseri. While determining the sample from the accessible population, the first researcher conducted interviews with school administrators in all schools in the 4th education region of Melikgazi district. School administrators and science teachers did not let the researchers to collect data during some courses (e.g. science, mathematics.). Therefore, the data were collected by the first researcher during visual arts, technology design, and physical education courses. Therefore, data collection continued for four weeks.

During the collection of the data, the participants were told that the scale did not measure their achievement, had no effect on their school scores. Also, they are asked to be sincere, reflect their ideas truly, and answer all the items in the scale.

The collected data was transferred to the SPSS analysis program. In the context of research questions, the data were analyzed by the second and third researchers and the findings were reported. Then, the findings were compared with the results of the studies in the related literature and discussed in terms of similarities and differences.

DATA ANALYSIS

Frequency, mean, and percentage values were calculated to analyze the data to answer the first and second sub-problems of the study. In order to answer other sub-problems, despite the normal distribution of data, the data were analyzed using chi-square and cross tables. By analyzing cross tables, it was investigated whether science learning styles differ by gender, internet access, having an independent study room and educational future expectation variables.

ASSUMPTIONS AND LIMITATIONS

The study was conducted based on the assumption that the students answered the items in the scales sincerely and truly. In addition, the data of the research is limited to the data collected by using Grasha-Reichmann Learning Styles Scale from 584 people studying in the eighth grade in Melikgazi district of Kayseri.

RESEARCH ETHICS

Ethical principles and rules were followed during the planning, data collection, analysis, and reporting of the research. Ethical compliance approval was obtained for this research in accordance with the decision of Nevşehir Hacı Bektaş Veli University Ethics Committee dated 08.06.2020 and numbered 12.

3 | FINDINGS

In the study, firstly, it was aimed to determine which science learning styles the eighth-grade students used. For this purpose, the average of the participants' points from the items in each dimension was calculated. These averages were then compared with reference values.

Table 2. Students' Levels of Science Learning Styles

Learning Styles	Degree of Learning Styles			Value Obtained	Evaluation
	Low	Moderate	High		
Independent	(1.0 - 2.7)	(2.8 - 3.8)	(3.9 - 5.0)	3.47	Moderate
Avoidant	(1.0 - 1.8)	(1.9 - 3.1)	(3.2 - 5.0)	2.56	Moderate
Cooperative	(1.0 - 2.7)	(2.8 - 3.4)	(3.5 - 5.0)	3.64	High
Dependent	(1.0 - 2.9)	(3.0 - 4.0)	(4.1 - 5.0)	3.98	Moderate
Competitive	(1.0 - 1.7)	(1.8 - 2.8)	(2.9 - 5.0)	3.58	High
Participative	(1.0 - 3.0)	(3.1 - 4.1)	(4.2 - 5.0)	3.87	Moderate

As shown in Table 2, the science learning style of the eighth-grade students with the highest average was "dependent" and the learning style with the lowest average was "avoidant". When the average values obtained in the research were compared with the critical values determined by Grasha-Reichmann, it was determined that the students used the cooperative and competitive learning styles at a high level and the other learning styles at the moderate level.

In the research, the learning style of each student was determined individually. While determining the learning styles, the style with the highest average of each student was determined as the students' dominant learning style. In cases where the averages are equal, the learning style with a smaller range is accepted as the dominant style. The dominant learning styles of students are shown in Table 3.

Table 3. Dominant Science Learning Styles of Students

Dimension	Frequency	Percent	Cumulative Percent
Dependent	179	30.7	30.7
Participative	177	30.3	61.0
Cooperative	76	13.0	74.0
Competitive	72	12.3	86.3
Independent	56	9.6	95.9
Avoidant	24	4.1	100
Total	584	100.0	

As seen in Table 3, students mostly have dependent (30.7%) and participative (30.3%) learning styles. These two learning styles are fallowed by collaborative (13%), competitive (12.3%), independent (9.6%), and avoidant (4.1%) science learning styles. In other words, the dominant learning style of most of the students is dependent. Chi-square analysis was conducted to examine whether the science learning styles of the eighth-grade students differ by gender. The results of the chi-square analysis are given in Table 4.

Table 4. Chi-Square Results Regarding Distribution of Science Learning Styles by Gender

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.433	5	.000
Likelihood Ratio	25.823	5	.000
Linear-by-Linear Association	3.949	1	.047
N of Valid Cases	584		

As seen in Table 4, the learning styles of the students differ significantly by gender (p = .000 <.05). Findings regarding the learning styles of boys and girls are given in Table 5.

Table 5. Distribution of Science Learning Styles by Gender

		Science Learning Style						
		Independent	Avoidant	Cooperative	Dependent	Competitive	Participative	Total
Girls	Count	18	8	34	114	31	89	294
	% within gender	6.1%	2.7%	11.6%	38.8%	10.5%	30.3%	100.0%
	% within style	32.1%	33.3%	44.7%	63.7%	43.1%	50.3%	50.3%
	% of Total	3.1%	1.4%	5.8%	19.5%	5.3%	15.2%	50.3%
Boys	Count	38	16	42	65	41	88	290
	% within gender	13.1%	5.5%	14.5%	22.4%	14.1%	30.3%	100.0%
	% within style	67.9%	66.7%	55.3%	36.3%	56.9%	49.7%	49.7%
	% of Total	6.5%	2.7%	7.2%	11.1%	7.0%	15.1%	49.7%

When Table 5 is examined, girls' most preferred learning style is dependent, and the least preferred is avoidant learning style. On the other hand, the boys' most preferred learning style is participative and the least preferred style is avoidant. Also, independent, avoidant, collaborative, and competitive learning styles are preferred by boys more than girls, and dependent learning style is preferred by girls more than boys. The participatory learning style is preferred equally by boys and girls.

After the gender variable, it was investigated whether the science learning styles of the eighth grade students differ by the variable of having in an independent study room. Chi-square analysis was conducted and the results are given in Table 6.

Table 6. Chi-Square Results Regarding Distribution of Science Learning Styles by Having an Independent Study Room

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.374a	5	.065
Likelihood Ratio	10.000	5	.075
Linear-by-Linear Association	.032	1	.857
N of Valid Cases	584		

As seen in Table 6, students' science learning styles do not differ by the variable of having an independent study room (p = .065> .05). In other words, eighth grade students with and without a private study room use similar learning styles in science lessons.

For the fifth sub-problem of the research, an answer was sought to determine whether the science learning styles of the eighth-grade students differ by the variable of having internet access. The findings obtained from the chi-square analysis to answer this question are presented in Table 7.

Table 7. Chi-Square Results Regarding Distribution of Science Learning Styles by Having Internet Access

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.512[a]	5	.019
Likelihood Ratio	14.651	5	.012
Linear-by-Linear Association	6.861	1	.009
N of Valid Cases	584		

As can be seen in Table 7, students' science learning styles differ by having internet access (p = .019 <.05). Findings of science learning styles of students with and without internet access are provided in Table 8.

Table 8. Chi-Square Results Regarding Distribution of Science Learning Styles by Having Internet Access

		Science Learning Style						
		Independent	Avoidant	Cooperative	Dependent	Competitive	Participative	Total
With internet access	Count	51	21	54	143	58	127	454
	% within internet	11.2%	4.6%	11.9%	31.5%	12.8%	28.0%	100.0%
	% within style	91.1%	87.5%	71.1%	79.9%	80.6%	71.8%	77.7%
	% of Total	8.7%	3.6%	9.2%	24.5%	9.9%	21.7%	77.7%
Without internet access	Count	5	3	22	36	14	50	130
	% within internet	3.8%	2.3%	16.9%	27.7%	10.8%	38.5%	100.0%
	% within style	8.9%	12.5%	28.9%	20.1%	19.4%	28.2%	22.3%
	% of Total	0.9%	0.5%	3.8%	6.2%	2.4%	8.6%	22.3%

As seen in Table 8, students' most preferred learning style with internet access is dependent (31.5%), and the least preferred one is avoidant (4.6%). While students who do not have internet access mostly prefer the participative science learning style, the least preferred style of these students is the avoidant learning style. In addition, students have internet access use each learning style more than students who don't. For example, 91.1% of students using an independent learning style are students with internet access, and 8.9% are students without internet access. Similarly, while 80.6% of students using the competitive learning style have internet access, 19.4% do not have internet access.

Lastly, it was investigated whether the science learning styles of the eighth grade students differ by their future expectations. The results of the chi-square analysis made within the scope of this review are given in Table 9.

Table 9. Chi-Square Results Regarding Distribution of Science Learning Styles by Future Expectation

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	28.799[a]	15	.017
Likelihood Ratio	23.022	15	.084
Linear-by-Linear Association	1.376	1	.241
N of Valid Cases	584		

a. 3 cells (12.5%) have expected count less than 5. The minimum expected count is 1.77.

As seen in Table 9, science learning styles of eighth grade students differ significantly according to their future expectations (p = .017 <.05). Findings regarding how students' science learning styles change according to their future expectations are given in Table 10.

Table 10. Distribution of Science Learning Styles by Students' Future Expectations

		Science Learning Styles						
		Independent	Avoidant	Cooperative	Dependent	Competitive	Participative	Total
Finish High School	Count	4	7	6	12	2	12	43
	% within expectation	9.3%	16.3%	14.0%	27.9%	4.7%	27.9%	100 %
	% within style	7.1%	29.2%	7.9%	6.7%	2.8%	6.8%	7.4%
Finish University	Count	31	11	36	96	42	93	309
	% within expectation	10.0%	3.6%	11.7%	31.1%	13.6%	30.1%	100 %
	% within style	55.4%	45.8%	47.4%	53.6%	58.3%	52.5%	52.9%
Starting Your Own Business	Count	13	2	15	21	11	25	87
	% within expectation	14.9%	2.3%	17.2%	24.1%	12.6%	28.7%	100 %
	% within style	23.2%	8.3%	19.7%	11.7%	15.3%	14.1%	14.9%
Working in the Public Sector	Count	8	4	19	50	17	47	145
	% within expectation	5.5%	2.8%	13.1%	34.5%	11.7%	32.4%	100 %
	% within style	14.3%	16.7%	25.0%	27.9%	23.6%	26.6%	24.8%

As seen in Table 10, students whose future expectations are to finish the university and work in the public sector mostly prefer dependent learning style. The most preferred learning style of the students aiming to start their own business is participative science learning style. The students who aim to graduate from high school mostly use dependent and participative learning styles. In addition, the students who aim to finish university use all learning styles more than other groups. For example, 55.4% of students using an independent learning style and 58.3% of students using competitive learning style aim to graduate from the university.

4 | Discussion and Conclusion

In this study, it was aimed to examine the science learning styles of eighth-grade students. In this context, it was found that the eighth-grade students use collaborative and competitive learning styles at a high level and other learning styles at a moderate level. In addition, it was found that students mostly use dependent and participative learning styles as the dominant learning style. The science learning style, which was the least preferred by students, was the avoidant learning style. When the literature on learning styles is examined, it was seen that there are studies conducted on different groups and

reaching similar results with our research (Aydemir, Koçoğlu & Karali, 2016; Elban, 2018; Öztürk, 2019; Kamışlı & Özonur, 2019; Şentürk & Yıldız İkikardeş, 2011, Tatar, Tuysuz, and Ilhan, 2008). On the other hand, there are some other studies reaching different results from our results in terms of level of learning style and dominant learning styles (Kaleci, 2012; Sidekli & Akdoğdu, 2018). In the literature, there are studies at which Grasha- Reichmann learning styles scale is used and conducted with students from different levels. It is an important result that collaborative and competitive learning styles come to the fore in these studies. There may be several reasons for this. The first may be reference values, which are taken into account in the evaluation of the findings. Therefore, while adopting the scale, reference values may also need to be adapted for different samples and cultures. The second reason may be the group activities conducted in science lessons (Kamışlı & Özonur, 2019). In group studies, students can learn by cooperating within the group while competing with other groups. Therefore, students may have developed both collaborative and competitive learning styles.

The reason for using a competitive learning style at a high level can be the large-scale tests in Turkey (Kamışlı & Özonur, 2019). Students go through a strict competition process to stay ahead of their competitors in preparation for these exams. Thus, this may be the reason why students use the competitive learning style at a high level.

The reasons why the largest number of students who prefer dependent and participative learning styles should be evaluated separately. Students with dependent learning style need guidance and support while learning (Grasha, 2002). Therefore, these students can get support from other students in the learning environments they cooperate and thus participate in the learning processes. Therefore, it is not surprising that students using dependent learning style also use the participative learning style. Supporting this inference, it is found in the study that dependent and participative learning styles are the most common dominant learning styles. Thus, it can be said that students with dependent learning style are not avoidant in the classroom, participate in learning processes, and can search for support from their teachers or friends.

Another finding of the study is that students' science learning styles were affected by gender. In this context, female students use the dependent learning style and male students use the participative learning style. In related literature, there are some results that students' learning styles do not differ by gender (Arslan & Babadoğan, 2005; Elban, 2918; Kaleci, 2012). There are also other studies reported that male students use avoidant (Süral, 2008; Sidekli & Akdoğdu, 2018), and collaborative learning styles (Yılmaz, 2014); while female students use dependent, participative (Sidekli & Akdoğdu, 2018; Süral, 2008), and competitive learning styles (Yılmaz, 2014). According to Kolb (1984), differences in individuals' experiences cause changes in their learning styles. These differences can be explained by the fact that female and male students come with different school experiences due to their developmental differences and their environment outside the school.

The study showed that the eighth-grade students' science learning styles did not differ by having an independent study room. There are similar results in the literature that having an independent study room does not affect the learning styles of students (Adatepe, 2014, Gül, 2011; Keleşoğlu, 2011). On the other hand, it is stated that students who have an independent study room will look for alternative ways of learning and the students who do not have a room will prefer social learning environments (Toğrul, 2014). Therefore, it can be expected that the students who have their own study room will use the independent learning style and the students who do not have the room will use the participative and dependent learning styles. However, this expectation was not emerged in the results of the study. According to the results of our study, having an independent room is not an effective variable that will cause a significant difference in students learning styles.

The distribution of science learning styles of students by having internet access was examined. According to the findings of the research, students with internet access prefer mostly dependent learning style of (31.5%), while students without internet access prefer mostly participative learning style. The least preferred learning style of both groups is the avoidant learning style. In addition, students with internet access use each learning style more than students who don't have internet access. Considering the role of the internet in the learning process, it is thought that students with internet access will have high access to information and develop independent learning skills (Kurbanoğlu & Akkoyunlu, 2001). Moreover, it can be said that students who use the internet to do their homework will gain expertise (Livingstone & Bober (2004), so independent learning styles will develop. On the contrary, according to findings of the current study, students with internet access use dependent learning style. Based on this finding, it can be said that students do not use the internet as a learning tool. Indeed, there are results in the literature that students use the internet for non-educational purposes such as playing games, listening to music, and chatting (Sarı & Kunt, 2014; Tarı, Taşdemir, Özcan & Tarı, 2018; Yan, 2005). Therefore, it can be said that students cannot use the internet efficiently. On the other hand, students who do not have internet access mostly use dependent learning style. In this case, it can be said that students see authorities and experts as a resource of knowledge (Grasha, 2002). The use of dependent learning style by these students can be explained in this context.

As the last finding of the research, it was seen that the learning styles of students differ by their future expectations. In this context, it has been found that students who aim to finish university and work in public institutions use dependent learning style while students who want to start their own business use the participative learning style. Students whose future goal is to finish high school use dependent and participative learning styles. In addition, students aiming to finish university use all learning styles more than others. When the literature is examined, there is no study examining the learning styles in the context of future expectation in education. In connection with this issue, it can be said that there is a relationship between students' future expectations and their attitudes towards school and the tasks required at school (Beal & Crockett, 2010). Considering that education is the dynamo of social mobility (Celkan, 2018), it can be said that students aiming to go to the upper classes in the society will work more in line with this goal (MacLeod & Byrne, 1996). Therefore, these students are more likely to use student-centered learning styles (independent, participative and, collaborative). This expectation is partly seen in the research findings. For example, students who aim to finish university and work in public institutions use the participative learning style more and students who aim to complete the university use all learning styles more than other students. Thus, it can be said that students' future expectation in education can be an effective variable for students' science learning styles.

Based on the results of the research, the suggestions for teachers, students and researchers are as follows;

1. It can be recommended that teachers should be aware of their students' learning styles and plan their lessons considering the students with different learning styles.
2. Being aware of the fact that girls and boys can have different learning styles, appropriate arrangements in classroom activities, classroom seating plans, and group work should be made.
3. According to the results of our research, students do not use the internet as an opportunity to learn independently. Therefore, it is recommended that especially information technology teachers and school counselors should conduct studies towards students and other teachers to develop their digital literacy.
4. As a result of the research, it was seen that the future expectations of the students were influential in science learning styles. Therefore, guidance activities should be included to enable students to realize that education has an important role in promoting society.

5. In this study, the science learning styles of the eighth-grade students were investigated in terms of some variables on students selected from Melikgazi district of Kayseri using the adapted version of Grasha-Reichmann Learning Style Scale to Turkish by Vural (2013). Similar studies can be done for different courses in terms of different samples and different variables, using different methods and scales.

5 | Statement of Publication Ethics

As authors of the research, we declare that the study has no unethical problem and we observed research and publication ethics. Ethical principles and rules were followed during the planning, data collection, analysis and reporting of the research. Ethical compliance approval was obtained for this research in accordance with the decision of Nevşehir Hacı Bektaş Veli University Ethics Committee dated 08.06.2020 and numbered 12.

6 | Researchers' Contribution Rate

The data of the research is collected by the first author. In planning, organizing, data analyzing and rest of the study the three authors involved in the research contributed equally.

7 | Conflict of Interest

There is no conflict of interest for this study.

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Meta-Analytic and Meta-Thematic Analysis of Digital Storytelling Method

Tarık Talan[a*]

a*. Asst. Prof. Dr., Gaziantep Islamic Science and Technology University, (http://orcid.org/0000-0002-5371-4520) * ttalan46@hotmail.com

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Abstract

The purpose of this study is to analyze the effect of the digital storytelling method on academic achievement and various variables by examining the method in terms of meta-analytic and meta-thematic aspects. Therefore, meta-analytic and meta-thematic dimensions were used together in the study. Within the context of the meta-analytic dimension of the research, the data obtained from 34 studies meeting the criteria of inclusion from various databases were analyzed using Comprehensive Meta-Analysis Software (CMA) to examine the effect of digital storytelling method on academic achievement. On the other hand, in the meta-thematic dimension performed to complete the obtained data, qualitative findings were obtained by quoting common codes and themes from the qualitative studies. In this context, the general characteristics of the digital storytelling method, their contributions to the cognitive dimension, and difficulties encountered during application were addressed. According to the results of the research, the digital storytelling method has been found to have a significant positive effect on academic achievement. The results of the meta-thematic assessments revealed that the digital storytelling method had an effect on making the students gain several 21st-century skills such as creative thinking, effective communication, and research skills, and it facilitated learning, provided permanence, and positively affected academic achievement. Time limitation, limited internet access, technological insufficiency, technical problems, lack of technical knowledge and skills, and lack of technical support are some of the problems faced during the implementation.

Keywords: Digital storytelling, effect size, meta-analysis, meta-thematic analysis

Dijital Öyküleme Yönteminin Meta-Analitik ve Meta-Tematik Analizi

Öz

Bu araştırmanın amacı dijital öyküleme yönteminin meta-analitik ve meta-tematik açıdan incelenerek akademik başarı ve farklı değişkenler üzerindeki etkisini incelemektir. Bu amaç doğrultusunda, çalışmada meta-analitik ve meta-tematik boyutlar birlikte kullanılmıştır. Araştırmanın meta-analiz boyutu kapsamında, dijital öyküleme yönteminin öğrenme başarısı üzerindeki etkisini incelemek amacıyla farklı veri tabanlarından dahil edilme kriterlerine uyan 34 çalışmanın verileri CMA programıyla analiz edilmiştir. Diğer yandan elde edilen verileri tamamlamak amaçlı yapılan meta-tematik boyutta ise nitel yönlü çalışmaların ortak kod ve temalarından alıntılar yapılarak nitel bulgulara ulaşılmıştır. Bu kapsamda dijital öyküleme yönteminin genel özellikleri, bilişsel boyuta katkıları ve uygulama esnasında karşılaşılan güçlüklere değinilmiştir. Araştırma sonuçlarına göre, dijital öyküleme yönteminin öğrenme başarısı üzerinde olumlu ve anlamlı bir etkisinin olduğu görülmüştür. Yapılan meta-tematik değerlendirmeler sonucunda dijital öyküleme yönteminin öğrencilerin yaratıcı düşünme, etkili iletişim ve araştırma becerileri gibi 21.yy becerilerin kazandırılmasında etkili olduğu, öğrenmeyi kolaylaştırdığı, kalıcılığı sağladığı ve akademik başarısını pozitif yönde etki ettiği anlaşılmıştır. Zaman darlığı, sınırlı internet erişimi, teknolojik açıdan yaşanan yetersizlikler, teknik sorunlar, teknik bilgi ve beceri eksikliği, teknik destek eksikliği uygulama esnasında yaşanan problemler arasında yer almaktadır.

Anahtar kelimeler: Dijital öyküleme, etki büyüklüğü, meta-analiz, meta-tematik analiz

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1 | INTRODUCTION

Developments in electronic and digital fields and changes in student profiles bring along the use of new methods and techniques in education. Today's methods and techniques used to differentiate, support, and enrich education provide the opportunity for effective, quality, and permanent learning as well as structuring the knowledge. Therefore, there is a transition from traditional teaching methods, where paper and pencil are used, to contemporary teaching methods, where computer and Internet technologies are utilized. One of these learning methods is the digital storytelling method which has replaced traditional storytelling. This method, which allows creating stories in the digital environment, involves skills of creating stories and using technology as well as using the stories for pedagogical purposes in the classroom environment (Meadows, 2003; Smeda, Dakich & Sharda, 2012).

In digital storytelling, which spreads far and wide today and adds a new dimension to traditional storytelling, mostly visual images containing multimedia applications are used instead of verbal images (Sayılgan, 2014). Digital storytelling can be defined as a short (2-3 minute) video-narrative created by gathering multimedia elements such as text, sound, graphics, animation, still and animated imagery to inform the audience about a certain subject (Robin, 2006). While Wang and Zhan (2010) define digital storytelling as a modern version of the art of traditional storytelling, Armstrong (2003) defines it as information transfer or sharing storytelling through media. Although there are different definitions of digital storytelling in the literature, the common point of these definitions is the enrichment of the art of storytelling with various multimedia elements such as images, sound, text, and video (Robin, 2006).

The digital storytelling process in teaching environments is composed of four main phases: "(1) pre-production, (2) production, (3) post-production, and (4) distribution". In the first phase, the story's main focus and topic are determined, and ideas are created about the elements of the story. In this phase, multimedia materials and contents are created for the story/scenario. In the next phase, scenarios and images are transferred into the digital media. Animated images are produced and dubbing of the story is performed in the virtual environment using the selected computer software. In the third phase, the fragments are put together to unify. Peer review and expert assessment techniques are used to get feedback and obtain different perspectives on digital storytelling created, and necessary adjustments are made accordingly. In the final phase, digital stories are shared and presented to get contributions and comments (Demirer, 2013; Kearney, 2011; Kocaman-Karoğlu, 2016). Besides, seven key elements should be taken into consideration for creating an effective digital story (Büyükcengiz, 2017; Robin, 2006). These elements are shown in Table 1.

Table 1. The Seven Elements of Digital Storytelling

Point of View	Identifying the main point of the story and the perspective of the author.
A Dramatic Question	A key question that keeps the viewer's attention until the end of the story.
Emotional content	Identifying an issue that connects the viewer to the story in an emotional manner.
Emotional Content	Impressive and fluent dubbing that makes the story easy to understand.
The Power of the Soundtrack	Using music or sound effects that support and embellish the main theme of the story.
Economy	Using just enough content to tell the story without overloading the viewer.
Pacing (Rhythm)	The progress of the story in a natural rhythm and tempo.

We could group digital stories into three different categories (Robin, 2006). The first one is personal narratives. In this type of storytelling, the narrator shares significant incidents in his/her life. Stories shared on social media could be examples of this type. The second category is historical documentaries that focus on historical events. These documentaries, which are told as documentaries, are stories investigating past

events that would help us better understand the history. The third one is instructive and informative narratives on a particular concept or practice. This type of storytelling is usually used in education.

According to the studies in the literature, it could be seen that digital stories are used in two different ways in education (Gils, 2005; Büyükcengiz, 2017). In the first one, the students share their own digital stories that they have created in the classroom environment under the teacher's guidance, while the teachers present digital stories, which they or others have created, to students in the second one. In the first case, the students are provided with training on how to create stories, and several examples are analyzed before they create their digital stories. These two categories could be further classified into two as the ones with the images created by the students, and the ones in which stock images are used (Balaman, 2017).

Digital storytelling has the characteristics of a source which supports educational practices by being integrated with the curricula at different levels from pre-school period to higher education. This method can be used as an effective tool in several disciplines and various courses such as teacher education, literacy instruction, literature, history, language skills (listening, speaking, reading, writing), health, and community practices (Dupain & Maguire, 2005; Sadik, 2008; Robin, 2006). Therefore, the inclusion of digital storytelling in curricula as a complementary and empowering tool may contribute to effective, meaningful, and permanent learning (Dakich, 2008).

The inclusion of digital storytelling in curricula has many contributions. The studies in the literature revealed that digital storytelling method improves student achievement and performance (Abiola, 2014; Francis, 2018; Hung et al., 2012; Ing, 2018; Kahraman, 2013; Liu et al., 2018; Yang & Wu, 2012), positively affects students' attitudes towards the course (Büyükcengiz, 2017; Çiçek, 2018; Demirer, 2013; Yang & Wu, 2012), has a positive effect on their interests and motivations (Aktaş & Yurt, 2017; Demirer, 2013; Doğan, 2007; Hung et al., 2012; Kahraman, 2013; Robin, 2006), and ensures the active participation of the students in the courses instead of being passive (Doğan, 2007; Howell & Howell, 2003; Gils, 2005; Raymond, 2008; Robin, 2006). Also, various studies state that it improves writing skills, critical thinking skills, problem-solving skills, and communication skills of the students (Baki, 2015; Doğan, 2007; Duman & Göçen, 2014; Foley, 2013; Gakhar, 2007; Hung et al., 2012; Robin, 2006; Yang & Wu, 2012). In the studies, it is also stated that this method is particularly effective in teaching boring, hard-to-understand, and complicated topics, concreting abstract concepts and facilitating the learning process and making it more comprehensible (Büyükcengiz, 2017; Kotluk & Kocakaya, 2017; Robin, 2008). Moreover, several studies have revealed that digital storytelling has been effective in acquiring 21st-century skills such as information literacy, visual literacy, technology literacy, creative thinking, effective communication, researching, and presentation (Jakes, 2006; Robin, 2006; Sadik, 2008; Yang & Wu, 2012). To conclude, the digital storytelling method, which is a student-centered approach, supports permanent learning by activating multiple senses such as hearing, seeing, and feeling (Turgut & Kışla, 2015).

Considering the studies in the literature generally, it is found out that both teachers and students face some problems while applying the digital storytelling method in classrooms. The most frequent problems that prevent the use of digital storytelling are lack of hardware and software, insufficiency of sources, insufficient technical support, and time limitation (Cuban, 2001; Dayan, 2017; Snoeyink & Ertmer, 2001). Besides, limited Internet access may prevent to access sources for the students, and it negatively reflects on the process of digital storytelling (Karakoyun, 2014). On the other hand, inadequate technology skills of teachers and students, their resistance to change, lack of interest, attitude, and motivation can be expressed as some other important problems encountered in the process of digital storytelling (Duhaney, 2001; Bauer & Kenton, 2005). Moreover, infringement of copyright and intellectual property rights by the students becomes prominent as a negative factor in the formation of digital storytelling (Bull & Kajder, 2004; Karakoyun, 2014). It can be stated that these problems should be eliminated to achieve the desired effect of digital storytelling studies.

The Purpose and Significance of the Study

Although there has been an increase in the number of studies on the effectiveness of the use of the digital storytelling method in the teaching environment in terms of different fields and sample groups in recent years, there is no comprehensive information that examines their results in a holistic approach. Therefore, it can be stated that there is a need for comprehensive and reliable high-level studies that can contribute to a holistic analysis of the results of these studies, to reach a general judgment, and to make the comments stronger. In light of this basic justification, the present study aims to reveal the general situation as a result of the two-dimensional (meta-analytic and meta-thematic) analysis of the digital storytelling method, which is rarely seen in the literature.

Meta-analysis studies on the effect of digital storytelling on students' academic achievement are limited in the literature. In this context, the meta-analysis dimension of the study was performed, and the results of previous studies on the subject were examined to reach a general judgment by presenting the existing knowledge. Unlike the studies that suggest that the digital storytelling is an effective approach to academic achievement in the literature (Abiola, 2014; Aktaş & Yurt, 2017; Büyükcengiz, 2017; Çiçek, 2018; Demirer, 2013; Francis, 2018; Göçen, 2014; Hung et al., 2012; Ing, 2018; Kahraman, 2013; Liu et al., 2018; Özerbaş & Öztürk, 2017; Yang & Wu, 2012); also several studies state that the method has no or low impact on academic achievement (Abdolmanafi-Rokni & Qarajeh, 2014; Nam, 2017; Özpinar, Gökçe & Yenmez, 2017). Therefore, added results of various studies on the effect of the digital storytelling method on academic achievement. It can be stated that conducting such a study is important to determine whether the digital storytelling method affects the academic achievement or not by aggregating independent empirical research, also, to determine its level to make more clear estimations and generalizations for the future, if it has. Furthermore, it can be stated that this study is important to aggregate the knowledge created by the existing studies, pioneer the future studies on the subject, and provide a reference.

On the other hand, a thematic dimension was added to the study to reveal the big picture to support and strengthen the meta-analysis dimension. It is thought that the extrapolated results will provide a comprehensive and general overview of digital storytelling method, also, the two-dimensional study will fill the academic gap and draw attention in related literature and encourage the researchers to conduct studies using multiple methods. It can also be stated that the present study, which has both qualitative and quantitative aspects, is different from other studies; thus, it has a unique characteristic. Since there are almost no multi-dimensional studies on the subject in literature, it is thought that the present study will be unique, shed light on future studies, and serve as a model. In the light of these basic justifications, this study aims to examine the effectiveness of digital storytelling method in terms of academic achievement using meta-analysis, and its impact on different dimensions using meta-thematic analysis. In line with this general purpose, the research seeks answers to the following questions:

1. What is the effect size of the digital storytelling method on academic achievement?
2. In terms of different education levels, what is the effect size of the digital storytelling method on academic achievement?
3. In terms of practice duration, what is the effect size of the digital storytelling method on academic achievement?
4. What is the effect size of the digital storytelling method on academic achievement in terms of course/subject areas?
5. How effective is the digital storytelling method in terms of thematic review based on document analysis?

2 | METHOD

In the present study, the effectiveness of the digital storytelling method on academic achievement, its cognitive contributions in the process of integration with education, general characteristics, and difficulties encountered during application were examined. In this respect, both quantitative and qualitative methods were used together to present a comprehensive perspective. In this part of the study, the type and design of the research, processes of collecting, coding, and analyzing the data are explained in detail.

In the quantitative dimension of the research, the meta-analysis method, which is a form of systematic synthesis methods, was used. The meta-analysis, which is a kind of synthesis of experimental studies, is a literature review method used to combine and reinterpret the results of individual studies on a specific subject (Cohen et al., 2002; Little et al., 2008). Although there are many literature review methods, what distinguishes the meta-analysis method from others is that it is a quantitative method based on statistical techniques and numerical data. The meta-analysis method was used in the present study because it aimed to examine the effect of digital storytelling on academic achievement and there was a need to make interpretations with a holistic approach and come to a conclusion by benefiting from available studies on the subject.

With the intent of making a more detailed search on the subject, expanding the scope of the study, and enriching the data set, the qualitative dimension (meta-thematic analysis) was added to complete and supplement the qualitative dimension (Batdı, 2017). In the meta-thematic analysis method, it is aimed to bring together the views of the respondents selected for qualitative studies related to the research subject (Batdı, 2017). From this point of view, a method which includes the process of revising the themes created from the opinions is in question. In the meta-thematic analysis process, the data obtained through document review were interpreted. Document review, which is one of the qualitative research methods, includes the analysis of written materials containing information about the case or cases aimed to be investigated (Yıldırım & Şimşek, 2013).

DATA COLLECTION

In this research, studies on digital storytelling method were searched in databases of Web of Science, ERIC (EBSCO), Wiley Online Library Full Collection, Science Direct, Taylor & Francis Online, Scopus (A&I), Springer LINK, Google Scholar, ProQuest Dissertation & Thesis Global, and Turkish Council of Higher Education Thesis Center. To reach the relevant studies, the following terms were searched as keywords in databases:

(i) terms related to the digital environment (i.e., digital, computer, mobile, tablets, technology, etc.);

(ii) terms related to storytelling (i.e., story, stories, storytelling, story telling, narrative, etc.);

(iii) terms related to academic achievement (i.e., achievement, success, gains, performance, learning outcomes, etc.).

In this research, studies in Turkish and English were chosen. As it was aimed to reach all studies on the impact of the digital storytelling method on academic achievement in the research, no time filter was used. The screening process was carried out between December 2019 and March 2020, and the complementary search was made in July 2020. In the search results, M.Sc. and Ph.D. theses and articles published in peer-reviewed journals were included in the analysis. Besides, attention was paid to include experimentally designed studies with control groups in meta-analysis so that the standard effect size would be calculated. In the studies that will be included in the meta-analysis, the independent variable is the digital storytelling method and the dependent variable is the studies on academic achievement. The studies that did not meet the inclusion criteria and those that did not have sufficient data to calculate the effect size were left out of the scope of the research. The PRISMA flow diagram (Moher, Liberati, Tetzlaff, Altman, & Prisma Group,

2010) showing the process of obtaining the studies included in meta-analysis during the literature review stage is given in Figure 1.

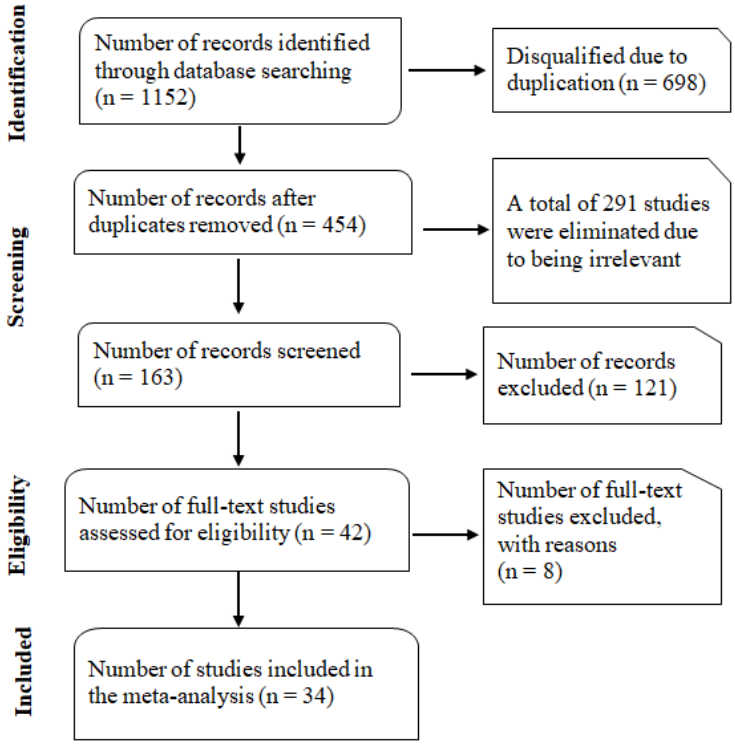

Figure 1. *Flow Chart for Selection of Studies*

Examining Figure 1, it is seen that a wide range of publications (n=1152) addressing the impact of the digital storytelling method on achievement was reached at the end of first searches on the databases. Relevant filters were applied to these publications, and the scope of the research was narrowed down. After the implementation of search criteria, 698 of these studies were excluded as they were duplicates, and 291 of them were excluded after reading their abstracts and understanding that their titles were irrelevant. In the end, 163 studies were included in the study. Upon examining these studies within the context of inclusion criteria, 121 of them were eliminated. When the remaining 42 studies were evaluated in terms of suitability and quality, eight studies that did not contain a sufficient amount of data (n=3) and were of poor quality (n=5) were also excluded. Thus it was decided to include only 34 studies in meta-analysis. However, it was seen that four of the studies (Dinçer, 2019; Liu, Tai & Liu, 2018; Nnakwe, 2019; Tahriri et al., 2015) the variable of academic achievement was used for multiple subject areas at the same time. The study included 39 items from 34 studies. Therefore, the findings of these studies were meta-analyzed separately in line with the structure of the meta-analysis studies and included in the research as different studies, and the number of studies was expressed accordingly. Moreover, it was found out that the data required to calculate the effect size were missing in one of the studies included in the study (Göçen, 2014). The data was included in the analysis by contacting the author of this study.

Coding Process

Each study, which was reached after the literature review, needs to be coded to convert their descriptive data to quantitative data, to compare the studies, and to determine if the studies meet the inclusion criteria of meta-analysis. In this context, the studies included in the research were coded. At this stage, a coding form was created in line with the purpose of the research. The generated coding form consists of two parts. In the first part, descriptive details of the studies (study number, author(s), publication

year, the course in which the study was implemented, education level, and application period) were used as data. Sample size (n), average ($\bar{X}$), and standard deviation (sd) data of experimental and control groups were included in the second part to calculate the effect size of the studies. To test the reliability of the study, coding processes were cross-checked by two independent raters, erroneous coding and classification were eliminated, and the analysis was continued until consensus was reached between the raters.

Data Analysis

Examination dimensions in the research form were coded in detail using Microsoft Office Excel and converted into a table, and related findings were calculated by filtering the descriptive analyses. In this study, CMA software was used to apply the meta-analysis technique. Although the classification of effect size calculated as a meta-analysis unit varies, the effect sizes were assessed according to Cohen (1988). According to Cohen (1988), the effect sizes between 0.2-0.5 are considered small, effect sizes between 0.5-0.8 are considered medium, and effect sizes equal to 0.8 and above are considered large. It is not possible to say that the studies conducted by different researchers to determine the effectiveness of the digital storytelling method on achievement have measured the same widespread impact. Therefore, it is inevitable for the studies included in the analysis to cause diversity among the results as they were conducted under different conditions. Therefore, Random Effects Model (REM) was used in this study to calculate the overall effect size. Moreover, the values revealed according to Fixed Effects Model are given in the findings. "Inter-Rater Reliability Level Formula" [consensus / (consensus + disagreement) x 100] (Miles & Huberman, 1994) was used to figure out the reliability of the research. According to the results of the calculations, the reliability of the research was found to be 100%, and this value indicates that the coding process was reliable.

In the qualitative dimension of the research which was based on a thematic examination, the reviewed qualitative studies on digital storytelling (n=8) were analyzed using QSR NVivo 8.0 software. The content analysis method was used to analyze the data. In fact, the content analysis aims to aggregate oral or written data which resemble each other and present an understandable study for the readers (Yıldırım & Şimşek, 2013). In this context, it was decided that content analysis is the most suitable method for this study to obtain similar/common results from studies conducted on the use of digital storytelling method in education. Similar/common themes and codes in previous studies conducted on the present subject were rearranged within a certain harmony and order and qualitative findings were obtained in this study. Then these findings were presented as models. Moreover, when the expressions in the studies on themes and codes were presented, they were cited in the text for support, justification, and most importantly, to ensure reliability. While these citations were presented, they were obtained from the relevant studies without making any changes in the expressions. The direct citations are indicated with the code of the related study and page number (e.g.: statement 471776-P.66; page 66 of study no. 471776).

Inter-rater agreement values (Cohen's Kappa) were used to ensure validity and reliability in the qualitative dimension of the study, (Viera & Garrett, 2005). In the present study, it was seen that the compliance value varied in the range of between 0.71 and 0.82. As these values were in the range of "good/very good compliance" according to Viera and Garrett (2005), they support the reliability of coding.

3 | Results

This section presents the data obtained as a result of meta-analytic and meta-thematic analyses of the examined studies. In this context, firstly, the results of the meta-analytic impact analysis of the studies on the impact of the digital storytelling method on academic achievement are presented. Then the meta-thematic findings related to the use of the digital storytelling method in education are provided.

Descriptive Statistics of the Studies

Descriptions examined in this research consist of educational level, application period, type of publication, publication year, subject area, and sample size. Descriptive data related to these variables are presented in Table 2.

Table 2. Descriptive Data of the Studies Included in Meta-Analysis

Variable	k	%	Variable	k	%
Duration of Application (Weeks)			Publication Year		
≤5	14	35.90	2012-2014	6	15.38
6-9	14	35.90	2015-2017	9	23.08
≥10	11	28.21	2018-2020	24	61.54
Education Level			Course/Subject		
Primary School	5	12.82	Science	12	30.77
Secondary School	22	56.41	Mathematics	4	10.26
High School	6	15.38	Social Sciences	4	10.26
University	5	12.82	Language Education	17	43.59
Other	1	2.56	Computer	2	5.13
Publication Type			Sample Size		
Article	18	46.15	Small Sample (n≤50)	17	43.59
M.Sc. Thesis	11	28.21	Medium Sample (51≤n≤100)	17	43.59
Ph.D. Thesis	10	25.64	Large Sample (n≥101)	5	12.82

Examining Table 2, it is seen that the majority of the 39 studies included in the meta-analysis were conducted in secondary schools (56.41%); and the least number of studies were conducted in university and primary schools. Eighteen of the studies (46.15%) included in the research were articles, 10 of them (25.64%) were Ph.D. theses, and 11 of them (28.21%) were M.Sc. theses. Six of the studies (15.38%) were conducted between the years of 2012-2014, and nine of them (23.08%) were conducted between 2015-2017. According to the sample sizes, it is seen that 17 studies (43.59%) were based on small samples, 17 (43.59%) were based on medium samples, and five (12.82%) were based on large samples. Finally, it was observed that most of the studies were conducted in the field of Language Education (43.59%), 12 studies (30.77%) were conducted in Science, and the least number of studies were conducted in the field of Computer.

Findings Regarding the Effect Sizes of the Studies on Academic Achievement

The average effect size values of the studies included in the analysis are presented in Table 3.

Table 3. The Homogeneous Distribution Value, Mean Effect Size, and Confidence Intervals of the Studies Included in the Meta-Analysis According to the Effect Models

Type of Model	k	Z	p	Q	df	ES	SE	% 95 CI	
								Lower	Upper
Fixed Effects	39	15.967	0.000	214.747	38	0.682	0.043	0.599	0.766
Random Effects	39	7.525	0.000	40.778	38	0.775	0.103	0.573	0.977

Note. k = number of effect sizes; df = degrees of freedom; ES = Effect Size; SE = standard error; CI = confidence of interval for the average value of ES.

As shown in Table 3, the results of the meta-analysis based on the Fixed Effects Model indicated that the upper limit of 95% confidence interval was 0.766, the lower limit was 0.599 and the average effect size was 0.682. At the end of the homogeneity test, the Q-statistical value was calculated to be 214.747. According to the Random Effects Model, it is seen that the value of the average effect size was calculated as 0.775, where the lower and upper bounds of the range were 0.573 and 0.977, respectively, with a standard error of 0.103 and a confidence interval of 95%. When the statistical significance of this effect size was calculated according to Z-Test, it was found to be 7.525 (p=0.000). When the findings of the research are interpreted according to Cohen (1988), it can be stated that the digital storytelling method has a medium effect on increasing academic achievement.

To ensure reliability in meta-analysis studies, dissemination bias status was examined. In this context, the Funnel Plot is given in Figure 2 for determining whether there is a bias or not in favor of the studies that have significant differences among the studies included in the research.

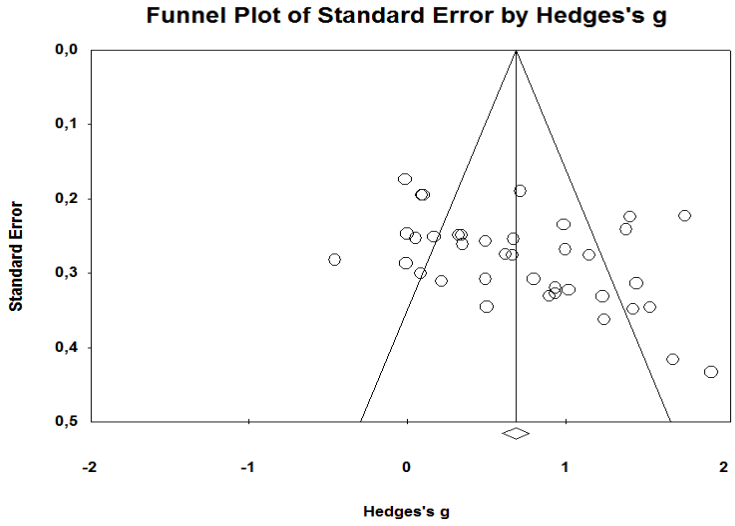

Figure 2. *Funnel Plot*

When Figure 2 is examined, it is understood that the studies do not show an asymmetric distribution around the overall effect size. In other words, distribution is not concentrated on one side. The fact that the distribution does not form an asymmetric accumulation at a single point means that the study sample is not biased in favor of the digital storytelling method, and this meta-analysis study is reliable. The Rosenthal FSN value was also calculated to support the finding obtained from the funnel plot. The findings are given in Table 4.

Table 4. Rosenthal's Fail-Safe Number Calculations

Z-value for observed studies	16.94270
p-value for observed studies	0.00000*
Alfa	0.05000
Tails	2
Z for alpha	1.95996
Number of observed studies	39
Fail-safe N	2876

Note. $^*p < .05$

Examining Table 4, it is seen that the safe N number is 2876. In other words, it can be stated that if the study with a negative or neutral difference as much as the number in this value is included in the analysis, the significant effect may decrease to zero. Comparing the number of studies included in the analysis with

the FSN value, it is understood that the FSN value is quite high and unreachable. This information shows that the meta-analysis results are reliable.

Effect Sizes of the Studies According to Moderators

According to the results of the study, it was observed that studies included in the present study had different education levels, course/subject areas, and application durations. Therefore, it was desired to investigate whether the effect size of the digital storytelling method on academic achievement varies by the education level, subject area, and duration of application. Moderator analysis results of studies included in the meta-analysis are presented in Table 5.

Table 5. The overall effect sizes of the studies according to moderator analyses.

	Variables	N	ES	% 95 CI		QB	Z	df	p
				Lower	Upper				
Education Level	Primary School	5	0.714	0.397	1.031	15.885	10.686	4	0.003
	Secondary School	22	0.662	0.376	0.949				
	High School	6	1.302	1.008	1.596				
	University	5	0.865	0.397	1.334				
	Other	1	0.323	-0.164	0.811				
	Sum	39	0.837	0.683	0.990				
Course/ Subject	Computer	2	0.697	-0.663	2.056	22.609	6.715	4	0.000
	Language Education	17	0.776	0.462	1.089				
	Science	12	0.944	0.536	1.352				
	Mathematics	4	0.142	-0.080	0.363				
	Social Sciences	4	0.977	0.560	1.395				
	Sum	39	0.523	0.371	0.676				
Duration of Application	≤5	14	0.470	0.185	0.755	5.937	7.482	2	0.051
	6-9	14	1.016	0.635	1.397				
	≥10	11	0.862	0.518	1.206				
	Sum	39	0.726	0.535	0.916				

According to Table 5, when the inter-group homogeneity test was analyzed by *education levels*, Q_B was found to be 15.885. Since the value of Q_B (15.885) was observed to be larger than the critical value of $\chi 2$ distribution with degrees of freedom of 4, it could be said that the distribution was heterogeneous ($\chi 2_{(0.95)}$= 9.488). Also, it could be said that the overall effect size of education levels (ES=0.837) was large in terms of Cohen's (1988) classification. According to these results, the effect of the digital storytelling method on academic success varies by education levels (p=0.003).

When the intergroup homogeneity test was analyzed by course/*subject areas*, Q_B was found to be 22.609. Therefore, since the statistical value of Q_B (22.609) was larger than the $\chi 2$ value ($\chi 2_{(0.95)}$=9.488), it could be said that the distribution between effect sizes was heterogeneous. It was then concluded that the overall effect size was found to be ES=0.523 and that this value regarded as medium according to Cohen (1988). On the other hand, it can be also said that the effect of the digital storytelling method on academic achievement differs across course/subject areas (p=0.000).

When the *duration of the application* of studies was analyzed, Q_B value was found to be 5.937. Therefore, the statistical value of Q_B was found to be smaller than the $\chi 2$ value ($\chi 2_{(0.95)}$=5.991). In this case, it could be stated that the distribution of effect sizes was homogeneous and the effect of the digital

storytelling method on academic achievement did not differ by the duration of application (p=0.051). Hence, the level of academic achievement was found to be independent of the duration of the application in classes in which the digital storytelling method was used. On the other hand, the overall effect size value was found to be ES=0.726, and this value was regarded as medium according to Cohen (1988).

FINDINGS REGARDING THE EFFECTIVENESS OF DIGITAL STORYTELLING METHOD WITHIN THE SCOPE OF THEMATIC ANALYSIS

In this section of the study, themes, and codes obtained from the meta-thematic analysis are presented to support the meta-analytic findings and provide enriched data for the study. Direct citations were included in the text to support the thematic data presented in different shapes and models. The thematic data obtained via comprehensive analyses were grouped and visualized under different themes in three models. The models addressing the contribution of the digital storytelling method to the cognitive dimension (Figure 3), its general characteristics (Figure 4), and the difficulties encountered during the application (Figure 5) are presented below.

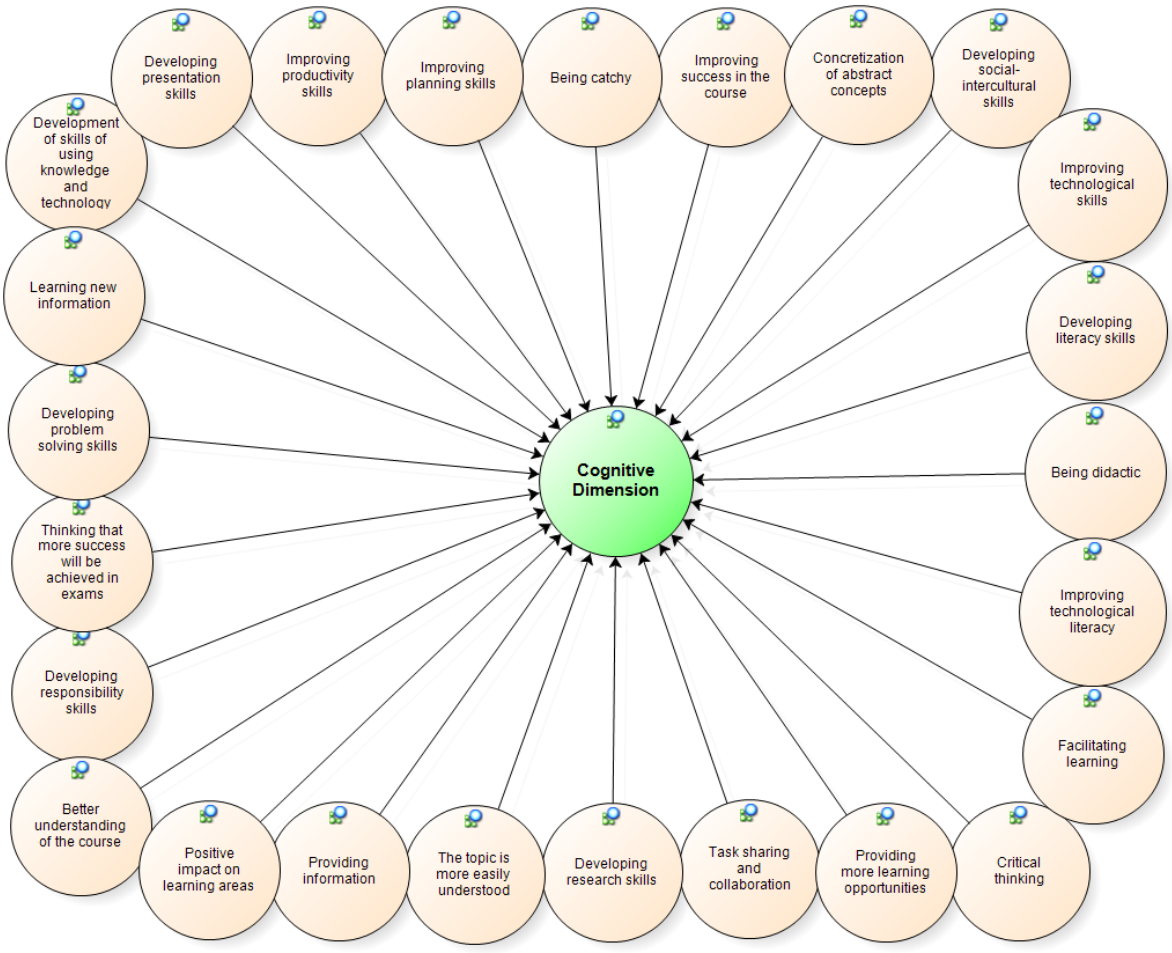

Figure 3. *Contribution of Digital Storytelling Method to Cognitive Dimension*

In Figure 3, some of the codes mentioned in the context of the contributions of the digital storytelling method to cognitive dimension are specified as "improving productivity, planning, problem-solving, and critical thinking skills; being catchy; concreting abstract concepts and being instructional". Within the context of this theme, the cited topic from the study coded 328704-S.237 "*allows us to repeat the topic. The repetition of the topic enables us to understand better. We also benefit visually. What we learn becomes more permanent…*" and the statement in the study coded 361705-S.125 "*I liked it very much because learning*

new things in the digital environment has improved me a lot. Most of it was an informative video. I believe I've learned new things from most of them. Even a friend of mine had done something on time travel. I have found it very interesting. I watched them and learned new things" statements were used as reference sentences and used in the formation of codes.

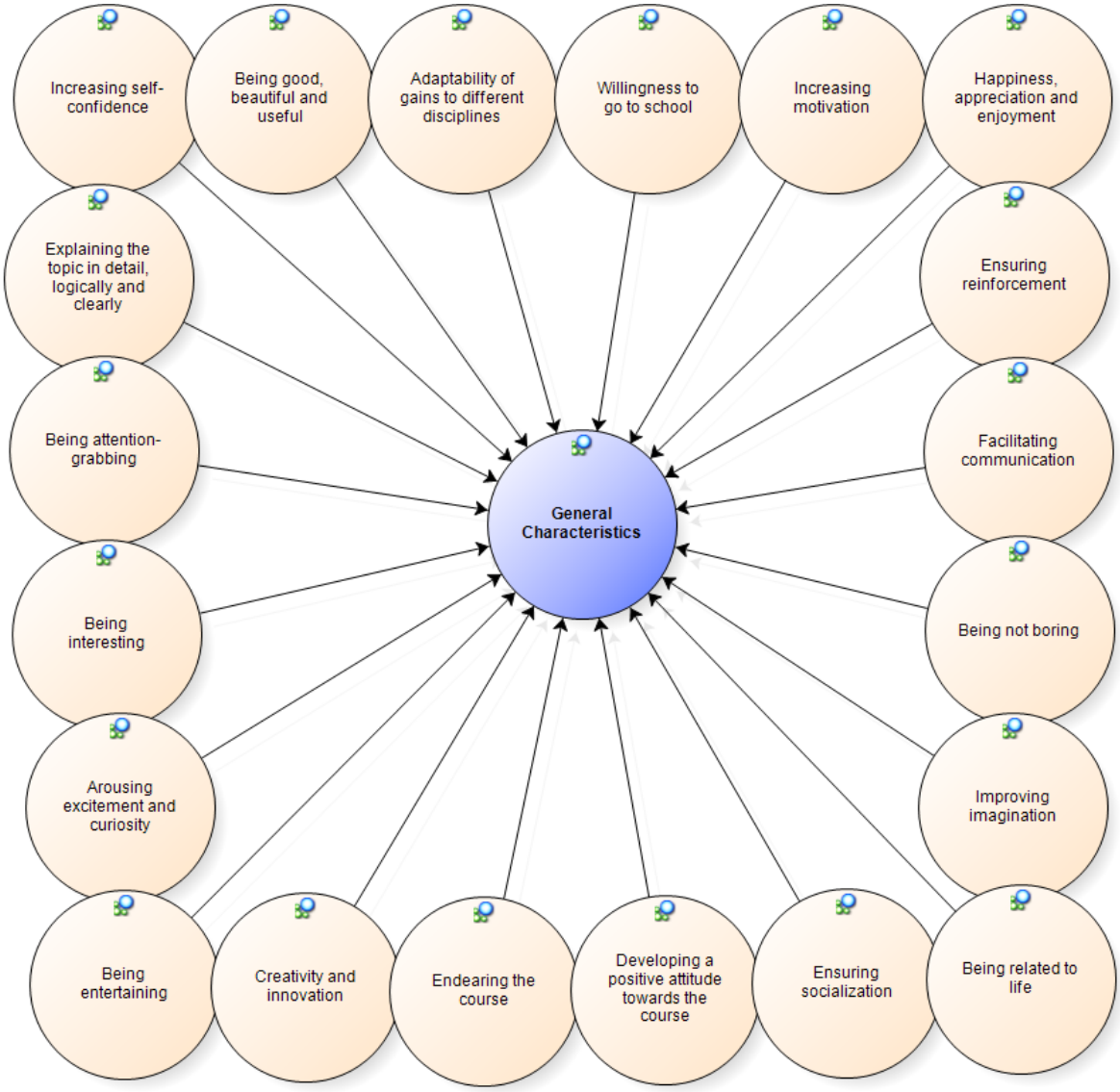

Figure 4. *General Characteristics of Digital Storytelling Method*

When Figure 4 is examined, it is understood that the codes about the general characteristics of the digital storytelling method were created. Some of the codes related to this model can be expressed as "being interesting and entertaining; improving communication, participation, self-confidence, and motivation; being associated with life; ensuring socialization and reinforcement". Some expressions used as a reference to create the related codes were cited from the study coded 471776-S.66 are "*Our normal science classes were boring. Courses were very hard. They were not entertaining. I was having difficulty understanding the course. But now we shoot movies about the course in groups and our lessons have become more entertaining with digital storytelling*", or the expression cited from the study coded 352043-S.93 can be stated as: "*Using digital storytelling enables us to understand the course and associate it with life.*" The

sentences found in the study coded 328704-S.224 states that "*It has improved my imagination... For example, I can do different things on different photos. I consider how I can make it better.*" can be specified as the sentences used as a base when creating the codes.

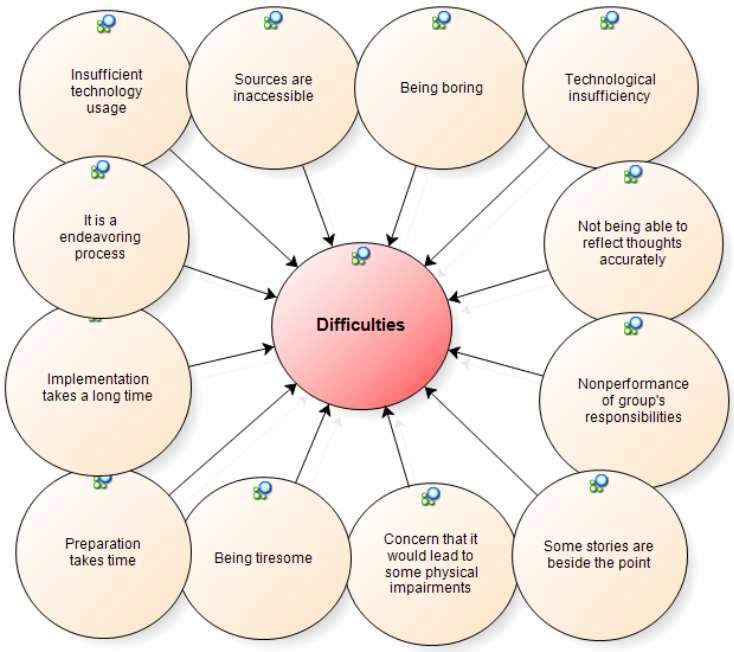

Figure 5. *Difficulties Encountered During Implementation*

It is seen that the difficulties and limitations encountered in the implementation of the digital storytelling method are expressed in Figure 5. Some of the prominent codes can be stated as "technical problems, insufficient usage of technology, time limitations, inaccessible sources, and being tiresome and hard process". Related codes such as "*Preparation takes time.*" (471776-S.67); "*... If you ask me, what I don't like about it is that it is tiresome. And sometimes the website can be very slow due to Internet connection ...*" (328704 -S.218) were created based on the above statements.

4 | Discussion & Conclusion

This research includes meta-analytic and meta-thematic assessments concerning the utilization of the digital storytelling method in educational environments. In this context, 34 studies were included in the meta-analysis and eight studies were included in meta-thematic assessments in line with the purpose of the research. Within the scope of the research, the data of the studies included in the meta-analysis were primarily examined. In conclusion, it was understood that studies generally focused on secondary schools, published articles, and language teaching. Besides, it was concluded that the number of studies increased after 2018, and those studies focused on practices that lasted for one or two months.

When the findings of the meta-analysis are examined, it was determined that the digital storytelling method has a positive and medium effect on academic achievement (ES=0.775). This result indicates that the digital storytelling method affects the improvement of the academic achievement of students. It also indicates that the digital storytelling method has a more positive effect on students' academic achievement compared to the teaching method stated in the curriculum. In fact, many studies in the literature reveal that digital storytelling method has a positive effect on academic achievement of students (Abiola, 2014; Aktaş & Yurt, 2017; Büyükcengiz, 2017; Çiçek, 2018; Demirer, 2013; Francis, 2018; Göçen, 2014; Hung et al., 2012; Ing, 2018; Kahraman, 2013; Liu et al., 2018; Özerbaş & Öztürk, 2017; Yang & Wu, 2012). In this case, it can be stated that the conclusion of the study is consistent with the related literature, and the said method improves the academic achievement of students. Within this context, the reasons why digital

storytelling method positively affects the academic achievement of students can be explained as follows; it is a student-centered approach (Bromberg et al., 2013), it is associated with life (Kahraman, 2013), it enables students to have an active role in the learning process, it attracts interest and attention of students and improves their motivation (Robin, 2006). Moreover, in this method where the technology is utilized effectively in adding images to written texts (Demirer, 2013), concretizing of abstract concepts, and thus, making the lesson more apprehensible (Büyükcengiz, 2017; Robin, 2008) can be regarded as reasons of improvement in the achievement. On the other hand, some studies have revealed that there is no significant difference between the digital storytelling method and traditional teaching methods in terms of academic achievement (Abdolmanafi-Rokni & Qarajeh, 2014; Nam, 2017; Özpinar et al., 2017).

According to the results of the funnel chart and publication bias tests, it was found that there was no publication bias on calculating the overall effect size. This information demonstrates that the meta-analysis results are reliable. Besides, the moderator analysis was used to see whether the effectiveness of the digital storytelling method on students' academic achievement differed by education levels, subject areas, and the duration of the application. The relevant results demonstrate that the effectiveness of the digital storytelling method on students' academic achievement differed by education levels and subject areas; however, it did not differ by the duration of the application. The study sample is composed of 2371 participants.

Meta-thematic analyses were carried out along with meta-analysis in the research, and various themes and codes were generated regarding the impact of the digital storytelling method on different dimensions. At this point, firstly, the theme of contribution of the digital storytelling method to the cognitive dimension was created in support of the academic achievement specified in meta-analysis. When the codes mentioned under this theme were evaluated, it was found that digital storytelling method improved some 21st-century skills such as reasoning, creative thinking, productivity, critical thinking, effective communication, and problem-solving (Jakes & Brennan, 2005; Hung et al., 2012; Yang & Wu, 2012). It is concluded that this method, which enables effective use of technology in the classroom environment, is also effective in acquiring skills such as digital literacy, visual literacy, global literacy, media literacy, technology, and information literacy (Jakes, 2006; Robin, 2008). Also, it can be stated that it facilitates learning by making the hard-to-understand and boring topics easier and interesting and concretizing abstract topics (Büyükcengiz, 2017; Robin, 2008). Some studies in the literature are concluded that the method supports permanent learning by activating more than one senses, provides more learning opportunities, enables the students to understand the lesson better; thus, it positively affects their performance in the course (Turgut & Kışla, 2015; Aktaş & Yurt, 2017; Tecnam, 2013; Francis, 2018). On the other hand, considering the codes under the heading of "general characteristics and contributions of digital storytelling method", it was determined that the method positively affected the motivation for learning, participation in the lessons, and the attitude towards the course; thus, it provides a more enjoyable and entertaining learning-teaching experience in the classroom (Demirer, 2013; Robin, 2008; Yang & Wu, 2012). It also attracts the attention of students by addressing different senses organs along with arousing excitement and curiosity and contributes to the development of imagination and creativity concerning knowledge, ideas, and new products (Demirer, 2013; Kahraman, 2013; Tunç & Karadağ, 2013). It is considered that the digital storytelling method positively affects the willingness of students to like the course and attend the school as it explains the topic in detail, logically, and clearly, associates it with life and ensures socialization (Dayan, 2017; Kahraman, 2013; Özpinar et al., 2017). Due to all these positive aspects, the digital storytelling method provides an enriched learning experience to students and prevents them from getting bored by attracting attention to the course (Ayvaz Tunç, 2016; Büyükcengiz, 2017). Besides these contributions of the digital storytelling method to education, it was also determined that it has some difficulties and limitations. Technological insufficiency such as hardware deficiency and insufficient sources experienced in the digital storytelling method, technical problems encountered during its implementation such as limited Internet access are among the problems mentioned frequently in terms

of integration with technology (Demirer, 2013; Dayan, 2017; Karakoyun, 2014). Another important problem encountered in the process of digital storytelling is that the method is demanding and difficult and preparation takes a long time (Büyükcengiz, 2017; Snoeyink & Ertmer, 2001). Besides, some of the other negative aspects of the method can be stated as the teachers don't have enough knowledge about the method, they are insufficient in the utilization of technology, and the students cannot reflect their thoughts totally (Ayvaz Tunç, 2016; Kaya, 2014).

To implement the digital storytelling method effectively in schools, such problems should be solved. In this context, it is very important to enable the students to have access to the Internet, technological devices such as tablets, computers, and sources (Robin, 2006). Otherwise, technological insufficiency will make the implementation of the method difficult, and this will lead to significant inconveniences. It can also be suggested that the skills of students and teachers to utilize these technological devices and the software products required for the implementation should be taken into consideration, and necessary training should be provided (Coghlan, 2004; Lai & Kritsonis, 2006; Lin & Lu, 2012; Schwab & Foa, 2001). It can be stated that technical support can be provided to students to eliminate problems such as technical ones, and this would enable them to overcome such problems; thus, it improves the effectiveness of the method. Besides, the students may pay attention to lessons without getting bored by providing reinforcement to them and directing them to their areas of interest (Karakoyun, 2014). It is considered that the guidance of teachers would be helpful to direct the students to the phases of storytelling and keep them active in the learning process in order not to diminish the success of implementation (Woodhouse, 2008). It is also stated in the literature that digital storytelling should be short, plain, and apprehensible (Gregori-Signes, 2014; Kearney, 2011; Clarke & Adam, 2011; Boase, 2008).

This study is limited to query terms and scientific studies on the effect of the digital storytelling method on academic achievement carried out between 2011-2020. Besides, the study is limited to analyses of coded moderator variables. Studies compiled in the present study are limited to M.Sc. and Ph.D. theses and articles published in peer-reviewed journals only in English and Turkish. The study does not include studies published in other languages and other types of publications (such as book chapters and presentations). These findings and results could only be generalized if they are evaluated within the same context. Therefore, different research findings could be obtained by conducting more in-depth and comprehensive research.

The present study aimed to investigate the effectiveness of the digital storytelling method on academic achievement using meta-analysis and its effect on different dimensions using meta-thematic analysis. It is thought that research findings and results will be a good reference for researchers and instructors as well as contributing to the literature. In future studies, variables such as attitude, motivation, and permanence could be investigated, sub-group analyses could be conducted considering the duration of the application, sample size, age, and gender, and the practicality and effectiveness of the digital storytelling method could be analyzed in more detail. It has been observed that studies included in the meta-analysis generally focus on secondary school. The analysis could be repeated by including future studies focusing on other education levels. The analysis could also be repeated and compared by including the findings of new studies on the digital storytelling method to be carried out in the future. It is suggested that research techniques such as meta-analysis method, which allows combining and interpreting different findings from similar individual studies, should be used more in studies carried out today when information has been increasing rapidly

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Meta-Analytic and Meta-Thematic Analysis of Digital Storytelling Method

Tarık Talan[a*]

a*. Asst. Prof. Dr., Gaziantep Islamic Science and Technology University, (http://orcid.org/0000-0002-5371-4520) * ttalan46@hotmail.com

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Abstract

The purpose of this study is to analyze the effect of the digital storytelling method on academic achievement and various variables by examining the method in terms of meta-analytic and meta-thematic aspects. Therefore, meta-analytic and meta-thematic dimensions were used together in the study. Within the context of the meta-analytic dimension of the research, the data obtained from 34 studies meeting the criteria of inclusion from various databases were analyzed using Comprehensive Meta-Analysis Software (CMA) to examine the effect of digital storytelling method on academic achievement. On the other hand, in the meta-thematic dimension performed to complete the obtained data, qualitative findings were obtained by quoting common codes and themes from the qualitative studies. In this context, the general characteristics of the digital storytelling method, their contributions to the cognitive dimension, and difficulties encountered during application were addressed. According to the results of the research, the digital storytelling method has been found to have a significant positive effect on academic achievement. The results of the meta-thematic assessments revealed that the digital storytelling method had an effect on making the students gain several 21st-century skills such as creative thinking, effective communication, and research skills, and it facilitated learning, provided permanence, and positively affected academic achievement. Time limitation, limited internet access, technological insufficiency, technical problems, lack of technical knowledge and skills, and lack of technical support are some of the problems faced during the implementation.

Keywords: Digital storytelling, effect size, meta-analysis, meta-thematic analysis

Dijital Öyküleme Yönteminin Meta-Analitik ve Meta-Tematik Analizi

Öz

Bu araştırmanın amacı dijital öyküleme yönteminin meta-analitik ve meta-tematik açıdan incelenerek akademik başarı ve farklı değişkenler üzerindeki etkisini incelemektir. Bu amaç doğrultusunda, çalışmada meta-analitik ve meta-tematik boyutlar birlikte kullanılmıştır. Araştırmanın meta-analiz boyutu kapsamında, dijital öyküleme yönteminin öğrenme başarısı üzerindeki etkisini incelemek amacıyla farklı veri tabanlarından dahil edilme kriterlerine uyan 34 çalışmanın verileri CMA programıyla analiz edilmiştir. Diğer yandan elde edilen verileri tamamlamak amaçlı yapılan meta-tematik boyutta ise nitel yönlü çalışmaların ortak kod ve temalarından alıntılar yapılarak nitel bulgulara ulaşılmıştır. Bu kapsamda dijital öyküleme yönteminin genel özellikleri, bilişsel boyuta katkıları ve uygulama esnasında karşılaşılan güçlüklere değinilmiştir. Araştırma sonuçlarına göre, dijital öyküleme yönteminin öğrenme başarısı üzerinde olumlu ve anlamlı bir etkisinin olduğu görülmüştür. Yapılan meta-tematik değerlendirmeler sonucunda dijital öyküleme yönteminin öğrencilerin yaratıcı düşünme, etkili iletişim ve araştırma becerileri gibi 21.yy becerilerin kazandırılmasında etkili olduğu, öğrenmeyi kolaylaştırdığı, kalıcılığı sağladığı ve akademik başarısını pozitif yönde etki ettiği anlaşılmıştır. Zaman darlığı, sınırlı internet erişimi, teknolojik açıdan yaşanan yetersizlikler, teknik sorunlar, teknik bilgi ve beceri eksikliği, teknik destek eksikliği uygulama esnasında yaşanan problemler arasında yer almaktadır.

Anahtar kelimeler: Dijital öyküleme, etki büyüklüğü, meta-analiz, meta-tematik analiz

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1 | INTRODUCTION

Developments in electronic and digital fields and changes in student profiles bring along the use of new methods and techniques in education. Today's methods and techniques used to differentiate, support, and enrich education provide the opportunity for effective, quality, and permanent learning as well as structuring the knowledge. Therefore, there is a transition from traditional teaching methods, where paper and pencil are used, to contemporary teaching methods, where computer and Internet technologies are utilized. One of these learning methods is the digital storytelling method which has replaced traditional storytelling. This method, which allows creating stories in the digital environment, involves skills of creating stories and using technology as well as using the stories for pedagogical purposes in the classroom environment (Meadows, 2003; Smeda, Dakich & Sharda, 2012).

In digital storytelling, which spreads far and wide today and adds a new dimension to traditional storytelling, mostly visual images containing multimedia applications are used instead of verbal images (Sayılgan, 2014). Digital storytelling can be defined as a short (2-3 minute) video-narrative created by gathering multimedia elements such as text, sound, graphics, animation, still and animated imagery to inform the audience about a certain subject (Robin, 2006). While Wang and Zhan (2010) define digital storytelling as a modern version of the art of traditional storytelling, Armstrong (2003) defines it as information transfer or sharing storytelling through media. Although there are different definitions of digital storytelling in the literature, the common point of these definitions is the enrichment of the art of storytelling with various multimedia elements such as images, sound, text, and video (Robin, 2006).

The digital storytelling process in teaching environments is composed of four main phases: "(1) pre-production, (2) production, (3) post-production, and (4) distribution". In the first phase, the story's main focus and topic are determined, and ideas are created about the elements of the story. In this phase, multimedia materials and contents are created for the story/scenario. In the next phase, scenarios and images are transferred into the digital media. Animated images are produced and dubbing of the story is performed in the virtual environment using the selected computer software. In the third phase, the fragments are put together to unify. Peer review and expert assessment techniques are used to get feedback and obtain different perspectives on digital storytelling created, and necessary adjustments are made accordingly. In the final phase, digital stories are shared and presented to get contributions and comments (Demirer, 2013; Kearney, 2011; Kocaman-Karoğlu, 2016). Besides, seven key elements should be taken into consideration for creating an effective digital story (Büyükcengiz, 2017; Robin, 2006). These elements are shown in Table 1.

Table 1. The Seven Elements of Digital Storytelling

Point of View	Identifying the main point of the story and the perspective of the author.
A Dramatic Question	A key question that keeps the viewer's attention until the end of the story.
Emotional content	Identifying an issue that connects the viewer to the story in an emotional manner.
Emotional Content	Impressive and fluent dubbing that makes the story easy to understand.
The Power of the Soundtrack	Using music or sound effects that support and embellish the main theme of the story.
Economy	Using just enough content to tell the story without overloading the viewer.
Pacing (Rhythm)	The progress of the story in a natural rhythm and tempo.

We could group digital stories into three different categories (Robin, 2006). The first one is personal narratives. In this type of storytelling, the narrator shares significant incidents in his/her life. Stories shared on social media could be examples of this type. The second category is historical documentaries that focus on historical events. These documentaries, which are told as documentaries, are stories investigating past

events that would help us better understand the history. The third one is instructive and informative narratives on a particular concept or practice. This type of storytelling is usually used in education.

According to the studies in the literature, it could be seen that digital stories are used in two different ways in education (Gils, 2005; Büyükcengiz, 2017). In the first one, the students share their own digital stories that they have created in the classroom environment under the teacher's guidance, while the teachers present digital stories, which they or others have created, to students in the second one. In the first case, the students are provided with training on how to create stories, and several examples are analyzed before they create their digital stories. These two categories could be further classified into two as the ones with the images created by the students, and the ones in which stock images are used (Balaman, 2017).

Digital storytelling has the characteristics of a source which supports educational practices by being integrated with the curricula at different levels from pre-school period to higher education. This method can be used as an effective tool in several disciplines and various courses such as teacher education, literacy instruction, literature, history, language skills (listening, speaking, reading, writing), health, and community practices (Dupain & Maguire, 2005; Sadik, 2008; Robin, 2006). Therefore, the inclusion of digital storytelling in curricula as a complementary and empowering tool may contribute to effective, meaningful, and permanent learning (Dakich, 2008).

The inclusion of digital storytelling in curricula has many contributions. The studies in the literature revealed that digital storytelling method improves student achievement and performance (Abiola, 2014; Francis, 2018; Hung et al., 2012; Ing, 2018; Kahraman, 2013; Liu et al., 2018; Yang & Wu, 2012), positively affects students' attitudes towards the course (Büyükcengiz, 2017; Çiçek, 2018; Demirer, 2013; Yang & Wu, 2012), has a positive effect on their interests and motivations (Aktaş & Yurt, 2017; Demirer, 2013; Doğan, 2007; Hung et al., 2012; Kahraman, 2013; Robin, 2006), and ensures the active participation of the students in the courses instead of being passive (Doğan, 2007; Howell & Howell, 2003; Gils, 2005; Raymond, 2008; Robin, 2006). Also, various studies state that it improves writing skills, critical thinking skills, problem-solving skills, and communication skills of the students (Baki, 2015; Doğan, 2007; Duman & Göçen, 2014; Foley, 2013; Gakhar, 2007; Hung et al., 2012; Robin, 2006; Yang & Wu, 2012). In the studies, it is also stated that this method is particularly effective in teaching boring, hard-to-understand, and complicated topics, concreting abstract concepts and facilitating the learning process and making it more comprehensible (Büyükcengiz, 2017; Kotluk & Kocakaya, 2017; Robin, 2008). Moreover, several studies have revealed that digital storytelling has been effective in acquiring 21st-century skills such as information literacy, visual literacy, technology literacy, creative thinking, effective communication, researching, and presentation (Jakes, 2006; Robin, 2006; Sadik, 2008; Yang & Wu, 2012). To conclude, the digital storytelling method, which is a student-centered approach, supports permanent learning by activating multiple senses such as hearing, seeing, and feeling (Turgut & Kışla, 2015).

Considering the studies in the literature generally, it is found out that both teachers and students face some problems while applying the digital storytelling method in classrooms. The most frequent problems that prevent the use of digital storytelling are lack of hardware and software, insufficiency of sources, insufficient technical support, and time limitation (Cuban, 2001; Dayan, 2017; Snoeyink & Ertmer, 2001). Besides, limited Internet access may prevent to access sources for the students, and it negatively reflects on the process of digital storytelling (Karakoyun, 2014). On the other hand, inadequate technology skills of teachers and students, their resistance to change, lack of interest, attitude, and motivation can be expressed as some other important problems encountered in the process of digital storytelling (Duhaney, 2001; Bauer & Kenton, 2005). Moreover, infringement of copyright and intellectual property rights by the students becomes prominent as a negative factor in the formation of digital storytelling (Bull & Kajder, 2004; Karakoyun, 2014). It can be stated that these problems should be eliminated to achieve the desired effect of digital storytelling studies.

The Purpose and Significance of the Study

Although there has been an increase in the number of studies on the effectiveness of the use of the digital storytelling method in the teaching environment in terms of different fields and sample groups in recent years, there is no comprehensive information that examines their results in a holistic approach. Therefore, it can be stated that there is a need for comprehensive and reliable high-level studies that can contribute to a holistic analysis of the results of these studies, to reach a general judgment, and to make the comments stronger. In light of this basic justification, the present study aims to reveal the general situation as a result of the two-dimensional (meta-analytic and meta-thematic) analysis of the digital storytelling method, which is rarely seen in the literature.

Meta-analysis studies on the effect of digital storytelling on students' academic achievement are limited in the literature. In this context, the meta-analysis dimension of the study was performed, and the results of previous studies on the subject were examined to reach a general judgment by presenting the existing knowledge. Unlike the studies that suggest that the digital storytelling is an effective approach to academic achievement in the literature (Abiola, 2014; Aktaş & Yurt, 2017; Büyükcengiz, 2017; Çiçek, 2018; Demirer, 2013; Francis, 2018; Göçen, 2014; Hung et al., 2012; Ing, 2018; Kahraman, 2013; Liu et al., 2018; Özerbaş & Öztürk, 2017; Yang & Wu, 2012); also several studies state that the method has no or low impact on academic achievement (Abdolmanafi-Rokni & Qarajeh, 2014; Nam, 2017; Özpinar, Gökçe & Yenmez, 2017). Therefore, added results of various studies on the effect of the digital storytelling method on academic achievement. It can be stated that conducting such a study is important to determine whether the digital storytelling method affects the academic achievement or not by aggregating independent empirical research, also, to determine its level to make more clear estimations and generalizations for the future, if it has. Furthermore, it can be stated that this study is important to aggregate the knowledge created by the existing studies, pioneer the future studies on the subject, and provide a reference.

On the other hand, a thematic dimension was added to the study to reveal the big picture to support and strengthen the meta-analysis dimension. It is thought that the extrapolated results will provide a comprehensive and general overview of digital storytelling method, also, the two-dimensional study will fill the academic gap and draw attention in related literature and encourage the researchers to conduct studies using multiple methods. It can also be stated that the present study, which has both qualitative and quantitative aspects, is different from other studies; thus, it has a unique characteristic. Since there are almost no multi-dimensional studies on the subject in literature, it is thought that the present study will be unique, shed light on future studies, and serve as a model. In the light of these basic justifications, this study aims to examine the effectiveness of digital storytelling method in terms of academic achievement using meta-analysis, and its impact on different dimensions using meta-thematic analysis. In line with this general purpose, the research seeks answers to the following questions:

1. What is the effect size of the digital storytelling method on academic achievement?
2. In terms of different education levels, what is the effect size of the digital storytelling method on academic achievement?
3. In terms of practice duration, what is the effect size of the digital storytelling method on academic achievement?
4. What is the effect size of the digital storytelling method on academic achievement in terms of course/subject areas?
5. How effective is the digital storytelling method in terms of thematic review based on document analysis?

2 | METHOD

In the present study, the effectiveness of the digital storytelling method on academic achievement, its cognitive contributions in the process of integration with education, general characteristics, and difficulties encountered during application were examined. In this respect, both quantitative and qualitative methods were used together to present a comprehensive perspective. In this part of the study, the type and design of the research, processes of collecting, coding, and analyzing the data are explained in detail.

In the quantitative dimension of the research, the meta-analysis method, which is a form of systematic synthesis methods, was used. The meta-analysis, which is a kind of synthesis of experimental studies, is a literature review method used to combine and reinterpret the results of individual studies on a specific subject (Cohen et al., 2002; Little et al., 2008). Although there are many literature review methods, what distinguishes the meta-analysis method from others is that it is a quantitative method based on statistical techniques and numerical data. The meta-analysis method was used in the present study because it aimed to examine the effect of digital storytelling on academic achievement and there was a need to make interpretations with a holistic approach and come to a conclusion by benefiting from available studies on the subject.

With the intent of making a more detailed search on the subject, expanding the scope of the study, and enriching the data set, the qualitative dimension (meta-thematic analysis) was added to complete and supplement the qualitative dimension (Batdı, 2017). In the meta-thematic analysis method, it is aimed to bring together the views of the respondents selected for qualitative studies related to the research subject (Batdı, 2017). From this point of view, a method which includes the process of revising the themes created from the opinions is in question. In the meta-thematic analysis process, the data obtained through document review were interpreted. Document review, which is one of the qualitative research methods, includes the analysis of written materials containing information about the case or cases aimed to be investigated (Yıldırım & Şimşek, 2013).

DATA COLLECTION

In this research, studies on digital storytelling method were searched in databases of Web of Science, ERIC (EBSCO), Wiley Online Library Full Collection, Science Direct, Taylor & Francis Online, Scopus (A&I), Springer LINK, Google Scholar, ProQuest Dissertation & Thesis Global, and Turkish Council of Higher Education Thesis Center. To reach the relevant studies, the following terms were searched as keywords in databases:

(i) terms related to the digital environment (i.e., digital, computer, mobile, tablets, technology, etc.);

(ii) terms related to storytelling (i.e., story, stories, storytelling, story telling, narrative, etc.);

(iii) terms related to academic achievement (i.e., achievement, success, gains, performance, learning outcomes, etc.).

In this research, studies in Turkish and English were chosen. As it was aimed to reach all studies on the impact of the digital storytelling method on academic achievement in the research, no time filter was used. The screening process was carried out between December 2019 and March 2020, and the complementary search was made in July 2020. In the search results, M.Sc. and Ph.D. theses and articles published in peer-reviewed journals were included in the analysis. Besides, attention was paid to include experimentally designed studies with control groups in meta-analysis so that the standard effect size would be calculated. In the studies that will be included in the meta-analysis, the independent variable is the digital storytelling method and the dependent variable is the studies on academic achievement. The studies that did not meet the inclusion criteria and those that did not have sufficient data to calculate the effect size were left out of the scope of the research. The PRISMA flow diagram (Moher, Liberati, Tetzlaff, Altman, & Prisma Group,

2010) showing the process of obtaining the studies included in meta-analysis during the literature review stage is given in Figure 1.

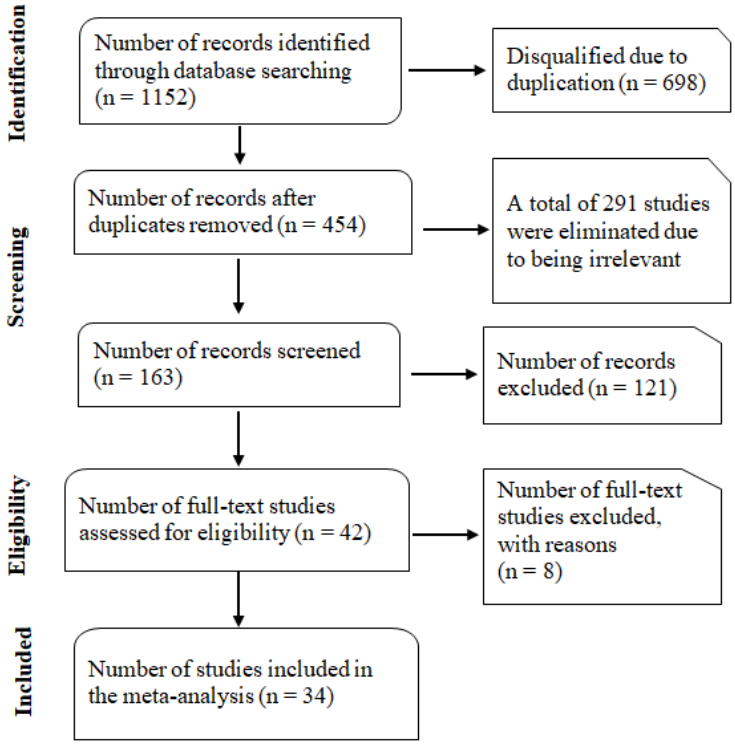

Figure 1. *Flow Chart for Selection of Studies*

Examining Figure 1, it is seen that a wide range of publications (n=1152) addressing the impact of the digital storytelling method on achievement was reached at the end of first searches on the databases. Relevant filters were applied to these publications, and the scope of the research was narrowed down. After the implementation of search criteria, 698 of these studies were excluded as they were duplicates, and 291 of them were excluded after reading their abstracts and understanding that their titles were irrelevant. In the end, 163 studies were included in the study. Upon examining these studies within the context of inclusion criteria, 121 of them were eliminated. When the remaining 42 studies were evaluated in terms of suitability and quality, eight studies that did not contain a sufficient amount of data (n=3) and were of poor quality (n=5) were also excluded. Thus it was decided to include only 34 studies in meta-analysis. However, it was seen that four of the studies (Dinçer, 2019; Liu, Tai & Liu, 2018; Nnakwe, 2019; Tahriri et al., 2015) the variable of academic achievement was used for multiple subject areas at the same time. The study included 39 items from 34 studies. Therefore, the findings of these studies were meta-analyzed separately in line with the structure of the meta-analysis studies and included in the research as different studies, and the number of studies was expressed accordingly. Moreover, it was found out that the data required to calculate the effect size were missing in one of the studies included in the study (Göçen, 2014). The data was included in the analysis by contacting the author of this study.

Coding Process

Each study, which was reached after the literature review, needs to be coded to convert their descriptive data to quantitative data, to compare the studies, and to determine if the studies meet the inclusion criteria of meta-analysis. In this context, the studies included in the research were coded. At this stage, a coding form was created in line with the purpose of the research. The generated coding form consists of two parts. In the first part, descriptive details of the studies (study number, author(s), publication

year, the course in which the study was implemented, education level, and application period) were used as data. Sample size (n), average ($\bar{X}$), and standard deviation (sd) data of experimental and control groups were included in the second part to calculate the effect size of the studies. To test the reliability of the study, coding processes were cross-checked by two independent raters, erroneous coding and classification were eliminated, and the analysis was continued until consensus was reached between the raters.

Data Analysis

Examination dimensions in the research form were coded in detail using Microsoft Office Excel and converted into a table, and related findings were calculated by filtering the descriptive analyses. In this study, CMA software was used to apply the meta-analysis technique. Although the classification of effect size calculated as a meta-analysis unit varies, the effect sizes were assessed according to Cohen (1988). According to Cohen (1988), the effect sizes between 0.2-0.5 are considered small, effect sizes between 0.5-0.8 are considered medium, and effect sizes equal to 0.8 and above are considered large. It is not possible to say that the studies conducted by different researchers to determine the effectiveness of the digital storytelling method on achievement have measured the same widespread impact. Therefore, it is inevitable for the studies included in the analysis to cause diversity among the results as they were conducted under different conditions. Therefore, Random Effects Model (REM) was used in this study to calculate the overall effect size. Moreover, the values revealed according to Fixed Effects Model are given in the findings. "Inter-Rater Reliability Level Formula" [consensus / (consensus + disagreement) x 100] (Miles & Huberman, 1994) was used to figure out the reliability of the research. According to the results of the calculations, the reliability of the research was found to be 100%, and this value indicates that the coding process was reliable.

In the qualitative dimension of the research which was based on a thematic examination, the reviewed qualitative studies on digital storytelling (n=8) were analyzed using QSR NVivo 8.0 software. The content analysis method was used to analyze the data. In fact, the content analysis aims to aggregate oral or written data which resemble each other and present an understandable study for the readers (Yıldırım & Şimşek, 2013). In this context, it was decided that content analysis is the most suitable method for this study to obtain similar/common results from studies conducted on the use of digital storytelling method in education. Similar/common themes and codes in previous studies conducted on the present subject were rearranged within a certain harmony and order and qualitative findings were obtained in this study. Then these findings were presented as models. Moreover, when the expressions in the studies on themes and codes were presented, they were cited in the text for support, justification, and most importantly, to ensure reliability. While these citations were presented, they were obtained from the relevant studies without making any changes in the expressions. The direct citations are indicated with the code of the related study and page number (e.g.: statement 471776-P.66; page 66 of study no. 471776).

Inter-rater agreement values (Cohen's Kappa) were used to ensure validity and reliability in the qualitative dimension of the study, (Viera & Garrett, 2005). In the present study, it was seen that the compliance value varied in the range of between 0.71 and 0.82. As these values were in the range of "good/very good compliance" according to Viera and Garrett (2005), they support the reliability of coding.

3 | Results

This section presents the data obtained as a result of meta-analytic and meta-thematic analyses of the examined studies. In this context, firstly, the results of the meta-analytic impact analysis of the studies on the impact of the digital storytelling method on academic achievement are presented. Then the meta-thematic findings related to the use of the digital storytelling method in education are provided.

DESCRIPTIVE STATISTICS OF THE STUDIES

Descriptions examined in this research consist of educational level, application period, type of publication, publication year, subject area, and sample size. Descriptive data related to these variables are presented in Table 2.

Table 2. Descriptive Data of the Studies Included in Meta-Analysis

Variable	k	%	Variable	k	%
Duration of Application (Weeks)			Publication Year		
≤5	14	35.90	2012-2014	6	15.38
6-9	14	35.90	2015-2017	9	23.08
≥10	11	28.21	2018-2020	24	61.54
Education Level			Course/Subject		
Primary School	5	12.82	Science	12	30.77
Secondary School	22	56.41	Mathematics	4	10.26
High School	6	15.38	Social Sciences	4	10.26
University	5	12.82	Language Education	17	43.59
Other	1	2.56	Computer	2	5.13
Publication Type			Sample Size		
Article	18	46.15	Small Sample (n≤50)	17	43.59
M.Sc. Thesis	11	28.21	Medium Sample (51≤n≤100)	17	43.59
Ph.D. Thesis	10	25.64	Large Sample (n≥101)	5	12.82

Examining Table 2, it is seen that the majority of the 39 studies included in the meta-analysis were conducted in secondary schools (56.41%); and the least number of studies were conducted in university and primary schools. Eighteen of the studies (46.15%) included in the research were articles, 10 of them (25.64%) were Ph.D. theses, and 11 of them (28.21%) were M.Sc. theses. Six of the studies (15.38%) were conducted between the years of 2012-2014, and nine of them (23.08%) were conducted between 2015-2017. According to the sample sizes, it is seen that 17 studies (43.59%) were based on small samples, 17 (43.59%) were based on medium samples, and five (12.82%) were based on large samples. Finally, it was observed that most of the studies were conducted in the field of Language Education (43.59%), 12 studies (30.77%) were conducted in Science, and the least number of studies were conducted in the field of Computer.

FINDINGS REGARDING THE EFFECT SIZES OF THE STUDIES ON ACADEMIC ACHIEVEMENT

The average effect size values of the studies included in the analysis are presented in Table 3.

Table 3. The Homogeneous Distribution Value, Mean Effect Size, and Confidence Intervals of the Studies Included in the Meta-Analysis According to the Effect Models

Type of Model	k	Z	p	Q	df	ES	SE	% 95 CI	
								Lower	Upper
Fixed Effects	39	15.967	0.000	214.747	38	0.682	0.043	0.599	0.766
Random Effects	39	7.525	0.000	40.778	38	0.775	0.103	0.573	0.977

Note. k = number of effect sizes; df = degrees of freedom; ES = Effect Size; SE = standard error; CI = confidence of interval for the average value of ES.

As shown in Table 3, the results of the meta-analysis based on the Fixed Effects Model indicated that the upper limit of 95% confidence interval was 0.766, the lower limit was 0.599 and the average effect size was 0.682. At the end of the homogeneity test, the Q-statistical value was calculated to be 214.747. According to the Random Effects Model, it is seen that the value of the average effect size was calculated as 0.775, where the lower and upper bounds of the range were 0.573 and 0.977, respectively, with a standard error of 0.103 and a confidence interval of 95%. When the statistical significance of this effect size was calculated according to Z-Test, it was found to be 7.525 (p=0.000). When the findings of the research are interpreted according to Cohen (1988), it can be stated that the digital storytelling method has a medium effect on increasing academic achievement.

To ensure reliability in meta-analysis studies, dissemination bias status was examined. In this context, the Funnel Plot is given in Figure 2 for determining whether there is a bias or not in favor of the studies that have significant differences among the studies included in the research.

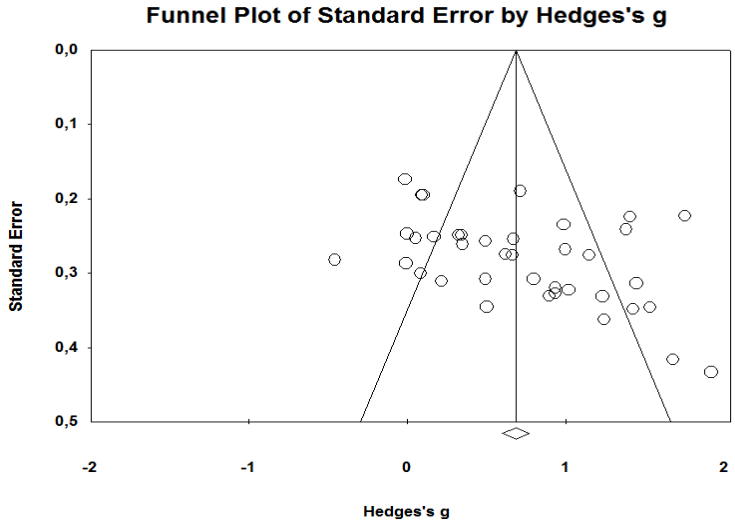

Figure 2. *Funnel Plot*

When Figure 2 is examined, it is understood that the studies do not show an asymmetric distribution around the overall effect size. In other words, distribution is not concentrated on one side. The fact that the distribution does not form an asymmetric accumulation at a single point means that the study sample is not biased in favor of the digital storytelling method, and this meta-analysis study is reliable. The Rosenthal FSN value was also calculated to support the finding obtained from the funnel plot. The findings are given in Table 4.

Table 4. Rosenthal's Fail-Safe Number Calculations

Z-value for observed studies	16.94270
p-value for observed studies	0.00000*
Alfa	0.05000
Tails	2
Z for alpha	1.95996
Number of observed studies	39
Fail-safe N	2876

Note. $^*p < .05$

Examining Table 4, it is seen that the safe N number is 2876. In other words, it can be stated that if the study with a negative or neutral difference as much as the number in this value is included in the analysis, the significant effect may decrease to zero. Comparing the number of studies included in the analysis with

the FSN value, it is understood that the FSN value is quite high and unreachable. This information shows that the meta-analysis results are reliable.

Effect Sizes of the Studies According to Moderators

According to the results of the study, it was observed that studies included in the present study had different education levels, course/subject areas, and application durations. Therefore, it was desired to investigate whether the effect size of the digital storytelling method on academic achievement varies by the education level, subject area, and duration of application. Moderator analysis results of studies included in the meta-analysis are presented in Table 5.

Table 5. The overall effect sizes of the studies according to moderator analyses.

	Variables	N	ES	% 95 CI		QB	Z	df	p
				Lower	Upper				
Education Level	Primary School	5	0.714	0.397	1.031	15.885	10.686	4	0.003
	Secondary School	22	0.662	0.376	0.949				
	High School	6	1.302	1.008	1.596				
	University	5	0.865	0.397	1.334				
	Other	1	0.323	-0.164	0.811				
	Sum	39	0.837	0.683	0.990				
Course/ Subject	Computer	2	0.697	-0.663	2.056	22.609	6.715	4	0.000
	Language Education	17	0.776	0.462	1.089				
	Science	12	0.944	0.536	1.352				
	Mathematics	4	0.142	-0.080	0.363				
	Social Sciences	4	0.977	0.560	1.395				
	Sum	39	0.523	0.371	0.676				
Duration of Application	≤5	14	0.470	0.185	0.755	5.937	7.482	2	0.051
	6-9	14	1.016	0.635	1.397				
	≥10	11	0.862	0.518	1.206				
	Sum	39	0.726	0.535	0.916				

According to Table 5, when the inter-group homogeneity test was analyzed by *education levels*, Q_B was found to be 15.885. Since the value of Q_B (15.885) was observed to be larger than the critical value of $\chi 2$ distribution with degrees of freedom of 4, it could be said that the distribution was heterogeneous ($\chi 2_{(0.95)}$= 9.488). Also, it could be said that the overall effect size of education levels (ES=0.837) was large in terms of Cohen's (1988) classification. According to these results, the effect of the digital storytelling method on academic success varies by education levels (p=0.003).

When the intergroup homogeneity test was analyzed by course/*subject areas*, Q_B was found to be 22.609. Therefore, since the statistical value of Q_B (22.609) was larger than the $\chi 2$ value ($\chi 2_{(0.95)}$=9.488), it could be said that the distribution between effect sizes was heterogeneous. It was then concluded that the overall effect size was found to be ES=0.523 and that this value regarded as medium according to Cohen (1988). On the other hand, it can be also said that the effect of the digital storytelling method on academic achievement differs across course/subject areas (p=0.000).

When the *duration of the application* of studies was analyzed, Q_B value was found to be 5.937. Therefore, the statistical value of Q_B was found to be smaller than the $\chi 2$ value ($\chi 2_{(0.95)}$=5.991). In this case, it could be stated that the distribution of effect sizes was homogeneous and the effect of the digital

storytelling method on academic achievement did not differ by the duration of application (p=0.051). Hence, the level of academic achievement was found to be independent of the duration of the application in classes in which the digital storytelling method was used. On the other hand, the overall effect size value was found to be ES=0.726, and this value was regarded as medium according to Cohen (1988).

FINDINGS REGARDING THE EFFECTIVENESS OF DIGITAL STORYTELLING METHOD WITHIN THE SCOPE OF THEMATIC ANALYSIS

In this section of the study, themes, and codes obtained from the meta-thematic analysis are presented to support the meta-analytic findings and provide enriched data for the study. Direct citations were included in the text to support the thematic data presented in different shapes and models. The thematic data obtained via comprehensive analyses were grouped and visualized under different themes in three models. The models addressing the contribution of the digital storytelling method to the cognitive dimension (Figure 3), its general characteristics (Figure 4), and the difficulties encountered during the application (Figure 5) are presented below.

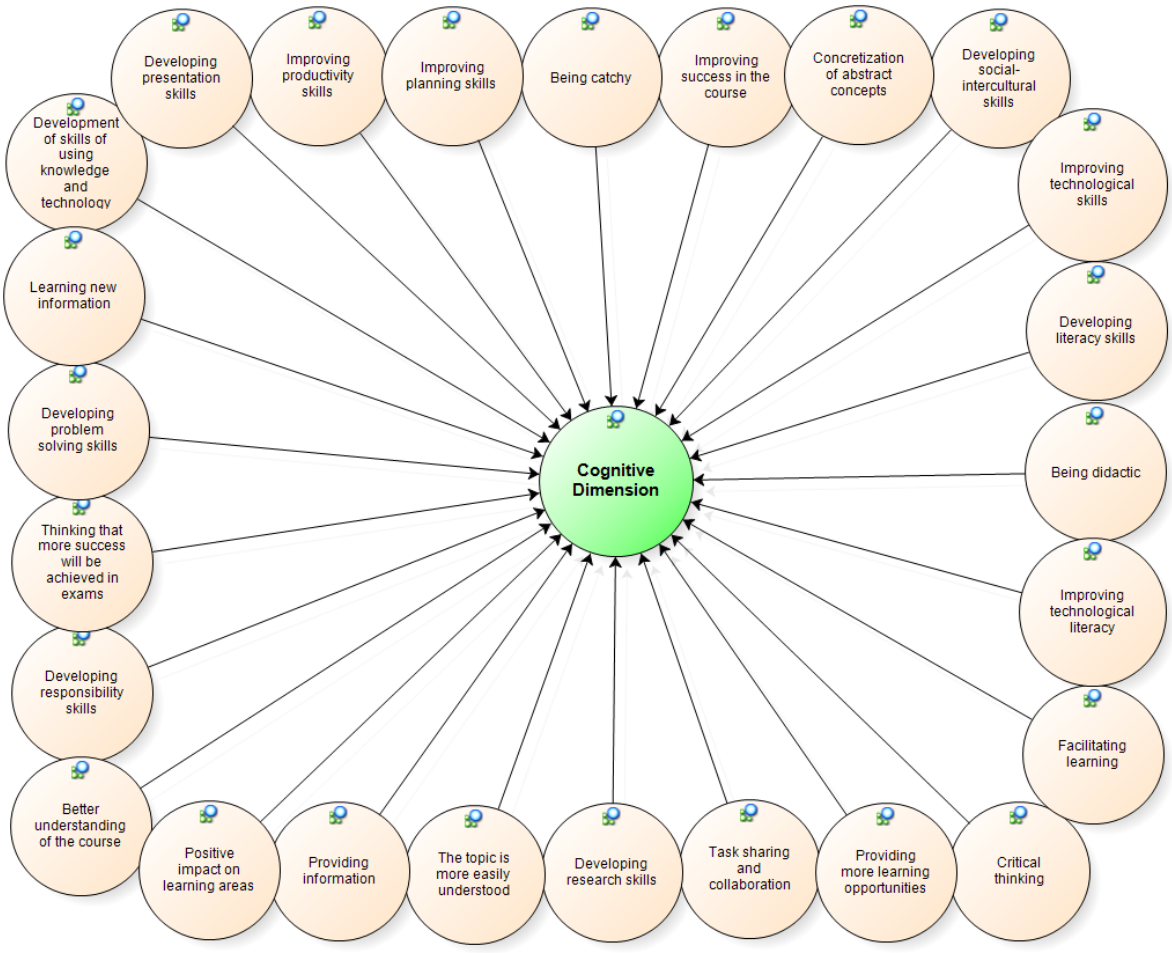

Figure 3. *Contribution of Digital Storytelling Method to Cognitive Dimension*

In Figure 3, some of the codes mentioned in the context of the contributions of the digital storytelling method to cognitive dimension are specified as "improving productivity, planning, problem-solving, and critical thinking skills; being catchy; concreting abstract concepts and being instructional". Within the context of this theme, the cited topic from the study coded 328704-S.237 "*allows us to repeat the topic. The repetition of the topic enables us to understand better. We also benefit visually. What we learn becomes more permanent…*" and the statement in the study coded 361705-S.125 "*I liked it very much because learning*

new things in the digital environment has improved me a lot. Most of it was an informative video. I believe I've learned new things from most of them. Even a friend of mine had done something on time travel. I have found it very interesting. I watched them and learned new things" statements were used as reference sentences and used in the formation of codes.

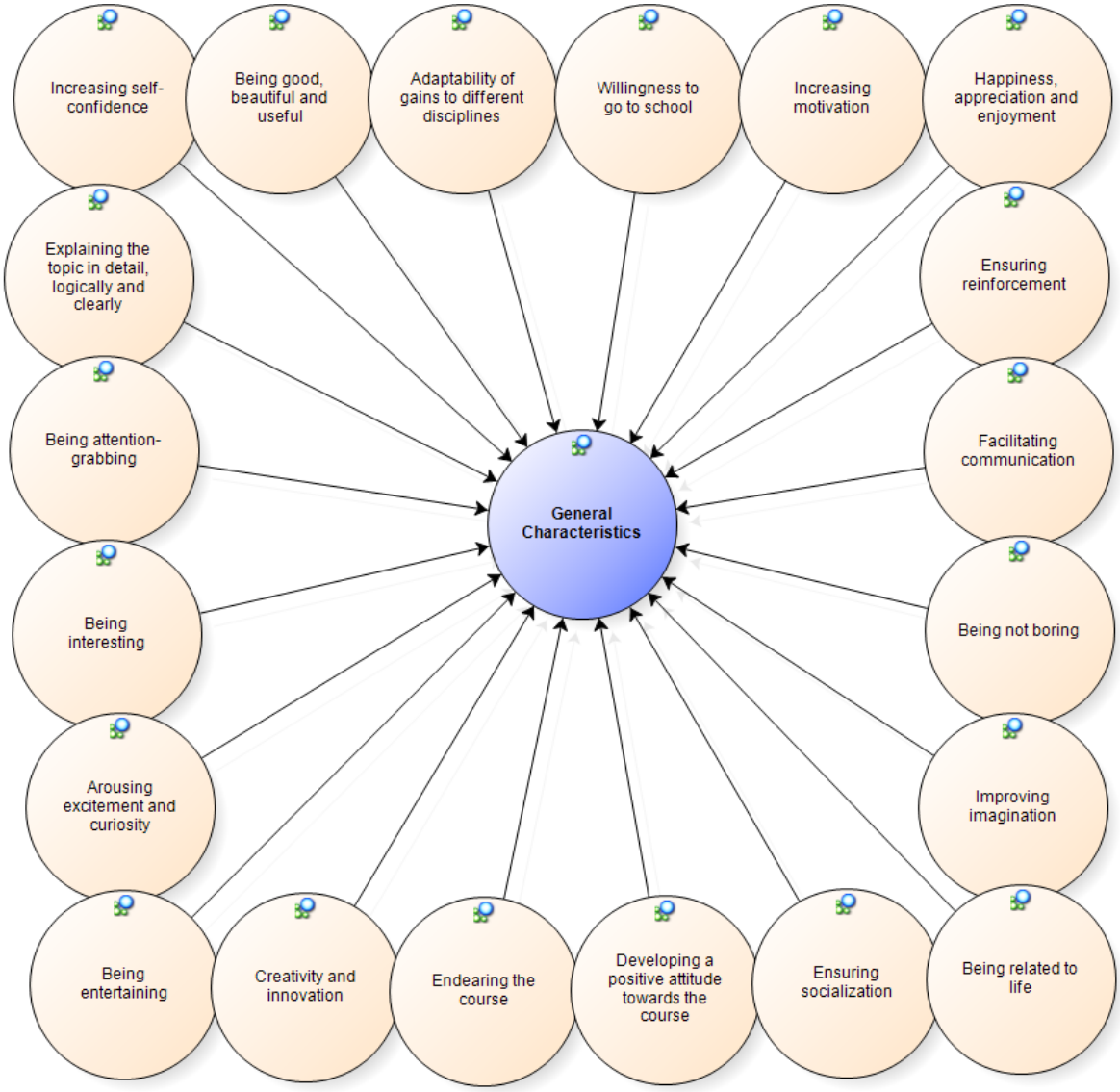

Figure 4. *General Characteristics of Digital Storytelling Method*

When Figure 4 is examined, it is understood that the codes about the general characteristics of the digital storytelling method were created. Some of the codes related to this model can be expressed as "being interesting and entertaining; improving communication, participation, self-confidence, and motivation; being associated with life; ensuring socialization and reinforcement". Some expressions used as a reference to create the related codes were cited from the study coded 471776-S.66 are "*Our normal science classes were boring. Courses were very hard. They were not entertaining. I was having difficulty understanding the course. But now we shoot movies about the course in groups and our lessons have become more entertaining with digital storytelling*", or the expression cited from the study coded 352043-S.93 can be stated as: "*Using digital storytelling enables us to understand the course and associate it with life.*" The

sentences found in the study coded 328704-S.224 states that "*It has improved my imagination... For example, I can do different things on different photos. I consider how I can make it better.*" can be specified as the sentences used as a base when creating the codes.

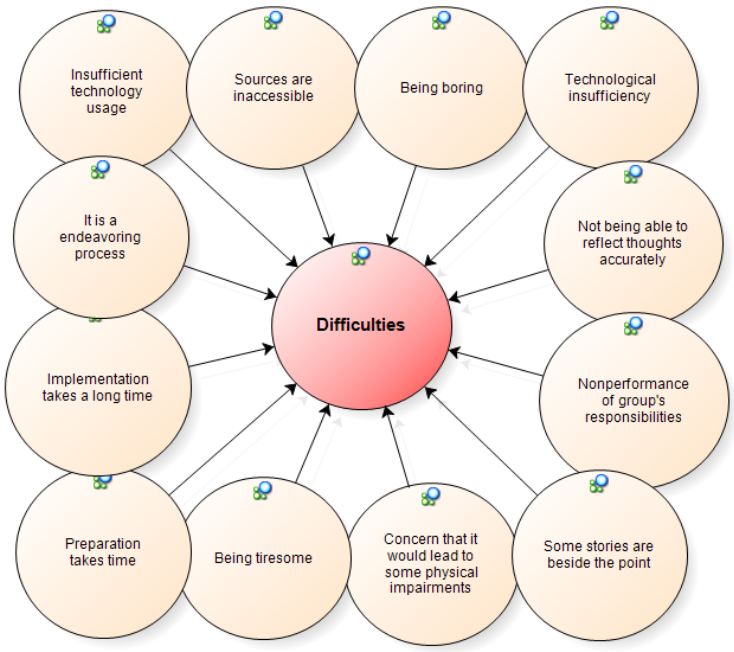

Figure 5. *Difficulties Encountered During Implementation*

It is seen that the difficulties and limitations encountered in the implementation of the digital storytelling method are expressed in Figure 5. Some of the prominent codes can be stated as "technical problems, insufficient usage of technology, time limitations, inaccessible sources, and being tiresome and hard process". Related codes such as "*Preparation takes time.*" (471776-S.67); "*... If you ask me, what I don't like about it is that it is tiresome. And sometimes the website can be very slow due to Internet connection ...*" (328704 -S.218) were created based on the above statements.

4 | Discussion & Conclusion

This research includes meta-analytic and meta-thematic assessments concerning the utilization of the digital storytelling method in educational environments. In this context, 34 studies were included in the meta-analysis and eight studies were included in meta-thematic assessments in line with the purpose of the research. Within the scope of the research, the data of the studies included in the meta-analysis were primarily examined. In conclusion, it was understood that studies generally focused on secondary schools, published articles, and language teaching. Besides, it was concluded that the number of studies increased after 2018, and those studies focused on practices that lasted for one or two months.

When the findings of the meta-analysis are examined, it was determined that the digital storytelling method has a positive and medium effect on academic achievement (ES=0.775). This result indicates that the digital storytelling method affects the improvement of the academic achievement of students. It also indicates that the digital storytelling method has a more positive effect on students' academic achievement compared to the teaching method stated in the curriculum. In fact, many studies in the literature reveal that digital storytelling method has a positive effect on academic achievement of students (Abiola, 2014; Aktaş & Yurt, 2017; Büyükcengiz, 2017; Çiçek, 2018; Demirer, 2013; Francis, 2018; Göçen, 2014; Hung et al., 2012; Ing, 2018; Kahraman, 2013; Liu et al., 2018; Özerbaş & Öztürk, 2017; Yang & Wu, 2012). In this case, it can be stated that the conclusion of the study is consistent with the related literature, and the said method improves the academic achievement of students. Within this context, the reasons why digital

storytelling method positively affects the academic achievement of students can be explained as follows; it is a student-centered approach (Bromberg et al., 2013), it is associated with life (Kahraman, 2013), it enables students to have an active role in the learning process, it attracts interest and attention of students and improves their motivation (Robin, 2006). Moreover, in this method where the technology is utilized effectively in adding images to written texts (Demirer, 2013), concretizing of abstract concepts, and thus, making the lesson more apprehensible (Büyükcengiz, 2017; Robin, 2008) can be regarded as reasons of improvement in the achievement. On the other hand, some studies have revealed that there is no significant difference between the digital storytelling method and traditional teaching methods in terms of academic achievement (Abdolmanafi-Rokni & Qarajeh, 2014; Nam, 2017; Özpinar et al., 2017).

According to the results of the funnel chart and publication bias tests, it was found that there was no publication bias on calculating the overall effect size. This information demonstrates that the meta-analysis results are reliable. Besides, the moderator analysis was used to see whether the effectiveness of the digital storytelling method on students' academic achievement differed by education levels, subject areas, and the duration of the application. The relevant results demonstrate that the effectiveness of the digital storytelling method on students' academic achievement differed by education levels and subject areas; however, it did not differ by the duration of the application. The study sample is composed of 2371 participants.

Meta-thematic analyses were carried out along with meta-analysis in the research, and various themes and codes were generated regarding the impact of the digital storytelling method on different dimensions. At this point, firstly, the theme of contribution of the digital storytelling method to the cognitive dimension was created in support of the academic achievement specified in meta-analysis. When the codes mentioned under this theme were evaluated, it was found that digital storytelling method improved some 21st-century skills such as reasoning, creative thinking, productivity, critical thinking, effective communication, and problem-solving (Jakes & Brennan, 2005; Hung et al., 2012; Yang & Wu, 2012). It is concluded that this method, which enables effective use of technology in the classroom environment, is also effective in acquiring skills such as digital literacy, visual literacy, global literacy, media literacy, technology, and information literacy (Jakes, 2006; Robin, 2008). Also, it can be stated that it facilitates learning by making the hard-to-understand and boring topics easier and interesting and concretizing abstract topics (Büyükcengiz, 2017; Robin, 2008). Some studies in the literature are concluded that the method supports permanent learning by activating more than one senses, provides more learning opportunities, enables the students to understand the lesson better; thus, it positively affects their performance in the course (Turgut & Kışla, 2015; Aktaş & Yurt, 2017; Tecnam, 2013; Francis, 2018). On the other hand, considering the codes under the heading of "general characteristics and contributions of digital storytelling method", it was determined that the method positively affected the motivation for learning, participation in the lessons, and the attitude towards the course; thus, it provides a more enjoyable and entertaining learning-teaching experience in the classroom (Demirer, 2013; Robin, 2008; Yang & Wu, 2012). It also attracts the attention of students by addressing different senses organs along with arousing excitement and curiosity and contributes to the development of imagination and creativity concerning knowledge, ideas, and new products (Demirer, 2013; Kahraman, 2013; Tunç & Karadağ, 2013). It is considered that the digital storytelling method positively affects the willingness of students to like the course and attend the school as it explains the topic in detail, logically, and clearly, associates it with life and ensures socialization (Dayan, 2017; Kahraman, 2013; Özpinar et al., 2017). Due to all these positive aspects, the digital storytelling method provides an enriched learning experience to students and prevents them from getting bored by attracting attention to the course (Ayvaz Tunç, 2016; Büyükcengiz, 2017). Besides these contributions of the digital storytelling method to education, it was also determined that it has some difficulties and limitations. Technological insufficiency such as hardware deficiency and insufficient sources experienced in the digital storytelling method, technical problems encountered during its implementation such as limited Internet access are among the problems mentioned frequently in terms

of integration with technology (Demirer, 2013; Dayan, 2017; Karakoyun, 2014). Another important problem encountered in the process of digital storytelling is that the method is demanding and difficult and preparation takes a long time (Büyükcengiz, 2017; Snoeyink & Ertmer, 2001). Besides, some of the other negative aspects of the method can be stated as the teachers don't have enough knowledge about the method, they are insufficient in the utilization of technology, and the students cannot reflect their thoughts totally (Ayvaz Tunç, 2016; Kaya, 2014).

To implement the digital storytelling method effectively in schools, such problems should be solved. In this context, it is very important to enable the students to have access to the Internet, technological devices such as tablets, computers, and sources (Robin, 2006). Otherwise, technological insufficiency will make the implementation of the method difficult, and this will lead to significant inconveniences. It can also be suggested that the skills of students and teachers to utilize these technological devices and the software products required for the implementation should be taken into consideration, and necessary training should be provided (Coghlan, 2004; Lai & Kritsonis, 2006; Lin & Lu, 2012; Schwab & Foa, 2001). It can be stated that technical support can be provided to students to eliminate problems such as technical ones, and this would enable them to overcome such problems; thus, it improves the effectiveness of the method. Besides, the students may pay attention to lessons without getting bored by providing reinforcement to them and directing them to their areas of interest (Karakoyun, 2014). It is considered that the guidance of teachers would be helpful to direct the students to the phases of storytelling and keep them active in the learning process in order not to diminish the success of implementation (Woodhouse, 2008). It is also stated in the literature that digital storytelling should be short, plain, and apprehensible (Gregori-Signes, 2014; Kearney, 2011; Clarke & Adam, 2011; Boase, 2008).

This study is limited to query terms and scientific studies on the effect of the digital storytelling method on academic achievement carried out between 2011-2020. Besides, the study is limited to analyses of coded moderator variables. Studies compiled in the present study are limited to M.Sc. and Ph.D. theses and articles published in peer-reviewed journals only in English and Turkish. The study does not include studies published in other languages and other types of publications (such as book chapters and presentations). These findings and results could only be generalized if they are evaluated within the same context. Therefore, different research findings could be obtained by conducting more in-depth and comprehensive research.

The present study aimed to investigate the effectiveness of the digital storytelling method on academic achievement using meta-analysis and its effect on different dimensions using meta-thematic analysis. It is thought that research findings and results will be a good reference for researchers and instructors as well as contributing to the literature. In future studies, variables such as attitude, motivation, and permanence could be investigated, sub-group analyses could be conducted considering the duration of the application, sample size, age, and gender, and the practicality and effectiveness of the digital storytelling method could be analyzed in more detail. It has been observed that studies included in the meta-analysis generally focus on secondary school. The analysis could be repeated by including future studies focusing on other education levels. The analysis could also be repeated and compared by including the findings of new studies on the digital storytelling method to be carried out in the future. It is suggested that research techniques such as meta-analysis method, which allows combining and interpreting different findings from similar individual studies, should be used more in studies carried out today when information has been increasing rapidly

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Domain Specific Hope Levels of University Students in Turkey: The Predicting Roles of Personal Belief in a Just World and Gender

Mine Muyan-Yılık[a*] & Ayhan Demir[b]

a. Asst. Prof. Dr., Izmir Democracy University, (http://orcid.org/0000-0001-9366-9173) * mine.muyan@idu.edu.tr

b, Prof. Dr., Middle East Technical University, (http://orcid.org/0000-0002-2113-2761)

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Abstract

The aim of the current study was to investigate the predicting roles of personal belief in a just world and gender in university students' hope levels in specific life domains (i.e., social relationships, romantic relationships, family life, academics, work life, and leisure activities). The participants were 168 university students from a major state university in Turkey. Data was collected with the Domain Specific Hope Scale, the Personal Belief in a Just World Scale, and a personal information sheet. Results of Multivariate Regression Analysis showed that both personal belief in a just world and gender were significant predictors of domain specific hope levels of university students. More specifically, personal belief in a just world was found to significantly predict university students' hope levels in academics, family life and leisure activities. In addition, female students were found to have higher hope levels in social relationships. Taken together, the findings highlighted the importance of studies on domain specific hope levels. Current findings were discussed within the context of the hope and just-world literature and gender roles in Turkey.

Keywords: Domain specific hope, personal belief in a just world, gender

Türkiye'deki Üniversite Öğrencilerinin Özel Yaşam Alanlarına İlişkin Umut Düzeyleri: Kişisel Adil Dünya İnancı ve Cinsiyetin Yordayıcı Rolü

Öz

Bu çalışmanın amacı, üniversite öğrencilerinin özel yaşam alanlarına (sosyal ilişkiler, romantik ilişkiler, aile yaşamı, akademik yaşam, iş yaşamı ve serbest zaman aktiviteleri) ilişkin umut düzeylerini yordamada kişisel adil dünya inançları ile cinsiyetlerinin rollerini incelemektir. Katılımcılar, Türkiye'de büyük bir devlet üniversitesinde okuyan 168 üniversite öğrencisidir. Veriler Özel Yaşam Alanlarına İlişkin Umut Ölçeği, Kişisel Adil Dünya İnancı Ölçeği ve kişisel bilgi formu ile toplanmıştır. Çok Değişkenli Regresyon Analizi sonuçları hem kişisel adil dünya inancının hem de cinsiyetin üniversite öğrencilerinin özel yaşam alanlarına ilişkin umut düzeylerinin anlamlı yordayıcıları olduğunu göstermiştir. Kişisel adil dünya inançlarının, üniversite öğrencilerinin akademik yaşamlarındaki, aile yaşamlarındaki ve serbest zaman aktivitelerindeki umut düzeylerini anlamlı şekilde yordadığı bulunmuştur. Ek olarak, kız öğrencilerin sosyal ilişkilerde daha yüksek umut düzeylerine sahip olduğu bulunmuştur. Sonuç olarak, bulgular özel yaşam alanlarına ilişkin umut çalışmalarının önemine işaret etmektedir. Mevcut bulgular, umuda ve adil dünya inancına ilişkin alanyazın ile Türkiye'deki cinsiyet rolleri kapsamında tartışılmıştır.

Anahtar kelimeler: Özel yaşam alanlarına ilişkin umut, kişisel adil dünya inancı, cinsiyet

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1 | INTRODUCTION

As a psychological strength and a well-known predictor of mental and physical health, hope is one of the well-studied concepts among university students (Cheavens & Ritschel, 2014). Hope Theory (Snyder, 1994; 2002) defines hope as a cognitive and goal-oriented thinking process which contains two distinguishable but related thinking processes, namely pathways thinking and agency thinking. Pathways thinking was introduced as one's perceived ability to produce primary and alternative routes to his/her desired goals whereas agency thinking was defined as one's goal-directed energy or motivation (Snyder, 2000). These components of hope are reciprocal, additive, and interact throughout the hope process (Snyder et al., 1991; Snyder, 2002). Hope Theory (Snyder, 1994; 2002) offers three levels of hope, namely dispositional hope, state hope, and domain-specific hope. According to Snyder and his colleagues (1996) people do not only have an enduring type of hope, dispositional hope, that is probably applied across different situations and times, but also people have state hope which is a representation of their current hope levels in a given time which may be affected by specific events. Moreover, Snyder and his colleagues (1997) indicated that there was a need for domain specific perspective for hope research. Snyder et al. (1997) stated that as people's hope levels vary depending on situations, it is important to examine their hope levels manifested in different life domains (i.e., social relationships, romantic relationships, family life, academics, work and leisure) which produced the concept of domain-specific hope.

Looking at hope literature, most of the hope studies are based on the first two levels of hope, dispositional and state hope (Cheavens & Ritschel, 2014; Çetin Gündüz, 2016 for reviews). However, as it can be easily observed, university students may behave or think very differently based on different life domains because of their developmental level. For instance, social life may have a greater role in their life since they are really interested in making friendships and love because of their developmental stage (Arnett, 2007). Similarly, Shorey et al. (2012) stated that life domains such as social relationships and achievements become more important rather than spirituality or health among college students. Shorey et al. (2012) highlighted that roles of college students are mostly based on their peer, romantic and family relations and academic achievement, and these life domains are more central to their self-concept. Consistently, studies on domain specific hope levels, which are quite limited in the literature, have pointed to the different levels of hope in these specific life domains among university students (e.g., Sympson, 1999; Şakar, 2019). Therefore, it may be better to investigate the third level, domain specific hope levels of university students and its predictors to reach a more holistic perspective among this specific sample of university students.

One predictor that may be worth to examine is people's own belief in a just world. Lerner's just world hypothesis stated that, "people want to and have to believe they live in a just world so that they can go about their daily lives with a sense of trust, hope, and confidence in their future." (Lerner, 1980, p. 14) Belief in a just world is conceptualized as one's belief that life events she/he has been experiencing are just (Kamble & Dalbert, 2012). In other words, it is the belief that one is living in a stable and orderly world which prevents her/him from unforeseen injustices (Correia et al., 2007; Lerner & Miller, 1978). Moreover, Correia et al. (2009) stated that even when facing with unfair treatments, one's belief in a just world may help the person to relieve the anxiety and increase the sense of control and hope for handling with the psychological threat of unfair treatments. Furthermore, Hafer and Gosse (2011) presented belief in a just world as a source for the sense of security and control which may help people engage in long-term goals. Given these explanations, one's belief in a just world may provide the basis for identifying goals, providing pathways to reach those goals and having the necessary motivation to follow those pathways which all together may refer to one's hope level. Research has also supported this contention as personal belief in a just world was found to be associated with higher hope levels (e.g., Otto & Dalbert, 2005; Uğur, 2007; Xie et al., 2011). For instance, Xie and her colleagues (2011) found personal belief in a just world to be a significant predictor of hope among 494 university students. However, the literature on belief in a just world-hope link is lack of findings on the relationships between belief in a just world and hope levels in

specific life domains of family, work, social relationships, romantic relationships, leisure, and academic life. To contribute to the literature, it may be important to understand the role of belief in a just world in university students' domain specific hope levels. Considering the just world literature, two types of belief in a just world is stated, namely personal belief in a just world and general belief in a just world (Dalbert, 1999; Lipkus et al., 1996). Personal belief in a just world refers to one's belief that the events in her/his own life are just whereas general belief in a just world refers to one's belief that the world is a just place (Kamble & Dalbert, 2012). This study focused on the role of personal belief in a just world rather than general belief in a just world since personal belief in a just world is suggested to be a better predictor of personal outcomes and mental health (Dalbert, 1999; Dzuka & Dalbert, 2002).

Another variable that may play a significant role in hope studies is gender. Hope studies provided controversial findings on gender differences. In scale development studies of Snyder and his colleagues (1991; 1996), gender was not found to have a significant association with hope. Similarly, some forthcoming studies abroad and in Turkey presented non-significant findings for gender differences on hope (e.g., Chang, 1998; Kemer & Atik, 2005; Snyder, 2002; Tarhan, 2012). However, some studies in Turkey found significant gender differences (Kemer & Atik, 2012; Küsgülü, 2014; Tarhan & Bacanlı, 2016; Türkmen & Demirli, 2011; Usta, 2013). For instance, Küsgülü (2014) found significant gender differences in hope among 526 university students. Therefore, the role of gender differences on hope in Turkish samples is still debatable (for a review, Çetin Gündüz, 2016). Moreover, despite these controversial findings of gender differences on dispositional or state hope levels of individuals, studies regarding gender differences on domain specific hope levels is quite limited both abroad and in Turkey (e.g., Mutlu, 2017; Sympson, 1997; 1999; Şakar, 2019; Yıldız Akyol & Işık, 2018). Sympson (1997) found significant gender differences on hope levels in family life and academics whereas she (1999) could only find significant difference on family life in her later study. Considering studies conducted in Turkey, in their study on hope in romantic relationships, Yıldız Akyol and Işık (2018) reached non-significant gender differences while Mutlu (2017) found female university students to have higher hope levels in family life and lower hope levels in romantic relationships, compared to male students, and Şakar (2019) found non-significant gender differences in domain specific hope levels among Turkish university students. Regarding the limited study on domain specific hope both abroad and in Turkey, it may be important to study this concept with its possible significant predictors, such as gender and personal belief in a just world.

Purposes of the present study

Given the possibilities presented above, we conducted this study to:

1) examine the relationships between university students' hope levels in social relationships, romantic relationships, family life, academics, work life, leisure activities and their personal belief in a just world.

2) investigate the predicting roles of personal belief in a just world, and gender in their hope levels in social relationships, romantic relationships, family life, academics, work life, and leisure activities.

2 | Method

The nature of the currently is correlational design. Correlational design is defined as investigating the possibility of relationships between two or more variables without applying any manipulation or intervention (Fraenkel et al., 2012). Correlational design is used for two general purposes, namely "to help explain important human behaviors or to predict likely outcomes" (Fraenkel et al., 2012, p. 332). We benefitted the prediction revealing characteristic of correlational design since the main purpose of the current study was to examine the prediction of personal belief in a just world and gender in domain-specific hope levels of university students. In prediction studies, under correlational design, the relationship between criterion variables and a combination of predictor variables is investigated (Fraenkel et al., 2012).

In the present study, domain specific hope levels were criterion variables whereas personal belief in a just world and gender were predictor variables.

Participants

Target population was Turkish university students who were native in Turkish and enrolled in an undergraduate program at a state university in Ankara, Turkey. The data were obtained from 168 voluntary university students from a major state university via convenience sampling. Among the participants, 93 were female (55.4%), and 75 were male (44.6%). Participants' ages ranged from 18 to 32 with a mean of 21.11 years (*SD* = 2.12). Participants included 20.2% freshman, 36.3% sophomore, 10.7% junior, 31% senior, and 1.8% who didn't indicate their class grade.

Data collection tools

In this study, the data collection tools were the Domain Specific Hope Scale, the Personal Belief in a Just World Scale, and a personal information sheet prepared by the researchers. The questions in the sheet were about gender, age and class grades of the participants.

Domain specific hope levels. The Domain Specific Hope Scale (DSHS; Sympson, 1999) was used to measure domain specific hope levels of the participants. The DSHS is a 48-item scale of hope levels in six life domains, namely social relationships, romantic relationships, family life, academics, work life and leisure activities. Respondents are asked to rate the extent to which they agree with the statements using an 8-point scale, ranging from 1 (totally disagree) to 8 (totally agree). Higher scores on the DSHS are indicative of greater hope levels in the related life domain. The Turkish adaption of the DSHS was made by Özbay and his colleagues (2011). Cronbach alpha coefficients for the life domains were ranged between .86 and .92 in Sympson (1999) and .83 and .93 in the adaptation study (Özbay et al., 2011). The Cronbach alpha coefficients in this study were found to be ranged between .81 and .89.

Personal belief in a just world. The Personal Belief in a Just World Scale (P-BJW; Dalbert, 1999) was used to measure the personal belief in just world levels of the participants. The P-BJW is a 7-item self-report of the belief that the events in one's own life are just. Respondents are asked to rate the extent to which they agree with the statements using a 6-point scale, ranging from 1 (totally disagree) to 6 (totally agree). Higher scores on the P-BJW indicate greater personal beliefs in a just world. The Turkish adaption of the P-BJW was made by Göregenli (2003). Cronbach alpha coefficients for the scale were .86 and .85 in Dalbert's (1999) study and Göregenli's (2003) study, respectively. The Cronbach alpha coefficient in this study was found as .89.

Data collection

The researchers supervised the implementation of the data collection tools in classroom settings. Participants were briefed about the purpose of the current study, anonymity of their identities, confidentiality of the data obtained, their rights during and after the data collection, and contact information of the researchers. The data collection process lasted for approximately 20 minutes.

Data analysis

In order to benefit from parametric or non-parametric tests, normality of the distribution was checked through a variety of values such as Kolmogorov-Smirnov and Shapiro-Wilk tests, skewness-kurtosis, Q-Q plots, and histograms. As for the Kolmogorov-Smirnov and Shapiro-Wilk tests, all study variables had significant values, although it is suggested that they must have non-significant values. Field (2009) suggests that these normality tests are very sensitive for detecting any minor deviations from normal distribution and they must be consulted with the values of skewness-kurtosis, histograms, and Q-Q plots. Consistent with this suggestion, these values were checked. Skewness values are expected to be lower than 3.00 whereas kurtosis values are expected to be lower than 10.00 for satisfying normality assumption (Kline,

2011). In this study, skewness values were ranged between -.12 and -2.02 while kurtosis values were ranged between .03 and 6.28. The histograms and Q-Q plots presented normal patterns for most variables. Taken together, it is decided to conduct parametric tests. To understand the relationships between study variables, bivariate correlations were checked. Subsequently, after checking necessary assumptions, multivariate linear regression was conducted to investigate the prediction of personal belief in a just world and gender in hope levels of university students in six life domains (social relationships, romantic relationships, family life, academics, work life, and leisure activities). Moreover, independent sample t-test was conducted to check the gender differences in domain-specific hope levels of university students. Data were analyzed by the Statistical Package Program for Social Sciences 22 (SPSS 22).

Research ethics

The ethical standards as specified by the APA were followed before and during the study. Prior to data collection, the necessary ethical permission was obtained from Middle East Technical University Human Subjects Ethics Committee with the decision number of 28620816/187-353. In addition to ethical permission, a voluntary participation form was utilized to the participants which informed them about the confidentiality, anonymity, purposes of the study, and contact information of the researchers and psychological counselling units in the campus. Moreover, all sources used in this study were cited in the references section, consistent with APA standards.

3 | Findings

Correlations, means, and standard deviations for all study measures in the present study are presented in Table 1. As seen in the table, hope levels in each life domain significantly correlated with each other with a correlation coefficient ranged between .15 and .58. Moreover, personal belief in a just world was found to be significantly and positively correlated with hope in academics (r = .19, $p \leq .01$), hope in family life (r = .35, $p \leq .001$), and hope in leisure activities (r = .20, $p \leq .01$).

Table 1. Correlations among Study Variables

Measures	1	2	3	4	5	6	7
1. P-BJW	--						
2. DSHS-Social	.55***	--					
3. DSHS-Academics	.23***	.58***	--				
4. DSHS-Romantic	.37***	.42***	37***	--			
5. DSHS-Family	.18**	.52***	.46***	.46***	--		
6. DSHS-Work	.27***	.06	-.01	.01	-.17**	--	
7. DSHS-Leisure	-.08	.18**	.20***	-.01	.29***	-.26***	--
Range	7-35	9-45	4-20	5-25	4-20	6-30	20-72
M	22.09	23.10	10.95	15.13	8.28	23.08	35.24
SD	5.26	7.64	3.35	4.85	3.28	5.04	11.50

N = 168. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$. P-BJW = Personal belief in a just world; DSHS-Social = Hope in social relationships; DSHS-Academic = Hope in academics; DSHS-Romantic = Hope in romantic relationships; DSHS-Family = Hope in family life; DSHS-Work = Hope in work life; DSHS-Leisure = Hope in leisure activities.

Belief in a just world and gender as predictors of domain specific hope levels of university students in Turkey

In order to examine whether personal belief in a just world and gender account for unique variances in hope levels of Turkish university students in six life domains (social relationships, romantic relationships, family life, academics, work life, and leisure activities), a multivariate linear regression analysis was

conducted. Results of the Multivariate Regression Analysis are presented in Figure 1. As Figure 1 presents, personal belief in a just world was found to be a significant predictor of domain specific hope levels of Turkish university students, V = 0.16, F (6, 160) = 5.02, p < .001. Similarly, gender was found to be a significant predictor of domain specific hope levels of Turkish university students, V = 0.09, F (6, 160) = 2.70, $p \leq .01$.

				Univariate																
	Multivariate			DSHS-Social			DSHS-Academics			DSHS-Romantic			DSHS-Family			DSHS-Work			DSHS-Leisure		
Variable	F^a	p	η^2	F^b	p	η^2	F^b	p	η^2	F^b	p	η^2	F^b	p	η^2	F^b	p	η^2	F^b	p	η^2
P-BJW	5.02	.00	.16	2.31	.13	.01	7.05	.01	.04	2.76	.10	.02	25.10	.00	.13	3.43	.07	.02	7.19	.01	.04
Gender	2.70	.02	.09	8.55	.00	.05	3.80	.05	.02	1.69	.19	.01	.78	.10	.02	.03	.86	.00	.89	.35	.01

Note. Multivariate F ratios were generated from Pillai's statistics. P-BJW = Personal belief in a just world; DSHS-Social = Hope in social relationships; DSHS-Academic = Hope in academics; DSHS-Romantic = Hope in romantic relationships; DSHS-Family = Hope in family life; DSHS-Work = Hope in work life; DSHS-Leisure = Hope in leisure activities

[a]Multivariate df = 6,160. [b]Univariate df = 1, 165.

Figure 1. *Multivariate and Univariate Regression Analyses for Domain Specific Hope Levels*

Accordingly, the unique predicting roles of personal belief in a just world and gender in different life areas were checked. In order to understand the significance of the predictors but also avoid Type I error, we benefitted from Bonferroni corrections by diving the alpha to our comparison number. Therefore, the new alpha was set as .008 (.05/6). Considering the prediction of hope in different life areas, personal belief in a just world significantly predicted hope in academics (V = 0.04, F (1, 165) = 7.05, $p \leq .01$), family life (V = 0.13, F (1, 165) = 25.10, p < .01), and leisure activities (V = 0.04, F (1, 165) = 7.19, $p \leq .01$). Moreover, gender significantly predicted hope in social relationships (V = 0.05, F (1, 165) = 8.55, p < .01). In order to test the gender differences, an independent samples t-test was run for hope in social relationships. According to the results, significant gender differences were found [t (166) = 2.83, p < .01]. More specifically, results indicated that females (M = 51.12, SD = 7.41) had significantly higher hope levels in social relationships than males (M = 47.57, SD = 8.83).

4 | Discussion and Conclusion

In this study, it was aimed to investigate how well university students' personal belief in a just world and gender predicted their hope levels in social relationships, romantic relationships, family life, academics, work life and leisure activities. As the previous studies suggested, it was expected that belief in a just world would be a significant predictor of hope. Consistent with previous studies (Otto & Dalbert, 2005; Uğur, 2007; Xie et al., 2011), we found personal belief is a just world to significantly predict hope levels of university students. The prediction of personal belief in a just world in hope levels of individuals may be explained by Lerner's contention (1980) that belief in a just world is a necessity for engaging in making long-term goal plans and providing the necessary effort to reach those goals. As Hafer and Gosse (2011) indicated, the sense of security and control over situations, which is fed by one's personal belief in a just world, may provide the necessary energy and motivation for hopeful thinking process.

Moreover, it was also expected that the prediction of personal belief in a just world might vary depending on life domains, especially in this specific group of university students. Consistently, personal belief in a just world was found to play different roles in predicting hope levels in different life domains. More specifically, personal belief in a just world was found to significantly predict hope levels in academics, family relationships, and leisure activities whereas it failed to predict hope levels in social relationships, romantic relationships and work life. In other words, the university students believed that only in academics, family life, and leisure activities they could get whatever they deserved in this study. Although studies indicate the importance of peer relations, romantic relationships, family relationships and

achievements in school for university students (Arnett, 2007; Shorey et al., 2012), our findings which are limited to significance of personal belief in a just world on academics, family life and leisure activities may be explained by the unique characteristics of this specific sample of university students. Recalling the sample characteristics, these students are very high achievers who succeed in enrolling and continuing their education in one of the best universities in Turkey; and most of them are in their first or second year in the university. Based on these characteristics, we may think that they may have more experiences in family life, leisure activities and academics, and may have the chance to see the results of their efforts in these life areas. To exemplify, their own experience as they worked really hard and deserved to be in this successful academic life may provide a personal evidence for these university students that they can set goals, produce pathways, and maintain the necessary motivation to follow these pathways in academic life. Hafer (2000) indicated that believing that you will be treated as you deserve helps individuals to invest more into their own future. Consistently, our participants who believed that their personal world was just may have invested their academic life, family life, and leisure activities more, which may predict higher levels of hope in these life areas. Considering the non-significant prediction of personal belief in a just world in hope in other life areas (i.e., social relationships, romantic relationships, and work life), the participants may have the belief or experiences that engaging in goal-oriented thinking processes and sustaining these processes in social or romantic relationships may require more than one's personal efforts and one's related belief of a just world. For instance, in addition to one's effort, the effort of other individuals in the relationship, luck or circumstances may also play an important role in these life domains. Moreover, some life domains may be unclear for the participants because of the limitation of experiences in these life areas. To clarify, since our participants are university students, their understanding of work life may be unclear or if they haven't got significant romantic relationships, this life area may also be unclear for them, which may influence their indications and prevent us from finding a significant link between personal belief in a just world and hope levels in these life areas. Given the very few studies on the relationships between personal belief in a just world and domain specific hope levels, further studies are strongly needed to better understand and discuss current findings.

Another important question of this study was investigating the gender differences in terms of predicting domain specific hope levels of university students. The role of gender has been controversial in the Turkish studies (for a review, Çetin Gündüz, 2016). Moreover, there are rather limited studies on the gender differences for hope levels in different life domains (Mutlu, 2017; Sympson, 1997; 1999; Şakar, 2019; Yıldız Akyol & Işık, 2018). In this study, it was found that gender played a significant predicting role only in hope levels in social relationships. This finding is inconsistent with the findings of previous studies (Mutlu, 2017; Sympson, 1997; 1999; Şakar, 2019) which ended with non-significant prediction of gender on social relationships. Gender differences on hope levels are usually explained by gender roles (e.g., Sympson, 1999; Tarhan & Bacanlı, 2016). Our finding related to the higher hope levels of female students in social relationships may also be explained with the gender roles in Turkey. Women may be provided with more skills and opportunities to set goals, produce pathways and maintain the necessary motivation towards those social goals than men in Turkish culture. For instance, previous studies indicated that compared to men, women are more inclined to open themselves (Gültekin, 2001; Gündoğdu, 2010) and perceived themselves more positively than men in communication skills (Korkut, 2005). Moreover, Knox et al. (2007) provided the findings that male university students had lower knowledge on how to make friends, therefore had limited socializing experiences on starting, developing and maintaining social relationships. Furthermore, stronger relational tendencies of women in Turkey was highlighted in previous studies (İmamoğlu, 2003; İmamoğlu & İmamoğlu, 1992). Taken together, gender differences on socializing processes and gender roles in Turkey which provides more opportunity for women to socialize may prepare the basis for gender differences in hope levels in social relationships.

The non-significant gender differences in domain specific hope levels of university students is consistent with the findings of Şakar (2019). According to her comparison with 1227 university students,

domain specific hope levels did not differentiate in terms of gender of the participants. Regarding the non-significant gender differences in hope in other life areas may be related to several explanations. Firstly, this finding may indicate that hope could be a gender-free variable where neither women nor men differentiate in these life areas. More specifically, our female or male students have similar hopeful thinking process in romantic relationships, family life, academics, work life and leisure activities. Hafer and Gosse (2011) explained that for hopeful thinking processes, individuals may need the sense of security and control over situations. Our participants' sense of security and control in these related life areas could be at similar levels. Another explanation for reaching non-significant findings in these life areas may refer to decreases in the effect of gender roles in romantic relationships, family life, academics, work life and leisure activities in this sample who spent most of their time with their friends in the university campus. Taken together, varying predicting role of gender in hope levels in different life areas in this study supports the controversial findings in the hope literature (Cheavens & Ritschel, 2014; Çetin Gündüz, 2016).

The findings of the current study provided evidence for the predicting role of one's personal belief in a just world in her/his domain specific hope levels. Previous studies clearly showed that higher hope is associated with higher positive outcomes whereas lower hope is a predictor of adverse outcomes (see reviews, Cheavens & Ritschel, 2014; Çetin Gündüz, 2016). Therefore, enhancing hope levels of university students gains importance. To do so, in addition to the direct interventions to increase hope levels (Cheavens et al., 2006; Feldman & Dreher, 2012), focusing on one's belief in a just world may also work. For instance, university counseling centers may develop or adapt activities and interventions for increasing the just world understanding of their students. Experiences supporting belief in a just world in universities may be provided more frequently. For instance, even providing stories with a just world was found to be associated in higher belief in a just world levels in Correia et al.'s (2009) study. Additionally, university counseling centers may offer trainings or seminars to instructors about the belief in a just world and its possible influences on students' lives, and how to support this belief by their teaching and evaluation processes. Moreover, this study reached significant gender differences on domain specific hope levels. As the just world literature suggests the sense of control and security for goal pursuits (Hafer & Gosse, 2011), universities may work on strengthening their students' sense of control and security in life areas. Furthermore, considering the gender difference on hope in social relationships in favor of female students, university counseling centers may provide programs or interventions for socialization skills, especially for male students.

Despite the importance of the current study as being one of the first studies on belief in a just world, gender and domain specific hope levels among university students, it also has some limitations. Firstly, since this is not an experimental study, it could not provide a cause-and-effect relationship between study variables. Secondly, as the design was cross-sectional, it could not detect the changes on study variables across time. Thirdly, since the sample of this study was gathered through convenience sampling procedure, the findings could be generalized limited to similar samples. To enhance the generalizability, future studies may benefit from random sampling procedures in their studies. Fourthly, this study investigated the predictor role of personal belief in a just world and gender; following studies may benefit from different variables in understanding domain specific hope levels of university students.

Concluding thoughts

This study was conducted to investigate whether personal belief in a just world and gender predicted hope levels in social relationships, romantic relationships, family life, academics, work life, and leisure activities among Turkish university students. Our findings indicated that personal belief in a just world and gender not only were significant predictors of domain specific hope levels of university students, but also they played different roles in predicting hope in different life domains. Thus, this study provided evidence for the importance of more-nuanced hope studies which go beyond investigating only dispositional or state hope levels of individuals. The current study has important contributions for domain specific hope research in Turkey. However, it also revealed the need for more research on individuals' just world beliefs

and its influence on hope, and gender-sensitive approaches for enhancing university students' hope levels in specific life domains.

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Statement of publication ethics

The author of the current study declare that the research has not any ethical problem and the research and publication ethics were considered in the study.

Conflict of interest

The authors declare that the study has not any conflicts of interest with respect to the research and/or authorship

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Science for Students with Visual Impairment: An Analysis of Hands-on Activity

Seraceddin Levent Zorluğlu [a*], Aydın Kızılaslan [b], & Mustafa Sözbilir [c]

a, Asst. Prof. Dr., Süleyman Demirel University (http://orcid.org/0000-0002-8958-0579) * seraceddinzorluoglu@sdu.edu.tr

b, Asst. Prof. Dr., Ağrı İbrahim Çeçen University (http://orcid.org/0000-0003-3033-9358)

c, Prof. Dr., Atatürk University (http://orcid.org/0000-0001-6334-9080)

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Abstract

Science courses are considered to be one of the most difficult courses since they contain difficult and abstract concepts for the individual who needs special education. Because traditional science teaching is mostly based on visual teaching. However, an effective science education can be done by making instructional adaptations and taking into account the individual needs of the students. In this study, the science activities and materials prepared by taking into consideration the needs of the students with visual impairment using the case study of qualitative research methods were made. the study sample consisted eight students including three blind and five students with low vision. The Activity Evaluation Scale (AES) was used to collect data. At the end, activities and materials were evaluated by teacher and independent researchers. In order to ensure the reliability of the study, the videos which were recorded during the course separately analyzed by the researchers, the AES was filled and then the analyses of the researchers were compared. As a result, it was determined that the science activity and materials prepared for the students with visual impairment can be useful in teaching the concepts of heat conductor and heat insulator.

Keywords: Students with visual impairment, science education, science activities, science materials

Görme Yetersizliği Olan Öğrencilere Fen Eğitimi: Uygulamalı Etkinlik Analizi

Öz

Fen dersleri, çoğu özel eğitime gereksinim duyan birey için zor ve soyut kavramlar içerdiğinden en zor derslerden biri olarak kabul edilir. Çünkü geleneksel fen öğretimi çoğunlukla görsel öğretime dayandırılmıştır. Fakat öğretimsel uyarlamalar yapılarak ve öğrencilerin bireysel ihtiyaçları göz önünde bulundurularak etkili bir iyi fen öğretimi yapılabilir. Bu çalışmada nitel araştırma yöntemlerinden durum çalışması kullanılarak görme yetersizliği olan öğrencilerin ihtiyaçları dikkate alınarak hazırlanan fen etkinlik ve materyallerinin analizi yapılmıştır. Çalışma grubu üç görmeyen ve beş az gören öğrenciden oluşturmaktadır. Çalışmada veri toplama aracı olarak Etkinlik Değerlendirme Ölçeği (EDÖ) kullanılmıştır. Etkinlik sonunda dersi yürüten öğretmen ve bağımsız araştırmacılar tarafından etkinlik ve materyalleri değerlendirilmiştir. Çalışmanın güvenirliğinin sağlanması amacıyla ders esnasında kaydedilen videolar araştırmacılar tarafından ayrı ayrı izlenerek EDÖ doldurulmuş ve daha sonra araştırmacıların analizleri karşılaştırılmıştır. Sonuç olarak görme yetersizliği olan öğrenciler için hazırlanan fen etkinlik ve materyallerinin ısı iletkeni ve ısı yalıtkanı kavramlarının öğretiminde yararlı olabileceği tespit edilmiştir.

Anahtar kelimeler: Görme yetersizliği olan öğrenciler, fen eğitimi, fen etkinlikleri, fen materyalleri

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1 | INTRODUCTION

Visual impairment is a decreased ability to see to a degree that causes problems not fixable by usual means, such as glasses (Lusk & Corn, 2006). Students with disabilities face many difficulties in learning science subjects and concepts due to the disadvantages arising from disability (Isaacson, Supalo, Michaels & Roth, 2016). The abstract nature of the concepts in science lessons can prevent students' active participation in science activities (Kizilaslan, Zorluoglu & Sozbilir, 2020). Since these students feel insecure, they think that they will not be successful in science activities and will not be able to comprehend science subjects (Nepomuceno, Decker, Shaw, Boyes, Tantillo & Wedler, 2016). It is thought that these students will be able to learn, participate in activities and be interested in science by preparing activities considering their inadequacies for students with disabilities or by using sufficient amount of supplementary materials in teaching (Pence, Workman & Riecke, 2003). Teaching and students' learning can be facilitated by preparing tactile and audio materials for individuals with visual impairment, visual materials for individuals with hearing impairment, and materials that will teach individuals with intellectual disabilities at a simple level (Cavkaytar, 2013; Kızılaslan, Sözbilir & Zorluoğlu, 2019; Mete, Çapraz & Yıldırım, 2017).

Considering that 80% of learning is provided by the sense of vision (Ataman, 2012; Özkan, 2013), students with visual impairment are at a more disadvantage than other students with disabilities in terms of learning (Kızılaslan, Sözbilir & Zorluoğlu, 2019). For this reason, the sense of vision is very important in individuals' learning. Visual impairment occurs when individuals' vision is lower than normal vision (Cavkaytar & Diken 2012; Farnsworth & Luckner, 2008). In particular, academic and conceptual development, communication, life skills, and movement skills are negatively affected by visual impairment. In this sense, long processes of concept and skill development are required in these individuals, and organs other than the sense organ should be integrated into educational interventions in order to shorten this process (Lee & Templeton, 2008).

Students with visual impairment use their senses of hearing, touch, smell, and taste for the purpose of accessing information, apart from the sense of sight (Douglas & McLinden, 2005). Different learning situations and needs arise depending on the use of these students' senses (Pence, Workman & Riecke, 2003). The changing learning styles of these students depending on the existing visual impairment and visual impairment; It requires determining the educational needs of individuals, taking individual differences into consideration and restructuring the educational process. This situation varies according to the content of the courses, subject and concept density (Beard, Carpenter & Johnston, 2011).

Courses that require field knowledge are the most important lessons that students with visual impairment fall behind in the teaching process, both cognitively and educationally (Sapp & Hatlen, 2010). It is known that students with visual impairment cannot learn the subjects and concepts as effectively as other students in science lessons, especially due to the fact that they contain abstract concepts (Gray, 2009), and they need supporters that facilitate the student's learning (Zorluoğlu & Sözbilir, 2017).

In the learning process, individuals use cognitive processes effectively and structure information by constructing various patterns in the mind (Schreuer, Sachs, & Rosenblum, 2014). Information needs to be received by individuals, structured in the mind, shaped by individual and environmental thoughts and transferred to life (Cavkaytar & Diken 2012; Johnsen, 2001). In this context, science education makes sense with the fact that the information acquired in the process is applicable in daily life (Smith & Kelley, 2007). The purpose of science education in terms of acquiring applicable knowledge in daily life is to create an information society that is aware of science in this information age and to train individuals with the knowledge, skills, attitudes and behaviors required by the age (McGinnity, Seymour-Ford & Andries, 2004). Every student involved in the education process should acquire knowledge, skills and attitudes related to science courses (Fraser & Maguvhe, 2008). However, in science education for students with visual impairment, it is very important to bring different senses to the forefront in gaining the knowledge, skills and attitudes specified in the program and to integrate the materials that can use these sensory organs

into teaching (Gyimah, Sugden & Pearson, 2009). Students who actively participate in the process and use supportive materials in teaching will learn more easily and there will be no misconceptions related to incorrect learning.

In the light of the data obtained from misconceptions made for different learning areas in the science course; even students with normal vision have misconceptions about the basic concepts in learning areas. (Mastropieri & Scruggs, 2010). In line with these results, students who have low vision or is blind cannot participate actively in the learning process. Also, teaching with incomplete or non-existent materials do not reflect the desired concept to be taught. It is thought that there may be more / different conceptual deficiencies (Mitchell, 2008). These conceptual deficiencies of the students with visual impairment who learn the information to be learned due to the lack of visual perception, the most important sensory sense, have been supported by some studies that can be solved by various teaching methods, techniques, strategies and designs (McLoughlin & Lewis, 2005).

When the studies on science teaching for the students with visual impairment were examined, it was found that most of them were hand-on studies. Linn and Thier (1975) made adaptations in the science program and materials to enable students with visual impairment to learn science courses in the inclusive classes. Lunney (1994) developed a computer software program for students with visual impairment to benefit from the chemistry laboratory effectively. Ratliff (1997) developed two experiments in the general chemistry laboratory that can be performed by students with visual impairment. Gupta and Singh (1998) developed experimental materials for students with visual impairment to conduct chemistry experiments with cheaper methods in the chemistry laboratory. Jonesi, Andre, Superfine and Taylor (2003) found that computer haptics interact with viruses on the microscope slide.. Beck-Winchatz and Ostro (2003) developed three-dimensional materials in the teaching of asteroid concept and taught the concept with real asteroids falling into our world. Supalo (2005) mentioned the teaching techniques that can be used by teachers to make chemistry courses more efficient for students with visual impairment, and mentioned techniques that can be developed to get more efficient grades and participate in classes. McGookin and Brewster (2007) developed a tactile tool and an application that allowed students with visual impairment to create bar graphs interactively. Neely (2007) developed laboratory materials in order to enable students with visual impairment to benefit from laboratory studies better. Poon and Ovadia (2008) developed tactile-based teaching materials for the effective processing of chemistry courses. Bromfield-Lee and Oliver-Hoyo (2009) developed laboratory activity to help students better understand the esterification of chemistry using their sense of smell. Boyd-Kimball (2012) developed adaptive tools and teaching techniques for blind students studying at the undergraduate level chemistry department. These tools include writing and balancing chemical reactions, unit conversion and concentration calculation, drawing Lewis's point structures, understanding and writing structural representations of molecules with three-dimensional models. Darrah (2013) examined the learning of the contents of the curriculum by using computer haptics and visual and auditory supporters to increase the access to mathematics and science.

In this study, the needs of the students with visual impairment were determined in order to teach science concept. Because of the fact that the concepts of heat conductor and heat insulator are abstract concepts, it is a known fact that students without visual impairment have difficulty in learning abstract science concepts and students with visual impairment have difficulty in learning abstract concepts even though they are supportive in learning abstract concepts. This study aims to teach the science concepts related with heat transfer topic

2 | METHOD

RESEARCH DESIGN

Case study was used in this study. Case studies aim to investigate a single person, group, event or community (McMillan & Schumacher, 2010). Typically, data is collected from various sources and using various methods (e.g., observations and interviews). Research can also continue for a long time, so processes and developments can be studied as they are (Creswell, 2007). As shown in Figure 1, the stages of the study can be listed as follows:

I. The needs of the students with visual impairment to learn the science course gains were determined

II. Taking into account the information obtained in the first step, activities and materials for the concepts of heat conductor and heat insulator have been developed

III. The activities and materials developed in the second stage were applied to the students in the classroom environment.

IV. The contribution of activities and materials to learning related concepts is examined.

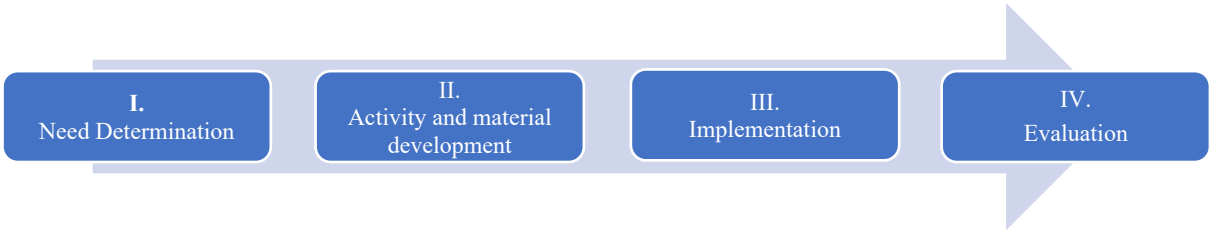

Figure 1. *Stages of the Study*

In the first stage, conceptual learning difficulties related to the concepts of heat, heat conductor and heat insulator were determined. For this purpose, in-class observations video camera recording and semi-structured interviews was used. In the second stage, activity, activity material and course module were developed in line with these identified needs (Appendix 1). For this purpose, firstly the individual needs of the students due to visual impairment were classified. For the students with low vision and blind students, the characteristics of the materials (the size of the material, - the size of the security, etc.) are designed for the students with low vision. The documents prepared for the students with low vision were in Century Gothic font and at least 18 font size. According to the research Century Gothic was identified as the best readable font by students with visual impairment (Çakmak, Karakoç, Şafak & Kan, 2014). The principles of module, activity and activity materials are as follows (Bailey & Daniel, 1993; Brigham, Scruggs & Mastropieri, 2011; Çakmak, Karakoç, Şafak & Kan, 2014; Sözbilir, Zorluoğlu & Kızılaslan, 2019; Karakoç, 2016; Teke & Sözbilir, 2019):

1. Pay attention to the fact that the prepared materials address multiple senses.

2. The articles on the materials prepared for the students with low vision should be at least 18 pt.

3. Teaching materials and information for the purpose of the contrast to be created on the document should be in a contrast.

4. Instructional material should be formed from substances that stimulate the sense of tactile and reveal similarities and differences.

5. Ratio-scale, integrity, accent and harmony adjustment should be provided as a whole. In other words, the harmony of an object with the other object and its relation with the whole should be given importance.

6. The prepared materials should be appropriate to the students' characteristics (age, intelligence and order of past experiences).

7. The meaning of material makes learning easier. For this purpose, the material must be exactly matched with the subject or concept intended for teaching.

8. Emphasis should be placed on the acquisition of cognitive knowledge as well as affective and psychomotor skills.

9. Heterogeneous groups should be formed according to the students' vision level in material design integrated with activity.

The module booklets prepared for the course are presented to two experts in science education and special education. The experts have examined the guidelines in terms of scope, structure, language and appearance. These experts specifically examine scientific conceptual understandings of students with visual impairments. Their works include exploring students' with visual impairments conceptual understanding of physical and environmental science through inquiry-based education. The module booklets were revised in line with the opinions taken from the experts and the teacher.

STUDY GROUP

The study group consisted of a total of eight students, three of them were blind and others were low vision. Three of the students are girls while five of them are boys. The age range is between 12 and 15 years. Two students receive access support for independent movement, while six students do not need access support for independent movement. Two students need an auxiliary material to read, while six do not need any supplementary material for reading (Table 1).

Table 1. Sample of the Study

Students	Gender	Age	Visual acuity	Mobility training	Use reading aids
S_1	Female	13	Blind	Receive training	No
S_2	Female	15	Low vision	No training	Yes
S_3	Female	14	Low vision	No training	Yes
S_4	Male	14	Low vision	No training	No
S_5	Male	13	Low vision	No training	No
S_6	Male	12	Low vision	No training	No
S_7	Male	13	Blind	Receive training	No
S_8	Male	15	Blind	No training	No

DATA COLLECTION TOOLS

Data were collected using the Activity Evaluation Scale (AES) (Table 2). In the first stage, evaluation criteria were determined by taking the opinions of three science education and one special education expert. In the evaluation criteria, the general analysis of the activity and the contribution of the activity to the teaching of the subject and concept were examined. The activities and materials prepared for the students with visual impairment were evaluated by the teachers and independent researchers conducting the course. The graded system in the scale is ‘strongly agree’ (4), ‘agree’ (3), ‘neutral’ (2), ‘disagree’ (1), and ‘strongly disagree’ (0). Necessary corrections have been made in the evaluation criteria considering the expert opinions. In order to ensure the reliability of the study, the videos recorded during the course were watched by independent researchers separately and they were asked to complete the AES form. As a result of independent analyses, the compliance percentage was determined as 77.7%.

Table 2. Activity Evaluation Scale (AES)

Performance Criteria	Ratings					Score
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	
The activity was appropriate to the level of interest and understanding						
The activity was clearly and logically organized						
The instruction materials were practical						
The activity duration was appropriate						
The activity met the identified needs						
The activity was easy to understand						
The activity was relevant to students' educational needs						
The activity was well-structured and organized						
Over-all quality of the activity met students' expectations						
Total score (Researcher)						
Total score (Teacher)						
Mean score						

Data Analysis

Descriptive data analysis method was used in the study. In descriptive analysis, data may not be interpreted according to previously determined themes. In a descriptive analysis, where data are presented with a flexible approach, direct quotations are frequently used to reflect the views of the individuals interviewed or observed (Hill, Thompson, & Williams, 1997). During the course module, the courses were recorded with the help of video camera. In order to ensure validity and reliability, the courses were recorded in the video camera and the situations considered as necessary were followed again and compared with the first observations.

3 | Findings

In this section, the course module, science activity and activity materials prepared for the purpose of teaching the heat, heat conduction and heat insulation concepts will be evaluated. Before proceeding to the findings, a detailed analysis of the course will be carried out (Figure 2 below).

The course is student-centered. At the beginning of the course, the teacher presented the materials to be used and asked the students to examine the materials. The teacher asked the question what is in his hand to check if the materials are understood by the students. After receiving the necessary answers, the activity document prepared by taking into account the inadequacies of the students were distributed to the students and the students were asked to read them individually. The talking thermometer was used to perform the activity individually. During the activity, the teacher asked questions about the activity - so that the students could understand what they were doing and to make sense of the information they obtained. At the end of the activity, the students were asked about the concepts of heat conductor and heat insulator by asking the end of the activity to be structured by the students. At the end of the course, the information sheets prepared by taking into consideration the inadequacies of the students to consolidate the information they have learned were distributed.

Beginning of the course:

Teacher: Now I'm going to give you the materials of the activity we are going to do today and you will examine them.

The teacher gives the wooden spoon, iron spoon, talking thermometer and glass bowl assembly to the students and asks the students to examine these materials.

Teacher: Yesss. You think this is what?

S8: This is the spoon. It's like iron.

Teacher: So what is this S6?

S6: My teacher is a wooden spoon. Light already.

Teacher: If everyone understands what is in front of them, you will distribute the activity sheets and try to understand it because you will make the activity.

The teacher distributes and prepares the papers of activity which are prepared by taking into account the inadequacies of each student. Then he asks the following questions to test if the students understand what they are reading and gets an answer:

Teacher: What will we find at the activity?

S1: Heat conduction of the spoon

Teacher: we'll find out which spoon conveys less heat at this activity.

Teacher: What are the necessary materials?

S3: Two pieces of iron spoon, wooden spoon, bowl, hot water, cold water, speaking thermometer.

Teaching of course:

Teacher: Now everyone should touch the bowl without touching too much. What do you feel?

S4: Hot

Teacher: Now measure the temperature of both the wooden spoon and the iron spoon with your hand and the thermometer.

Teacher: Now what do you expect to have on your spoons?

S7: Can I say it? We expect the spoon to be hotter.

Students measure the temperature of the spoons and wait for a certain time to touch the spoons and measure the temperature of the spoons with the thermometer again.

Teacher: Which is hotter which is colder? Yeah, S2, touch me which is hotter and which is colder?
S2: The following is hotter (iron spoon), it is more cold (wooden spoon)
Teacher: how were the spoons you put in this bowl?
Students were warm.
Teacher: How were the spoons after putting hot water in it?
S5: iron spoon was warmer than the wooden spoon was warm.
Teacher: How did you think the iron spoon became hot here?
S6: gave hot water temperature
Teacher: What happened when it was hot?
S1: received heat from water.
Teacher: what we aimed from the outset was to determine the heat conductor and heat insulator. Which of these materials do you think is the heat conductor which is the heat insulator?
S5: The thing is iron is warmer than the hot board.
S4: Iron conveyed heat then the board did not pass fully.
Teacher: whichever heat conductor is the heat insulator?
S4: Iron is the conductor of heat conductor.
Teacher: we can say on the board as heat insulator.
Students: Yesssss.
The teacher summarizes the activity and defines the concepts of heat conductor and heat insulator and distributes the leaflets prepared by taking into consideration the inadequacies for the students to repeat.

Figure 2. *Observations on the Implementation of the Module in the Classroom*

It is seen that the activity meets the needs in many areas in the analysis of the effectiveness according to the evaluation areas, experts and teacher evaluation (Table 4). According to Table 4, one of the expert researchers gave three points to the attractiveness of the event and the other expert researcher and teacher gave it full score. All evaluators stated that the activity was organized in a logical way and that the materials were simple and practical and the duration of the activity was appropriate. Similarly, experts and teachers stated that the activity met the learning needs, was easy to understand, allowed for collaborative work, activity steps were well structured and the activity met the expectations.

Table 4. Analysis of the Activity According to Evaluation Field

Activity Evaluation Field	Teacher Assessment	Researcher Assessment	Researcher Assessment	Total Score	% performance
The activity was appropriate to the level of interest and understanding	4	4	3	11	92
The activity was clearly and logically organized	4	4	4	12	100
The instruction materials were practical	4	4	4	12	100
The activity duration was appropriate	4	4	4	12	100
The activity met the identified needs	4	4	4	12	100
The activity was easy to understand	4	4	4	12	100
The activity was relevant to students' educational needs	4	4	4	12	100
The activity was well-structured and organized	4	4	4	12	100
Over-all quality of the activity met students' expectations	4	4	4	12	100

4 | Discussion & Conclusion

Students with visual impairment use their other senses at different degrees and frequency depending on the insufficiency in their vision. By taking into consideration the individual needs of the students, it is possible to facilitate the access to scientific knowledge to individuals with visual impairment by means of different senses in the teaching process (Holahan, McFarland & Piccillo, 1994). In this study, an activity design and activity materials related to this activity were designed so that students with visual impairment can better understand the subject of heat transfer. These activity materials consist of student activity sheet and teacher information package. These activity materials were brought to the forefront of the students' different senses and the students were included in the concept learning process related to the subject

A course package was prepared for the teachers and students to carry out the activity process in a clear, comprehensible and logical framework. As included in the appendix, it was provided to enable the teacher to carry out the course in a planned process by including information on how to include the total blind and low vision students in the course information package and what adaptations they should make in terms of security and the questions to be asked during the activity process (Kızılaslan, 2019). In our country, the implementation of disaggregated schools, in which all individuals in need of special education cannot participate in the integration, are continuing. Specialist teachers in these schools may be inexperienced due to lack of specialization in the branch of special education (Kızılaslan, Sözbilir & Zorluoğlu, 2019). Therefore, elaboration of the teaching process in the course information package increases the self-confidence of the teachers and contributes to the active participation of the students. Activity materials were chosen from daily life products, this has enabled the students to be more easily involved, especially in total blind students. Especially for the total blind student using the sense of touch, the easy perception of daily living materials makes it easier to learn and save time (Kumar, Ramasamy &

Stefanich, 2001). The activity was completed in the determined time and care was taken not to step out of the curriculum. As can be seen in the activity analysis, students were brainstormed during the activity process and students were asked questions for evaluation by the end of the activity. It can therefore be concluded that the activity met the learning needs of students. The fact that the activity was chosen from the daily living materials and the activity process was structured for both the teacher and the student facilitated the understanding of the activity. The fact that the message to be given is simple and does not allow sensory confusion is one of the factors facilitating learning especially in students with visual impairment (Dickerson, Smith & Moore, 1997). The fact that the activity consisted of two heterogeneous groups led the students to carry out the activity process in cooperation. Weisberger (1995) states that very structured inquiry and cooperative learning for children with visual impairment is the most effective method in science teaching. Students with low academic success learn in a collaborative environment better than their gifted peers (Kapperman, Heinze & Sticken, 2010; Kizilaslan, Zorluoglu & Sozbilir, 2020). In an inclusive class, collaborative learning among students with different learning abilities and learning needs has proved to be effective in promoting academic achievement, promoting positive attitudes towards the subject and improving social interaction between students (Heward, 2006; Zorluoglu, Sözbilir & Kızılaslan, 2016).

Suggestions

Students with visual impairments use their other senses at different degrees and frequency depending on the insufficient vision. By considering the individual needs of students, it can be facilitated for individuals who are affected by visual impairment to access scientific information by emphasizing different senses in the education-teaching process.

Standard curriculum is applied in schools in Turkey, individual needs or special needs of students are often ignored. Therefore, there is a need for adaptations and improvements in science teaching for individuals with visual impairment. In this study, the teaching of the concept of heat transfer with differentiated teaching materials and activities was done to the students with visual impairment and the efficiency of these activities and materials were examined. The prepared activities and materials are interesting, simple and practical, meet the student needs, are easy to understand by the students, the application time is sufficient for the students with visual impairment, they meet the expectations of the students; It was determined by the experts that the students carried out the activities with peer solidarity, the steps of the activities were structured in such a way that the students performed the activity themselves, and they were organized in a clear and logical way. Considering the Activity Evaluation Scale included in the study, the development of activities for students with visual impairment can be ensured that these students actively participate in the activities and that meaningful learning takes place as a result of teaching.

It was observed that the prepared activities and materials are interesting, simple and practical, meet the student needs, are easy to understand by the students, the application time is sufficient for the students with visual impairment, they meet the expectations of the students; It was determined by the experts that the students performed the activities with peer solidarity, the activity steps were structured in such a way that the students perform the activity themselves, and they were organized in a clear and logical way.

As a result, various adaptations and improvements in effective science teaching in line with the needs of individuals with visual impairments can be economically costly. For this reason, schools and teachers should be provided with budget support in terms of providing tools and materials support considering the individual differences of the students.

Recommendations for Teachers

As a result of interviews and observations with the students, it was determined that students with visual impairment did not learn much of the concept of 'Matter and Heat' on conceptual level. The reasons for this are to explain the concepts mainly by verbal means, the lack of printed documents in the hands of the students and the lack of tactile materials to facilitate the teaching of the concept.

The concepts of heat and heat insulation are abstract concepts which are very difficult to learn. The concept of heat insulation is understood by very few students. Basic misconceptions in the literature are listed below.

- Metals absorb cold, amounts and absorb.
- Conductors conduct heat more slowly than insulators.
- Insulators transmit heat very quickly, the heat is immediately separated from the insulators and therefore never heat up.
- Insulators absorb heat. Woolen heat the substances they are in contact with.
- Metal does not transmit heat well.
- Porcelain does not transmit heat at all.
- When we touch the metal at room temperature and touch the metal, we feel cold because our hands are hot.

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APPENDIX

Subject	Matter and Heat
Concepts	Heat conductor, heat insulation, heat insulation, heat insulation materials
Objectives	6.6.1.1. Classify substances in terms of heat conduction 6.6.1.2. [Conceptual knowledge / understanding] 6.6.1.3. Discusses the importance of thermal insulation in buildings in terms of family and country economy and effective use of resources 6.6.1.4. [Conceptual knowledge / Analysis]. 6.6.1.5. Determine the selection criteria of thermal insulation materials used in buildings 6.6.1.6. [Conceptual knowledge / Comprehension]. 6.6.1.7. Develops alternative thermal insulation materials 6.6.1.8. [Conceptual knowledge / Creation].
Science process skills	Observing, measuring, classifying, saving data, establishing hypothesis, using data and model, changing and controlling variables, conducting experiments.
Life skills	Analytical thinking, decision making, creativity, communication and teamwork.
Affective skills	Positive attitude development, pleasure to learn, willingness, value of the contribution of science, feeling individual and social responsibility.
SSTE	Relationship between science and technology, social contribution of science, science and career awareness

Course Information Package

Subject: Heat conductor and heat insulator

Objectives: 6.6.1.1 Classifies substances for heat conduction.
Duration: 40+40

Application Warnings

- Inform students about the materials to be used in Worksheet 1 and 2.
- For the activity in Worksheet 1 and 2, divide the students into two groups to form a heterogeneous structure in terms of visual impairment.
- Carry out safety warnings regarding the dangers of hot water. Make sure that the bowls and glasses are fixed with silicone on a wooden floor for activity in work sheets 1 and 2.
- For those who have never seen, it is reminded that the titles in TGA paper should be spoken verbally and written with tablet.

Process of the Lesson

- At the end of this activity, inform students about the concept of heat conductor and heat insulator.
- Start with the activity with Work Sheet 1.
- Use the question-answer and brainstorm technique to continue with the following questions about the relationship of matter to heat.

✓ Which of the spoons did you get the most?
✓ Which of the spoons warmed your hand most?
✓ While the wooden spoon did not heat your hand too much, the iron spoon warmed your hand further. What is the reason of this?
✓ What is the relationship between the measured temperatures of the spoons and the ones you feel when you touch them? What do you think is the reason for this relationship?
✓ What kind of spoons should we use when cooking? Why is that?
✓ Why should we use a wooden spoon when cooking?

- Answer the questions in the “The result of the activity” with your students.

✓ What do you think is heat insulator?
✓ What does the heat conductor mean?
✓ Is a heat conductor or a heat conductor if a substance delivers heat very well?

- Ask students to disseminate and read the Information Sheet 1 on the concepts learned in the conclusion section of the activity. Then repeat the concepts and make explanations if necessary.
- Ask students to give examples of heat conductors and heat insulators in their environment.

At the end of the course, ask students to define the concepts in this lesson

Activity Worksheet

Activity: Which spoon conveys less heat?

Necessary materials:

- ✓ 2 pieces of iron spoon
- ✓ 2 wooden spoons
- ✓ 2 bowls
- ✓ Warm Water
- ✓ Cold Water
- ✓ Talking thermometer

Let's Do the Activity

1. Measure the temperature of the spoons with a thermometer and touch them separately. Let's record our observations.

2. Let's use the illustrated bowl assembly and add hot water to one of the bowls and ice water to another.

3. Then put one iron and wooden spoon in each bowl.

After five minutes, measure the temperature of the spoons in each bowl with a thermometer and touch them separately. Let's write what we're observing.

Spoon Type	Pre-Experiment		Post-Experiment	
	Temperature	Touch Feeling	Temperature	Touch Feeling
Iron				
Wood				

Let's answer the following questions

1. Which one of your spoons did you have a cold?
2. Which of the spoons warmed your hand?
3. Sort your hands from the warmest to the highest heat.
4. Sort the spoons from the lowest to the highest.

Information Sheet

Each substance does not transmit the same heat. Substances are called heat conductors and heat insulators according to their heat conduction. Heat conducting material that does not interfere with heat exchange or conducts heat well. Metals such as gold, silver, copper, aluminum, iron and steel are examples of materials that conduct heat. Materials that do not conduct heat well are called heat insulating materials. Examples of heat insulating materials are plastics, wood, straw, leather, fibers and cotton.

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Science Teachers' Views on Nature of Scientific Inquiry

Günkut Mesci[a*] & Eda Erdaş-Kartal[a]

a*, Dr., Giresun University, (http://orcid.org/ 0000-0003-0319-5993) * gunkutmesci@gmail.com
b, Dr., Kastamonu University, (http://orcid.org/0000-0002-1568-827X)

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Abstract

The aim of this study is to examine in-service science teachers' views on nature of scientific inquiry and the possible reasons that led to these views. This study was designed as a multi-case study. 22 middle school science teachers who are currently working in various national education schools in Turkey, voluntarily participated in this study. The data were collected online through the open-ended VASI questionnaire and the follow-up semi-structured interviews, and were holistically analyzed with content analysis. According to the analysis, it was seen that the teachers who participated in this study generally had naive and mix views about the nature of scientific inquiry. It has been observed that these opinions of teachers vary depending on their education level, the courses they took in undergraduate and graduate terms, and the quality of education in in-service training. For example, the teachers who continue their master's and doctorate education in science education have quite an informed view. With this study, it is recommended to give importance to scientific inquiry in teacher training programs and in-service courses, and to encourage teachers to pursue graduate education in the field of science education.

Keywords: Nature of scientific inquiry, scientific literacy, middle school science teachers

Fen Bilimleri Öğretmenlerinin Bilimsel Sorgulamanın Doğası Görüşleri

Öz

Bu çalışmanın amacı fen bilgisi öğretmenlerinin bilimsel sorgulamanın doğası ile ilgili görüşlerini ve bu görüşlere neden olan olası sebepleri incelemektir. Bu çalışma çoklu durum çalışması olarak dizayn edilmiştir. Çalışmaya Türkiye'nin farklı şehirlerindeki devlet okullarında çalışan 22 ortaokul fen bilimleri öğretmeni gönüllü olarak katılmıştır. Açık uçlu VASI ölçeği ve onu takip eden yarı yapılandırılmış mülakatlar yoluyla online toplanan veriler, bütünsel olarak içerik analizi ile analiz edilmiştir. Analiz sonuçlarına göre, bu çalışmaya katılan öğretmenlerin genellikle bilimsel sorgulama ile ilgili naif ve geçiş görüşlere sahip oldukları görülmüştür. Bazı temalarda nispeten daha gelişmiş görüşe sahip olan öğretmenler özellikle lisans üstü eğitim almalarına göre önemli ölçüde farklılaşmışlardır. Özellikle fen eğitiminde yüksek lisans ve doktora eğitimine devam eden öğretmenlerin görüşlerinin oldukça gelişmiş olduğu görülmüştür. Öğretmenlerin bu görüşlerinin eğitim seviyelerine, lisans ve lisans üstü donemde aldıkları derslere ve hizmet içi eğitimlerdeki eğitimin kalitesine bağlı olarak değiştiği görülmüştür. Bu çalışma ile birlikte, öğretmen eğitiminde ve hizmet içi kurslarında bilimsel sorgulamaya önem verilmesi ve öğretmenlerin fen eğitimi alanında lisans üstü eğitim almaları için teşvik edilmesi önerilmektedir.

Anahtar kelimeler: Bilimsel sorgulamanın doğası, bilim okuryazarlığı, ortaokul fen bilimleri öğretmenleri

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1 | INTRODUCTION

The most important goal of science education is to raise scientifically literate individuals (AAAS, 1993; National Research Council (NRC), 2011; New Generation Science Standards (NGSS), Lead State, 2013; Ministry of National Education (MoNE), 2018). Scientific literacy is defined as "a combination of science-related skills, attitudes, values, understanding and knowledge, critical thinking, problem-solving and decision-making skills, and maintain a sense of curiosity about the environment and the world" (MoNE, 2005). In other words, scientific literacy is knowing and understanding nature of scientific knowledge and how this knowledge is produced, being aware of how science, technology, and society affect each other, having positive attitudes and value judgments about science and technology, and being able to use this knowledge and awareness in daily life (NRC, 1996). In this sense, nature of science (NOS) and nature of scientific inquiry (NOSI) have been recognized as essential components of science literacy (Lederman, Lederman & Antink, 2013; NGSS, 2014).

SCIENTIFIC INQUIRY AND NATURE OF SCIENCE

Teachers and science educators still come up against various uncertainties regarding the specific characteristics of NOSI and NOS and their integration into existing science teaching and science curriculum (Flick & Lederman, 2006; Park, 2008). The concepts of NOSI and NOS are often used interchangeably (Lederman, 2007; Lederman et al., 2014). Although NOSI and NOS are closely related, the concepts have different structures (Flick & Lederman, 2006; Lederman, 2019). NOSI involves science processes, also refers to combining these processes with scientific knowledge, scientific reasoning, and critical thinking to develop scientific knowledge (Lederman, Antink, & Bartos, 2014). NOSI includes asking questions, planning and applying the research, mathematical thinking, analyzing and interpreting data, and using communication skills effectively in explaining the facts with evidence in the part of sharing and discussing the findings (NRC, 2012; Pedaste et al., 2015). On the other hand, NOS refers to certain characteristics that limit and do not limit the use of scientific knowledge produced as a result of scientific inquiry (Flick & Lederman, 2006). In summary, NOSI is the process in which scientific knowledge is produced, while NOS refers to the basis of the knowledge produced as a result of this process, the epistemology of science, science as a way of knowing, and the values and beliefs inherent in the development of scientific knowledge (Lederman 1992; Lederman, 2006).

Researchers have a common view about the features of NOSI (Lederman et al., 2014; Osborne, Ratcliffe, Collins, Millar, & Duschl, 2013; Schwartz, Lederman, & Lederman, 2008). The characteristics of NOSI that are used as the targeted aspects in this study were listed as (a) all scientific investigations must begin with a question and do not necessarily test a hypothesis; (b) there is no single scientific method or sequence of steps followed in all investigations; (c) inquiry procedures are guided by the question asked; (d) all scientists performing the same procedures may not get the same results; (e) inquiry procedures can influence results; (f) research conclusions must be consistent with the data collected; (g) scientific data are not the same as scientific evidence; (h) explanations are developed from a combination of collected data and what is already known (Lederman et al., 2014; Lederman et al, 2019).

LITERATURE REVIEW AND PROBLEM STATEMENT

Scientific inquiry is seen as two different outputs for students. These are the ability to do scientific processes and to have knowledge about these processes. In international teaching documents, it is stated that scientific inquiry should be emphasized as skill and understanding (NGSS, 2013). It is not possible for students to know the scientific inquiry procedures and to participate in simple inquiry experiences without knowing the NOSI, understanding the epistemology of science, and achieving the objectives that are targeted by scientific inquiry (Doğan, Han-Tosunoğlu, Özer, & Akkan, 2020; Lederman, 2006; Metz, 2004; Wong & Hudson, 2010). Recent studies have, unfortunately, revealed that NOSI views of K12 students of all levels are naive and undeveloped (Anggraeni, Adisendjaja, & Amprasto, 2017; Aydeniz, Baksa & Skinner,

2011; Bell, Blair, Crawford, & Lederman, 2003; Doğan et al., 2020; Leblebicioğlu et al., 2020; Lederman et al., 2019; Lederman, 2012; Lederman, Bartels, Liu, & Jimenez, 2013; Yang, Park, Shin, & Lim, 2017). In this context, teachers are the most critical actors in the process of adopting scientific inquiry in science lessons and developing students' views on the targeted aspects of NOSI (Bostan-Sarıoğlan, 2018). Lack of understanding about scientific inquiry is one of the obstacles for teachers to apply scientific inquiry on their own lessons (Roehring & Luft, 2004). For this reason, it is of great importance for teachers to understand NOSI, which forms the basis of scientific knowledge and guides scientific research, and to carry out scientific inquiry applications (Zion & Mendelovici, 2012).

It has been revealed that teachers' NOSI views are quite limited because of perceiving NOS and NOSI as the same concepts (Lederman et al., 2014), focusing on teachers' inquiry skills rather than their NOSI views, and no sufficient measurement tools to reveal individuals' views of NOSI (Lederman et al., 2019). The studies investigating the individuals' NOSI views are mostly conducted with pre-service teachers, and it has been emphasized that the opinions of the pre-service teachers on NOSI are insufficient (Baykara & Yakar, 2020; Bostan-Saroğlan, 2018; Crawford, Zembal-Saul, Munford, & Friedrichsen, 2005; Haefner & Zembal-Saul, 2004; Mesci, Çavuş-Güngören & Yeşildağ-Hasancebi, 2020; Schwarz, 2009; Şenler, 2017).

When findings of these studies in which in-service teachers' opinions about NOSI are examined, it is seen that the teachers' views of NOSI are insufficient and the studies conducted are quite limited. One of these studies conducted by Lederman and Lederman (2004) included a three-week summer camp focusing on NOS, scientific inquiry, and unified concepts through a series of explicit/reflective activities, reading and discussion, followed by a teacher development program that included monthly workshops throughout the academic year. They found that the participants began the camp with naive views of NOSI especially about the scientific method, and after the trainings and practices, teachers improved their views on NOSI by 85%. In another study, Roehring and Luft (2004) identified the lack of understanding about scientific inquiry as one of these obstacles in their study, where teachers investigated the obstacles in applying scientific inquiry lessons. Lotter, Harwood, and Bonner (2006) examined the concepts and products developed by high school science teachers in a two-week summer camp, which is a part of a long-term professional development program, emphasized that most of the teachers before the camp had insufficient understanding of scientific inquiry and that they improved their understanding after the camp. In their study investigating the effect of an inquiry-based professional development program on teacher' views on NOS, their practices, and student views, Akerson and Hanuscin (2007) revealed that teachers' understanding of scientific inquiry was insufficient at the beginning of the program and they did not include scientific inquiry in their practices. Capps and Ross (2010) examined the effect of a professional development project on teachers. They found that most of the inexperienced teachers' scientific inquiry views were inadequate (naive) compared to experienced teachers (years of service 30 years or more). Dudu (2014) investigated the views of South African high school teachers about NOSI and revealed that teachers have mixed views. Bahbah et al. (2013) investigated the concepts about NOSI of primary and middle school teachers and the effect of participation in the research experience prepared for two different teacher group. They determined that although teachers started the program with sophisticated views, participation in research concepts improved teachers' understanding. Bartos and Lederman (2014) investigated physics teachers' knowledge about NOS and in-class applications on scientific inquiry. They found that there was a limited compatibility between teachers' knowledge structures about NOS and scientific inquiry. It was stated that all the views of four teachers participating in the study about scientific inquiry are at a sufficient level. Strippel and Sommer (2015), in their study investigating how teachers in chemistry classrooms incorporate teaching of scientific inquiry into their laboratory practice, revealed that teachers do not consider teaching NOSI as the main goal, but rather focus on scientific inquiry and developing inquiry skills. Also, they found that the teachers with doctoral degrees realized the role of scientific inquiry, especially the role of questions in scientific research, more than teachers without a doctorate. In their study comparing the views of Chinese and American science teachers on NOS and

NOSI, Wang and Zhao (2016) revealed that Chinese teachers' views on most components of NOSI are at a traditional level, and that American teachers' views are better than Chinese teachers. Adisendjaja, Rustaman, Redjeki and Satori (2017), in their study of science teachers' understanding of scientific inquiry in a professional development program focused on NOS and scientific inquiry, stated that most science teachers had insufficient understanding of scientific inquiry. In their study examining the understanding of science teachers' understanding of NOSI and their use of scientific inquiry in their lesson plans, who participated in a professional development program, Çiğdemoğlu and Köseoğlu (2019) revealed that teachers had insufficient views about scientific inquiry before the program. They reported that teachers' views improved after the program.

Related literature shows that teachers' opinions about NOSI may affect their scientific inquiry practices. In order to implement the scientific inquiry approach that is expected to be adopted in science teaching programs, it is necessary to determine the science teachers' NOSI understanding. It is anticipated that determining the views of science teachers about scientific inquiry might be the basis for the trainings to be planned to eliminate the deficiencies in this subject. As seen the literature given above, there are not enough studies in the national literature investigating the opinions of in-service science teachers on NOSI. It is thought that studies at national level are needed to fill this gap in the literature.

Purpose of the study and research questions

In this study, it is aimed to determine the science teachers' NOSI views and to reveal the factors that cause their views. The following research questions are guided to this study.

1. How do science teachers think about NOSI?
2. What are the factors affecting science teachers' views on NOSI?

2 | Method

This study was a qualitative exploratory case study of science teachers' views about NOSI. Each teacher's views of the aspects of NOSI and underlying reasons of these views were examined which in single-case embedded design (Yin, 1984). A case study is a research strategy in which the researcher thoroughly investigates a program, event, activity, process, or one or more individuals within a bounded time using a variety of data collection procedures (Creswell, 2009).

Participants

22 middle school science teachers (18 females, 4 males; average age: 38), who are currently working in various national education schools in Turkey, participated in this study. Ethical permissions were obtained for the study and teachers voluntarily participated in this study by signing the consent form. All of the teachers had graduated from a 4-year science education department in an education faculty. Some of them (11) are still continuing to do on their master's degree in the different programs like, master in science education, master in curriculum development, or master in measurement and evaluation, while some teachers (4) are continuing to do on their doctoral program in science education (see Table 1). Table 1 also shows the duration of the participants' professional teaching experience, whether that they had taken any NOS course during their bachelor, and whether that they attended any in-service training and any training about NOSI on those in-service training.

Table 1. Participants' Demographics

Participants	Gender	Highest Educational Degree	Professional Experience	NOS course during the bachelor	In-service training/NOSI teaching
ST1	Female	Ph.D. (S.Ed.)	6 years and above	Yes	Attended/Yes
ST2	Female	Master (M.Ed.)	6 years and above	do not remember	Attended /No
ST3	Male	Bachelor	6 years and above	do not remember	Attended /No
ST4	Female	Ph.D. (S.Ed.)	6 years and above	Yes	Attended /Yes
ST5	Female	Master (M.Ed.)	6 years and above	do not remember	Attended /No
ST6	Female	Bachelor	3-6 years	do not remember	Attended /No
ST7	Female	Master (M.Ed.)	6 years and above	do not remember	Attended /No
ST8	Female	Master (M.Ed.)	6 years and above	Yes	Attended /No
ST9	Female	Master (S.Ed.)	6 years and above	Yes	Attended /No
ST10	Female	Ph.D. (S.Ed.)	6 years and above	Yes	Attended /No
ST11	Female	Bachelor	6 years and above	do not remember	Attended /No
ST12	Female	Master (M.Ed.)	6 years and above	Not sure	Attended /No
ST13	Female	Master (S.Ed.)	6 years and above	Yes	Attended /Yes
ST14	Female	Master (S.Ed.)	3-6 years	Yes	Attended /No
ST15	Male	Bachelor	0-3 years	Yes	Attended /No
ST16	Male	Ph.D. (S.Ed.)	3-6 years	Yes	Attended /No
ST17	Female	Master (S.Ed.)	3-6 years	Yes	Attended /No
ST18	Female	Master (S.Ed.)	6 years and above	Yes	Attended /No
ST19	Female	Bachelor	6 years and above	do not remember	Attended /No
ST20	Female	Master (M.Ed.)	6 years and above	Yes	Attended /No
ST21	Female	Bachelor	6 years and above	do not remember	Attended /No
ST22	Male	Bachelor	6 years and above	Not sure	Attended /No

*Ph.D. (S.Ed.) indicates the participant has a Ph.D. degree at science education.

**Master (S.Ed.) indicates the participant has a Master's degree at science education.

***Master (M.Ed.) indicates the participant has a Master's degree at an educational program like, curriculum development or measurement and evaluation.

The teachers' names have been changed with codes in accordance with the principle of confidentiality and no expressions that reflect the true identities of the teachers have been used in any way. In this context, teachers were coded as Science Teacher (ST) and the numbers that follow, like ST1, ST2 etc.

Data collection

The data were collected using The Views About Scientific Inquiry (VASI) questionnaire, which was created by Lederman et al. (2014) and translated into Turkish by Mesci, Çavuş-Güngören & Yeşildağ-Hasancebi (2020). There are seven open-ended questions in the VASI questionnaire in order to reveal participants' NOSI understandings. Due to the pandemic, the data were collected online. The questionnaire was uploaded to google form, and the link shared with the teachers. It took about 20 minutes to filled out by the teachers. The follow-up semi-structured interviews were conducted with each teacher in order to make the answers more understandable and clearer, and to reveal the possible reasons leading to these answers. The online interviews took about 30 minutes for each teacher. While the interview questions vary depending on the individual responses, the typical questions based on the participant's answers were: (1) Can you explain what you mean by saying "_____" in your answer to the question "_____"? Can you give an example to help me understand what you think? (2) Have you considered this kind of issues before? When did you think? (3) What are the things (s) that make you think like that related to this question "....."?

(4) Do you use a similar example in your lessons? (5) Have you taken any lesson or training (in-service or university) related to these issues before? If yes, could you explain the general effect of this on you and your answers?

Data analysis

The teachers' responses to the questionnaire and follow-up interviews were analyzed in a holistic way. The codes and themes, which were identified by Lederman et al., (2014) for analyzing individuals' NOSI views were used during the analysis. A profile had been created for each teacher and their views on the targeted NOSI aspects were classified from naive "-", to mixed "(+)", to increasing level of understanding "+, ++, +++" on a continuum scale (Schwartz et al., 2008) (Figure 1). The teachers' responses were coded as naïve (-) if they have insufficient knowledge or incompatible view about the targeted NOSI aspects. If they have sufficient knowledge about the targeted aspect that is compatible with the literature, they were coded as informed. The informed level ("+", "++", "+++") varies depending on the explanations given appropriate examples with their own sentences. If the teachers' responses show inconsistency within the questionnaire or during the interviews, they were coded as mixed "(+)".

Figure 1. *NOSI Continuum Scale*

Interview data about the reasons that constitute the basis of the teachers' NOSI views were analyzed through content analysis, and codes, themes, and categories were created accordingly. In order to show the effect of teachers' education levels on their NOSI views, the teachers' NOSI views included in each education level were found by proportioning the number of naïve, mixed, and informed ranges in total number of categories.

All data for each participant were analyzed according to the credibility criteria (Başkale, 2016). 20% of all data were analyzed separately by the researchers. Analyses were compared and differences were resolved by further consultation of the data. Then, 40% of the data were again analyzed separately. Results were discussed until 100% consensus was reached. The first author subsequently analyzed the rest of the data.

Research Ethics

After obtaining the necessary ethical permissions for the collection and analysis of the data with the decision of Kastamonu University Social and Humanitarian Research and Publication Ethics Committee, dated 4.05.2020, number 27, the researchers sent a consent form to all potential participant teachers in order to participate in this stud via written script that was used online during the Covid-19 pandemic. The teachers who are interested in the project were asked to read the consent form carefully. After reading the consent form, the teachers who are agreeable to participate in this study, were asked to sign and return the informed consent form to the researcher, who then printed the forms and sealed them in an envelope.

Findings

According to the results of the analysis, it was found that the teachers who participated in the study had generally a naive or mixed understanding regarding the targeted NOSI aspects. The views of each teacher regarding each NOSI aspect are represented in the table below (Table 2). Teachers generally have naive and mixed views in some NOSI aspects, such as, "scientific investigations all begin with a question and do not necessarily test a hypothesis", "inquiry procedures are guided by the question asked", "all scientists performing the same procedures may not get the same results", and "scientific data are not the

same as scientific evidence" (Figure 2). The representative quotations of the teachers' NOSI views are given in Table 3.

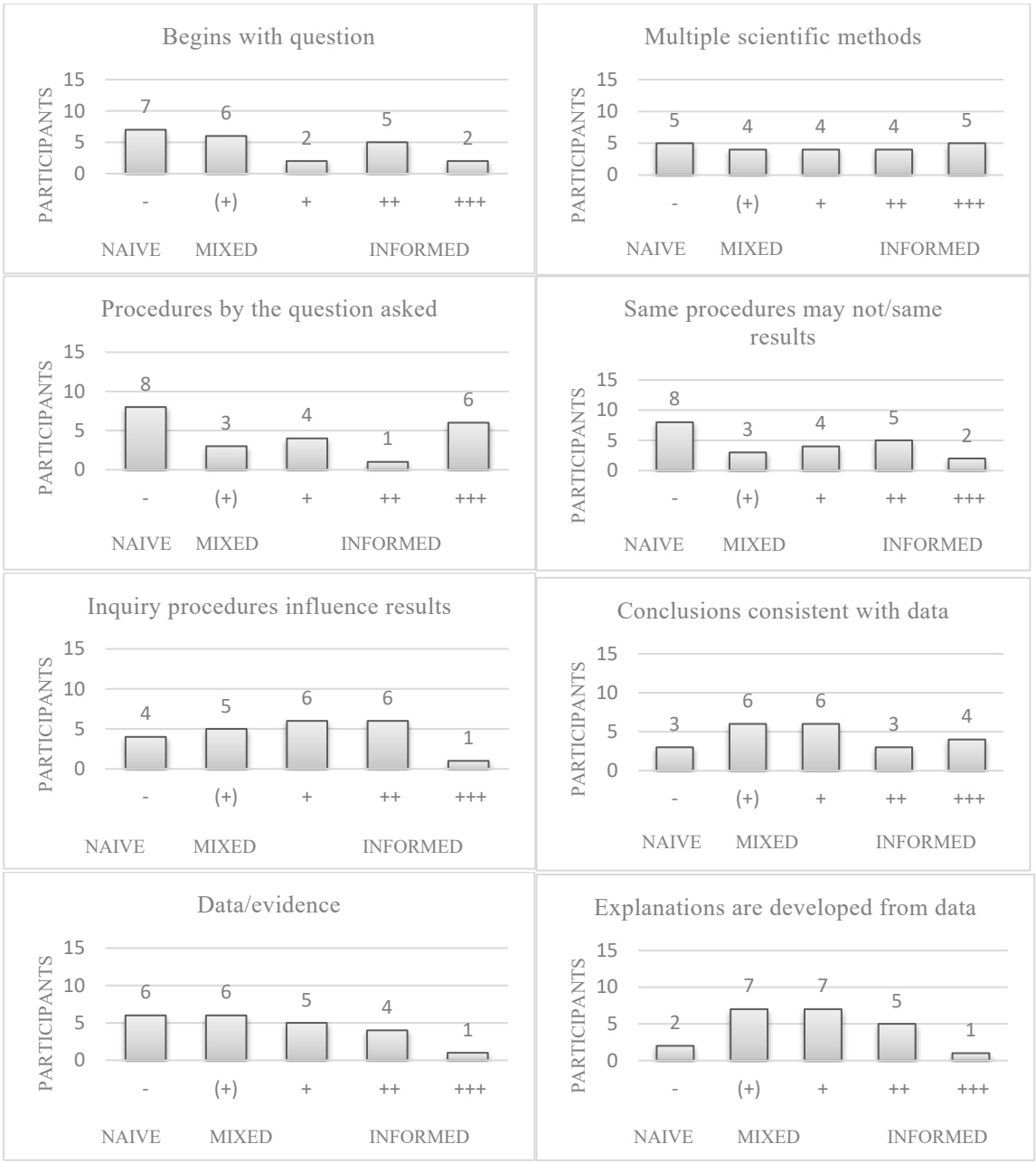

Figure 2. *Views in Relation to Each NOSI Aspect*

Table 2. Alignments of Science Teachers' Views of NOSI with Current Reforms

Participants	Begins with a question	Multiple Scientific Methods	Procedures are guided by the question asked	Same procedures may not get the same results	Inquiry procedures influence results	Conclusions consistent with data collected	Data/evidence	Explanations are developed from data…
ST1	+++	+++	+++	+++	++	+++	+	++
ST2	(+)	-	(+)	+	+	-	++	+
ST3	-	(+)	-	(+)	(+)	++	+	(+)
ST4	+++	+++	+++	+++	+++	+++	+++	+++
ST5	+	+	-	+	+	(+)	-	+
ST6	-	+++	-	-	(+)	-	(+)	(+)
ST7	-	+	+++	-	+	(+)	++	+
ST8	++	-	+++	-	-	+++	(+)	++
ST9	(+)	++	-	(+)	+	(+)	-	+
ST10	++	+++	+++	++	++	+++	++	++
ST11	-	+	-	+	+	+	(+)	(+)
ST12	(+)	-	+	-	-	+	(+)	(+)
ST13	(+)	+++	+++	-	-	(+)	+	(+)
ST14	++	++	-	++	++	+	+	++
ST15	-	-	-	(+)	(+)	-	-	-
ST16	++	++	++	++	++	++	++	+
ST17	+	(+)	-	++	++	(+)	(+)	++
ST18	++	++	+	+	+	++	+	+
ST19	-	(+)	(+)	-	(+)	+	-	+
ST20	(+)	+	+	++	++	+	-	(+)
ST21	-	(+)	(+)	-	(+)	(+)	-	-
ST22	-	+	-	+	+	(+)	-	(+)

"–" indicates naïve views of the targeted NOS aspect, "(+)" indicates mixed or transitional views, "+" indicates the participant's agreement with the current views, "++" indicates the participant's ability to articulate the meaning of the aspect in his/her own words, "+++" indicates the participant's ability to articulate the meaning of the aspect in his/her own words and provide examples

31% of the teachers (n: 7) thought that scientific investigations do not have to start with a question, and that science sometimes existed spontaneously. 27% of teachers (n: 6) gave inconsistent answers. Some teachers believed that a hypothesis had to be tested in science, while others used unstable statements about whether scientific research starts with a question. 40% of the teachers (n: 9) have an informed view on this aspect. Only two of them (these are doctoral graduate teachers) have more informed views and they stated and expressed their opinions with the appropriate examples that a scientific research starts with a question, but it is not necessarily to be tested with a hypothesis (Table 3).

22% of the teachers (n: 5) believed that there is only one scientific method and that all scientists must follow this method. They thought that if it is not followed in the exact order, what is done is not a scientific study. 18% (n: 4) had inconsistent answers and thought that there was only one scientific method, but scientific knowledge could still be produced if this method was not applied. In contrast, 59% (n: 13) stated

that there would be no single scientific method. Teachers, especially those with a more advanced view, argued that there are more than one scientific method and scientists do not have to follow one exact step (Table 3).

Regarding the aspect of "inquiry procedures are guided by the question asked", 36% of the teachers (n: 8) had naïve views, and they could not fully explain the importance of research questions in a scientific study. In general, they believed that the inquiry process was unique and independent of the question in a scientific study (Table 3). 50% of the teachers (n: 11) have advanced opinions on this aspect. In particular, teachers with a more informed view explained the effect of the research question on the research process in a scientific study by giving appropriate examples (Table 3).

36% of the teachers (n: 8) thought that in scientific studies where the same process is followed, the result should be the same because they stated that there is only one truth in science. They thought that if different results are found, there is definitely an error in the inquiry procedure, that error has to be corrected. While 13% of the teachers (n: 3) stated that they were undecided, 50% (n: 11) argued that different results could be obtained even if the same process has been done (Table 3).

Regarding the fact that the inquiry process affects the results in a scientific study, 18% of teachers (n: 4) had naive views and believed that the inquiry process will not affect the results. 22% of the teachers (n: 5) had undecided views, while 59% (n: 13) had informed understandings and thought that the inquiry process might affect the results of the research (Table 3).

Related to the aspect of "conclusions should be consistent with the data collected", 13% of the teachers (n: 3) had a naive view with this aspect. These people interpreted the data according to they have already known, and tried to fabricate the results (Table 3). 60% of the teachers (n: 13) had an informed view about this aspect and underlined that the results should be consistent with the data collected by interpreting the data correctly in the table provided (Table 3).

Table 3. Representative Quotes of Science Teachers' Views of NOSI Aspects

NOSI Aspects	Representative Quotations	
	Naive Views	Informed Views
Begins with a Question	Scientific research does not always start with a question. Scientists often formulate and test a hypothesis for their research to be scientific. (ST6)	A scientific investigation depends on the evidence of a claim based on the data, so a start is required. Thus, scientific research starts with questions because the greatest characteristics of scientists are that they are curious and ask questions. For example, Leeuwenhoek discovered unicellular microorganisms with the question of what I can see if I examine the water in the pond in his garden. (ST1)
Multiple Scientific Methods	In the scientific research, there is only one method and it is clear that the process must be followed so that it can be accepted as a scientific process. The first step is to create a problem, the second step is to make observations, then to collect data as a result of observations, to form a hypothesis in the light of the data, then to make predictions and examine them with experiments. If this order is not followed, the result will be wrong and not scientific. (ST8)	Scientific investigations are carried out with more than one method, for example, a controlled experiment can be done to find out that the potential energy is dependent on height. This is an experimental research. When we look at the theory of evolution, millions of years old fossils have been examined, observed, classified, and made logical inferences. When we look at the theory of relativity, we see that scientific research is done not only with observation and experiment, but also with imagination, creativity and mathematical deductions. (ST4)
Procedures are Guided by the Questions Asked	The path followed by Team B is correct because they have tested the quality of the tire by testing on different roads. (ST11)	If looking at the research question, it is necessary to focus on the quality of the different tires and so keep the road variable constant. Therefore, the research of the team A is consistent with the research question. (ST10)
Same Procedures may not Get the Same Results	If scientists investigate the same question and follow the same methods to collect data, they all get the same results. (Of course, all conditions should be equal. If there are no errors caused by measurement tools or the researcher) Repeatability is important in scientific studies. (ST19)	Even if the methods are the same, No, they do not reach the same result because the inferences vary according to the attitudes and values of the scientist, their perspective, the society they live in, their religious beliefs, and their culture. (ST16)
Inquiry Procedures Influence Results	If scientists investigate the same question and follow different methods to collect data, they all achieve the same results. If the research methods selected are scientific, the results should be the same. (ST13)	They may not achieve the same result. Their conclusion is not only related to whether the method they followed is the same or different because it is important how they evaluate the data, how they make inferences from this data, if they can make the same inferences, they can reach the same result. (ST20)
Conclusion Consistent with Data Collected	Plants grow constantly as they get sunlight because I knew it, plants do photosynthesize. (ST2)	If we interpret it according to the data in the table, as the duration of sunlight that the plant is exposed increased, the growth decreased, then it is increased at a certain point and then the growth stopped, so we can say that there is no relationship between this plant's growth and the sunlight it receives. (ST8)
Data/Evidence	While data is information specific to the observer, evidence is more of the information detected by many observers. Evidence is therefore a stronger concept. I think it is different and the evidence will bring faster results in scientific work. (ST22)	Data is collected and obtained in a study, from the observations or experiences. On the other hand, evidence is the arguments we use to support our claims by interpreting the data. (ST4)
Explanation are Developed from Data and What is Already Known	When scientists explain the results of their research or interpret other studies, they use the truth that everyone accepts. (ST15)	Scientists make their conclusions in accordance with the combination of data that they have and what is already known from existing literature. (St17)

Factors affecting teachers' views on NOSI were categorized into three groups, which are the education level, and the courses taken during the undergraduate and graduate periods, and in-service education. It is a striking factor that the majority of those who have this naive and mixed views about NOSI aspects are the teachers who only have bachelor's degree. It was observed that the education levels of the teachers differed positively especially in favor of the doctoral students who continue on their doctoral program in science education have more advanced views for each NOSI theme. It is seen that among graduate teachers who continue their master's degree in science education had more advanced views than those who continue their master's degree in another education program, like curriculum development or assessment and evaluation. Table 4 shows the relationship between teachers' education levels and NOSI views.

Table 4. The Relationship Between the Teachers' Education Levels and Their NOSI Views

Highest Educational degree		Naive	Mix	Informed
Bachelor		%42	%35	%23
Master	Another Educ. program	%27	%20	%53
	Science Education	%15	%22	%63
Ph.D. in Science Ed.		0	0	%100

Teachers stated that another factor affecting their NOSI views is the courses they have taken, especially during the undergraduate and graduate studies. The pre-service teachers mostly emphasized the effects of courses such as the nature of science and philosophy of science taken during these periods. They stated that they found the opportunity to use the knowledge they have learned in these courses, and that they had the opportunity to use their research in their courses in the school.

"Within the scope of the nature of science course that I took during my Ph.D., we have elaborated on what scientific inquiry is and the themes that make up scientific inquiry. Therefore, it was not difficult for me to answer these questions. For example, before these courses that I had not been taken, I believed that there was only one truth and one method in science. But I understood that this is not like that, and I often underline this to my students, too." (ST4)

"I remember a lesson with these issues during my undergraduate period, but it's been a long time, so I can't remember much. For this reason, I was not so sure when answering the questions." (ST15)

"During my graduate education, I had studies on nature of scientific inquiry and nature of science. My advisor was working on these issues, so I tried to integrate these topics into my lessons so I feel quite enough myself about these issues." (ST1)

Another factor that affects teachers' NOSI view is the participation in in-service training. The importance of scientific inquiry is better understood within the scope of the new science education program, especially for teachers attending in-service trainings or science camps.

"I attended an in-service training last semester. The expert, who carried out the training, frequently spoke about the importance of the scientific inquiry in science education, and stated that the new program was built on it. I can say that many of the answers I have provided have been learned from this in-service training." (ST18)

"I attended a lot of in-service training, but none of these issues were touched on. In fact, when I answered the questions, I realized that I constantly used these concepts in my lessons but I do not really know what they mean. For example, I use the concepts of data and evidence many times in my lessons, but I had difficulty in answering when you asked, I am not sure whether I answered correctly. I wish the in-service trainings would be tightened to learn these basic concepts." (ST22)

4 | Discussion & Conclusion

The purpose of this study was to reveal the science teachers' views about NOSI and the possible reasons that led to these views. In accordance with previous studies (e.g., Baykara, Yakar & Liu, 2018; Bostan-Saroğlan, 2018; Crawford et al., 2005; Doğan, 2017; Haefner & Zembal-Saul, 2004; Karışan, Bilican & Şenler, 2017; Mesci, Çavuş-Güngören & Yeşildağ-Hasancebi, 2020), findings of this study showed the science teachers generally have naive and mixed views of the targeted NOSI aspects. It has been observed that teachers' views were more informed especially in some NOSI themes (e.g. Inquiry procedures influence results) than some other NOSI themes (e.g. scientific investigations begin with a question). Contrary to the studies in the literature (e.g., Lederman and Lederman, 2004), the teachers participated in this study have generally informed views related to multiple scientific methods. Interestingly, it was observed that teachers had a highly informed view on the aspect of "explanation are developed from data and what is already known", which was analyzed in relation to the question asked with the dinosaur skeleton on the VASI questionnaire. Contrary to the findings of Crawford, Capps, Meyer, Patel and Ross (2010) that the views of experienced teachers have more developed views, no data could be found to support their findings in this study. Thus, the teachers' teaching experience did not have a significant effect on their NOSI views in the current study.

The factors affecting teachers' views were generally emerged as the effect of their education level, courses taken during the undergraduate and graduate periods, and in-service training. In particular, the effect of teachers' education levels on their NOSI views, as found in the study of Strippel and Sommer (2015), has been found to be in favor of doctoral teachers while the teachers who have only bachelor's degree have more naive views. As might be expected, it was clearly seen that teachers who had their graduate education in science education also had more advanced NOSI views compared to other educational fields. Therefore, related to NOSI, which is considered to be an important part of science literacy, it is recommended that teachers should begin a graduate program in the field of science education after starting their profession and also NOSI should be given more importance in other graduate programs.

The effect of the courses taken in undergraduate and graduate periods is a rather striking factor affecting teachers' NOSI views. This study showed that the history of science and the NOS courses and the scientific inquiry courses taken in the graduate periods have a significant impact on teachers' views of NOSI. When it is considered that the teachers who only have bachelors' degree, do not remember NOSI much from the related courses, it is recommended that those related courses should be taught more practical and increased an awareness of its' importance. As in the study of Mesci, Çavuş-Güngören & Yeşildağ-Hasancebi (2020), it is necessary to adopt the NOSI features as a science subject and to teach how to integrate them into the science lessons and teach them in the science laboratory courses. It should not be forgotten that it is not possible to teach a subject without fully knowing it or to get the desired efficiency by using it in lessons without knowing a teaching approach (Baykara & Yakar, 2020; Karışan, Bilican, & Şenler, 2017). Thus, it is of great importance for teachers to understand NOSI and to effectively integrate it into their science lessons (Zion & Mendelovici, 2012).

The effect of in-service training on teachers' NOSI views is first seen in this study. It was emphasized how important in-service trainings are especially in learning and teaching of NOSI for in-service teachers. For this reason, it is necessary to give additional seminars and increase the trainings in order to revise in-service trainings and to teach and implement issues such as NOSI, because it is clearly known that the education received during the undergraduate period is not sufficient (e.g., Baykara & Yakar, 2020; Bostan-Saroğlan, 2018; Crawford et al., 2005) and teaching camps for NOS/NOSI are effective (Çiğdemoğlu & Köseoğlu, 2019; Lotter, Harwood & Bonner, 2006). Increasing the number of such studies, particularly focusing on teachers' views on NOSI and its reasons, will expand the national literature and there will be more examples of the importance and application of the NOSI concept. In this respect, it is thought that this study will make a great contribution to national literature. This study is limited by the teachers who

participated in this study. Therefore, it is important to carry out similar studies with larger and different samples.

STATEMENTS OF PUBLICATION ETHICS

The research has no unethical problems and research and publication ethics have been fully observed.

RESEARCHERS' CONTRIBUTION RATE

Authors	Literature Review	Data Collection	Data Analysis	Manuscript writing stages			
				Introduction	Method	Findings	Conclusions
First Author	40%	50%	70%	20%	80%	60%	60%
Second Author	60%	50%	30%	80%	20%	40%	40%

CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

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An Examination of the Decision-Making Skill Perceptions of Third Grade and Fourth Grade Students in Primary School

Zeliha Nurdan Baysal[a*], Burcu Demirbaş-Nemli [b], Seda Özçelik [c], Şeyma Güneypınar [d]

a*, Prof., Marmara University (http://orcid.org/0000-0002-3548-1217) * znbaysal@marmara.edu.tr

b, Dr., İstanbul Provincial Directorate of National Education (http//orcid.org/0000-0002-8135-0242)

c, College of Çevre (http//orcid.org/0000-0002-0658-9034)

d, College of Enka (http//orcid.org/0000-0002-4644-7612)

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Abstract

Our life is shaped by the decisions we make. Our experiences show how these decisions affect our lives. Decision-making is a thinking skill and can be taught over the process. Primary school is an educational institution where the foundations of students' future experiences are laid and where students overcome problems by taking part in decisions. The experiences acquired in those ages undoubtedly impact their future experiences. A review of the literature reveals a need for decision-making studies on primary school students in Turkey. The purpose of this study is to examine the decision-making skill perception of third and fourth grade students in terms of several variables. Students' gender, age, grade level and their teachers' and parents', participation in the decision were covered as variables in this study using the survey model, a quantitative research method. The population of the study comprises Istanbul province while five schools based in the European and Asian sides of Istanbul constitute the sampling. The easily accessible sampling method was used in the selection of sampling. "The Marmara Decision-Making Skill Perception Scale for Primary School Students" was used for data collection. The scale is a four-point Likert-type scale with 5 factors and 17 items. According to the results, students' decision-making skill perception is at a medium level. Based on gender, students' decision-making skill perception differs significantly in favor of the male students, although there is no significant difference in terms of age, grade, and whether or not the student's opinion is asked in decision-making processes at home and school.

Keywords: Thinking skill, decision-making, primary school

İlkokul Üçüncü ve Dördüncü Sınıf Öğrencilerinin Karar Verme Beceri Algılarının İncelenmesi

Öz

Hayatımız verdiğimiz kararlarla şekillenmektedir. Bu kararların yaşamımızı ne kadar etkilediğini deneyimlerimiz bize göstermektedir. Karar verme düşünme becerileri içerisinde bulunan ve süreç öğretimi yapılabilen becerilerden birisidir. İlkokul ileriki yaşantıların temellerinin atıldığı ve öğrencilerin kararlara katılarak problemlerle baş ettiği eğitim kurumudur. Bu yaşlarda edinilen deneyimlerin ileriki yaşantıları etkileyeceği kuşkusuzdur. Alan yazın incelendiğinde Türkiye'de ilkokul öğrencileriyle karar verme çalışmalarının yapılması ihtiyacı hissedilmektedir. Bu araştırmanın amacı, ilkokul üçüncü ve dördüncü sınıf öğrencilerinin karar verme beceri algılarının çeşitli değişkenler açısından incelenmesidir. Araştırmada öğrencilerin cinsiyet, yaş, sınıf seviyesi, okulda ve evde kararlara katılma durumu değişken olarak ele alınmış yöntem olarak nicel araştırma yöntemlerinden tarama modeli kullanılmıştır. Çalışmanın evrenini İstanbul ili, örneklemini ise Anadolu ve Avrupa yakasında yer alan beş devlet okulu oluşturmaktadır. Örneklem seçiminde kolay ulaşılabilir örnekleme yönteminden yararlanılmıştır. Verilerin toplanmasında "İlkokul Öğrencileri için Marmara Karar Verme Beceri Algısı Ölçeği" kullanılmıştır. Ölçek 5 faktörlü, 17 maddeli, 4'lü likert tipinde bir ölçme aracıdır. Sonuçlara göre; öğrencilerin karar verme beceri algıları orta düzeydedir. Öğrencilerin karar verme beceri algıları cinsiyete göre erkek öğrenciler lehine anlamlı bir farklılık göstermekte iken yaş, sınıf düzeyi, öğretmenin ve ailenin karar durumunda öğrencinin fikrini almasına göre anlamlı bir farklılık göstermemektedir.

Anahtar kelimeler: Düşünme becerisi, karar verme, ilkokul

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1 | INTRODUCTION

Information is everywhere now. One may not confine it merely to the institutions with certain boundaries. Therefore, schools must be transformed into institutions that can create knowledge and equip individuals with such skills as understanding, analyzing and problem- solving, rather than merely communicating the information.

Education systems aim to raise individuals who can turn knowledge into a new format through thinking, which requires improving thinking skills. According to the Ministry of National Education (2007), thinking is a process of investigating, comparing and connecting information and concepts, and whereby creating other ideas. Thinking is the cognitive product resulting from this process. According to Fisher (1995), thinking is a set of cognitive activities that involve identification of a problem, creating and solving, decision-making, creating options and investigating the ideas. Thinking involves both the critical and creative aspects of mind (Tok, 2008). This description emphasizes that the skill is related to a set of cognitive and physical processes.

According to Chuska, (1986, p. 9-12, as cited in Karantık, 2016), four conditions are needed for thinking to occur and the resulting ideas to be effective. Each of these conditions is equally important when stepping into the process of thinking. They are listed as follows:

- There must be something to think about: an action, topic, idea, problem, an object, person, a living being or situation.
- There must be something that will trigger an individual to think such as an experience, observation, belief or emotions.
- There must be ways in which to think, such as comparing, summarizing, classifying.
- There must be something to think for, a purpose or a reason that requires thinking, such as resolving a conflict, making a decision on something, clarifying a particular issue.

Thinking is a skill that can be taught. Therefore, thinking skills must be developed in the learning and teaching processes (Doğanay, 2004). The activity of thinking was initially associated with an individual's natural talent or genetic predisposition; however, currently it is concluded that thinking/thinking skills can be taught; i.e., they are a part of education. For example, Robinson (1987) writes in his report that teaching to raise children as active thinkers has increasingly been seen as an immediate target of education. This is because students must acquire and process information to become successful in a world defined by the rapid advent of technology. Rapid changes and developments also shape the qualifications required for a growing individual. All the updated curricula have gradually included such skills upon the results of several recent studies, as well as with the awareness that those skills can be taught, based on such research. Despite the inclusion of such skills in the Turkish Education System, especially as of 2005, academic activities push students to merely memorize information, without even understanding and inquiring, whereas thinking skills remain neglected in these activities.

However, much importance has been placed on the development of skills at the primary school curricula for over a decade. Such skills include the following (the Ministry of National Education [MEB], 2005):

- Critical thinking skill: Critical thinking is the skill that involves interpretation and inference by approaching given issues with an inquiry-driven, skeptical approach.
- Creative thinking skill: Students should create novel and unique information and products based on their own thinking, while coming up with inventions with a unique approach to the facts.
- Communication skill: The communication skill involves effective use of skills such as speaking, listening, reading and writing.

- Inquiry skill: The inquiry skill is realizing, comprehending, planning and testing a problem by asking right, meaningful questions.
- Problem solving skill: Problem solving is the skill that involves solving problems a student encounters in his/her life.
- Information technology skill: The information technology skill involves the ability to use technology while researching, finding, processing and evaluating information.
- Entrepreneurial skill: The entrepreneurial skill is adopting harmonious behaviors in personal relationships, planning, putting the plans into practice and risk taking.
- Good command of the Turkish language with correct and effective use: This is the ability to correctly, fully and quickly grasp what is read, listened and seen.

Thinking skills are among the topics other countries also place importance on. In fact, critical thinking, creative thinking, problem- solving and decision-making skills are accepted as thinking skills according to a study (Developing Minds: A Resource Book for Teaching Thinking) conducted in 1991 with the assistance of 60 prominent researchers and educators by ASCD (Association For Supervision and Curriculum Development) (as cited in Kaya, 2008). This study focuses on the decision-making skill among the thinking skills.

Beyth-Marom et al. (1987) suggest that thinking skills are a means to make good choices. Accordingly, thinking skills are necessary instruments in society, characterized by rapid change, numerous alternatives for action and endless individual and collective options (Cotton, 1991). Such remarks especially refer to decision-making, one of the intertwined thinking skills such as problem solving, critical thinking and creative thinking. The fact that we are forced to make decisions, with various degrees of significance, in our daily lives seamlessly exemplifies use of theoretical knowledge in real life. The knowledge acquired at school should also make it possible to make right decisions.

There are a number of definitions regarding the decision-making skill in the literature. Decision-making can be briefly explained as the art of making preferences (Bağırkan, 1983). Based on another definition, decision-making has to do with identifying the options and choosing one of them by implementing a list of criteria (Baysal, 2009). There is an emphasis on the suggestion that decision-making is making a choice, in these definitions. One should make decisions with various degrees of importance continuously throughout their daily life.

This is a skill that can be taught like other thinking skills as explained above. Both family environment and school life should provide opportunities for individuals to experience and develop their decision-making experiences. It is also an important issue that how early these opportunities are provided. While the body of literature is examined, though there are very few studies (Pekdoğan, 2016) on pre-school education, some studies are remarkable for the primary school period (Yaşar, 2019; Uçar, 2019; Demirbaş-Nemli, 2018; Kaskaya, Calp & Kuru, 2017; Wolfson & Nash, 1968), but still few in number. The studies are carried out mostly on university students in education (Deniz, 2002; Ertural, 2019; Akpınar & Akpınar, 2017; Yüceloğlu-Keskin, Günay-Derebaşı, Bostancı & Kabadayı, 2016; Avşaroğlu, 2007; Alver, 2005). On the other hand, it is seen that decision-making is mostly dealt with in the field of management. However, it is necessary to determine individuals' perceptions on the decision-making skill at an early age, when the foundations of later ages are laid, and to take improving measures in this regard. Therefore, it is thought that this research will be important in terms of shedding light on the activities of the Ministry of National Education, Higher Education Institutions and the studies of academicians.

The main purpose of this study is to examine the decision-making skill perception of third grade and fourth grade students in primary schools based on various variables (e.g. gender, age, grade, inclusion of the student in the decision-making process by the teacher or family).

The following questions are addressed based on this main purpose:

- What is the decision-making skill level of the third and fourth grade students in primary school?
- Are the decision-making skill levels of the third grade and fourth grade students in primary schools different based on gender, age, grade, or inclusion of the student in the decision-making process by the teacher or family?

2 | METHOD

The methodological aspects, such as the type, validity and reliability of the study, as well as the data collection instruments, data collection process and data analysis are addressed under this chapter.

RESEARCH MODEL

The survey model, a descriptive research method, was adapted in the study. Survey research is generally conducted on relatively larger samples, compared to other types of research, involving the identification of opinions of respondents on a particular subject or event or their traits such as interests, skills, abilities, attitudes etc. (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz & Demirel, 2017). The research investigates the decision-making skill perception of the third grade and fourth grade students in primary school according to several variables in an attempt to obtain the largest sample possible.

Table 1. Demographics of the Students Who Participated in the Study

Gender	F	%
Female	284	48.80
Male	298	51.20
Age	F	%
8 years	80	13.75
9 years	271	46.56
10 years	204	35.05
11 years	27	4.64
Grade Level	F	%
Third Grade	314	53.95
Fourth Grade	268	46.05
Inclusion in Decision-Making by the Teacher	F	%
Yes	541	92.96
No	41	7.04
Inclusion in Decision-Making by the Family	F	%
Yes	488	83.85
No	94	16.15
TOTAL	582	100.0

A look into Table 1 indicates that 48.80% of the students who participated in the study are female students, while the 51.20% is male students. 13.75% of the students are 8; 46.56 % is 9; 35.05% are 10; and 4.64% are 11 years of age. 53.95% of the overall population are third grade students, and 46.05% are fifth grade students. 92.96% of the students state that their teacher asks for their opinion in decision-making processes, while 7.04% state the contrary. 83.85% of the students state that their family asks for their opinion in decision making, while 16.15% state the contrary.

Data collection instruments

“Personal Information Form", which was prepared by the researchers in order to be acquainted with the students, who constitute the sample, in terms of various aspects, was used. This form consists of five questions prepared to determine the gender, age, grade level of the student, and the involvement of the teacher and family in the decision. “The Marmara Decision-Making Skill Perception Scale for Primary School Students” that was developed by Ada, Baysal & Demirbaş Nemli (2017) to determine the decision-making skill perception of the third grade and fourth grade students in primary school was administered in the study as a data collection instrument, which is a four-point Likert-type scale with 5 factors and 17 items. While the scale was being developed, an item pool was created, presented to expert opinion, some prospective items were removed from the scale in line with expert opinions, and after some items were revised and corrected, the prospective scale was made ready for pre-application. The exploratory factor analysis technique was used to determine the construct validity of the scale. The explanatory factor analysis technique was used to determine the construct validity of the scale. The KMO (Kaiser- Meyer-Olkin) and Barlett Tests were performed to determine the scale’s suitability for factor analysis, and the KMO value was determined as .876. Cronbach Alpha reliability coefficient was obtained as 0.781 for the entire scale in the study. Barlett Test value in research was found as 5,9433 and the p value of the Barlett test was found to be significant at the 00 level.

It was observed that 9 items are positive and 8 items are negative in the scale consisting of 17 items. In addition, four items each are included in Factor-1-2 and 3, three items in Factor-4, and two items in Factor-5. The reliability coefficients of the sub-factors of the scale in the study are as follows: 0.839 for Factor-1; 0.821 for Factor-2; 0.809 for Factor-3; 0.716 for Factor-4 and 0.721 for Factor-5. The Cronbach Alpha reliability coefficient for the whole scale was found to be 0.781. It is seen that the Cronbach Alpha values of all sub-factors and the scale are above 0.70. The naming of each factor is as follows: "Factor-1: Feeling, Limiting and Defining the Problem”, “Factor-2: Information Gathering”, “Factor-3: Generating Alternative Solution Options "," Factor-4: Decision Making”and“Factor-5: Decision Application and Evaluation”. In this study, the scale was used by evaluating the total score. The scale was graded in 4-point Likert type in line with the opinions of experts. The scale was ranked as "I always behave like this (4)", "I often behave like this (3)", "sometimes I behave like this (2)", "I never behave like this (1)". Positive items in the scale were scored as 4-3-2-1, and negative items as 1-2-3-4. Thus, decision-making perception of each student was calculated. While the lowest score that can be obtained from the final scale is 17, the highest score is 68. The higher the score is, the higher the decision-making perceptions of the students are.

Data analysis

The students were requested to fill out the data collection instruments at the end of the spring semester of the 2017-2018 Academic Year. In data collection, researchers provided information on the purpose of the research, survey and the principle of volunteering; students were asked to keep themselves anonymous in order to ensure reliability. The response time for the scale was around 20 minutes. Statistical procedures were performed on the data collected from a total of 582 students. The collected data was transferred to the computer environment through scoring and coding according to the features of the scale. “SPSS” 25 package program was used for data analysis in the study. The statistical procedures were based on the .05 level of significance. The Kolmogorov-Smirnov normality test was conducted in order to understand whether the research data matches with the normal distribution. Non-parametric statistical techniques are used since the groups are not characterized by normal distribution. The arithmetic mean and standard deviations, independent Group T Test, Mann-Whitney U Test and The Kruskal-Wallis H Test were used in data analysis. In addition, when the categories of variables were examined, non-parametric tests were used as there were categories less than 30 in the sample and the large differences between the categories supported that the groups did not show normal distribution.

3 | FINDINGS

Findings obtained from research data analysis are presented under two categories according to the order of the questions within the scope of the study; namely, the decision-making skill of third grade and fourth grade students in primary school and differentiation of this level based on the variables covered.

FINDINGS REGARDING THE LEVEL OF THE DECISION-MAKING SKILL PERCEPTION OF THIRD GRADE AND FOURTH GRADE STUDENTS IN PRIMARY SCHOOL

Table 2. Arithmetic Means and Standard Deviation Values Associated with the Decision-Making Skill Perception of Third Grade and Fourth Grade Students in Primary School

n	Max	min	ss	$\bar{X}$
582	68	23	6,111	42,12

The arithmetic mean of third grade and fourth grade students (n=582) is 42.12, while the standard deviation is 6.111 according to Table 2. The decision-making skill perception of students is at a "medium level".

FINDINGS REGARDING THE DECISION-MAKING SKILL LEVELS OF THIRD GRADE AND FOURTH GRADE STUDENTS IN PRIMARY SCHOOLS BASED ON GENDER, AGE, GRADE, INCLUSION OF THE STUDENT IN THE DECISION-MAKING PROCESS BY THE TEACHER OR FAMILY

The independent Group T test was conducted to determine whether the decision-making skill perception of third grade and fourth grade students in primary school differs according to the gender variable. The data obtained is presented in Table 3.

Table 3. Results of the Independent Group T Test Conducted for the Differentiation of the Decision-Making Skill Perception of Third Grade and Fourth Grade Students in Primary School by Gender

				T test		
Gender	n	$\bar{X}$	sd	T	Sv	P
Female	284	41.25	5.981			
Male	298	42.95	6.126	3.394	579.656	.001

According to Table 3, while the arithmetic mean of the decision-making skill perceptions of the third and fourth-grade female students is 41.25 and its standard deviation as 5.981; the arithmetic mean of male students' decision-making skill perceptions is seen 42.95 and its standard deviation is 6.126. Decision-making skill perceptions of third and fourth grade students (n = 582) show a significant difference at the 01 level in favour of male students by gender. That is, it can be interpreted that male students' decision-making skill perceptions are higher than female students.

The independent Kruskal-Wallis H Test was conducted to determine whether the decision-making skill perception of third grade and fourth grade students in primary school differs by the age variable. The data obtained is presented in Table 4.

Table 4. Results of the Kruskal-Wallis H Test Conducted for the Differentiation of the Decision-Making Skill Perception of Third Grade and Fourth Grade Students in Primary School by Age

Age	n	X_{order}	X^2	sv	*P*
8 years	80	267.53			
9 years	271	(n=291.37	2.067	3	*.559*
10 years	204	294.25			
11 years	27	313.33			

A look into Table 3 shows that there is no significant difference in the decision-making skill perception of third grade and fourth grade students (n=582) by age (x2= 2,067; sd=3; p=,556).

The independent Group T test was conducted to determine whether the decision-making skill perception of third grade and fourth grade students in primary school differs by the grade variable. The data obtained is presented in Table 4.

Table 5. Results of the Independent Group T Test Conducted for the Differentiation of the Decision-Making Skill Perception of Third Grade and Fourth Grade Students in Primary School By Grade

				T test		
Grade	*N*	$\bar{X}$	*sd*	*T*	*Sd*	*p*
Third grade	*314*	*42.04*	*6.277*			
Fourth grade	*268*	*42.21*	*5.919*	*.345*	*580*	*.730*

There is no significant difference in the decision making skill level of students (n=582) by grade (p>.05) according to Table 5.

The independent Whitney U Test was conducted to determine whether the decision-making skill perception of third grade and fourth grade students in primary school differs by students' inclusion in decision-making by the teacher. The data obtained is presented in Table 6.

Table 6. Results of the Whitney U Test Conducted for the Differentiation of the Decision-Making Skill Perception of Third Grade and Fourth Grade Students in Primary School Based on Student's Inclusion in Decision-Making by the Teacher

Inclusion in the Decision Making Process	N	Xorder	∑order	U	z	p
Yes	541	294.19	9156.0			
				9.636	-1.403	.160
No	41	256.02	10497.0			

There is no significant difference in the decision-making skill perception of the students (n=582) who participated in the study based on students' inclusion in the decision-making process by teachers according to Table 6 (u=9,636; z= -1,403; p=,160).

The independent Whitney U Test was conducted to determine whether the decision-making skill perception of third grade and fourth grade students in primary school differs according to the variable of students' opinion inclusion in the decision-making process by the family. The data obtained is presented in Table 7.

Table 7. Results of the Whitney U Test Conducted for the Differentiation of the Decision-Making Skill Perception of Third Grade and Fourth Grade Students in Primary School by students' Opinion Inclusion in Decision-Making Processes by the Family

Inclusion in the Decision Making Process	N	Xorder	∑order	U	z	p
Yes	488	293.91	43428.0			
				2.176	-.789	.430
No	94	278.99	6225.0			

There is no significant difference in the decision-making skill perception of the students (n=582) who participated in the study based on the inclusion of the student in decision-making by the family according to Table 6 (u=2,176; z= -,789; p=,430).

4 | Discussion and Conclusion

According to the findings obtained, the results of this study are covered under two main categories.

Results regarding the evaluation of the decision-making skill perception of third grade and fourth grade students in primary school

- *The decision-making skill level of third and fourth grade students in primary school is at a "medium level". This result indicates that the decision-making skill perception of third and fourth grade students are not at the desired level.*

The results of the studies conducted abroad (Nickerson, 1988; Perkins, 1985; Reid & Paradis, 1989) indicate that thinking skills do not develop after attending school for 12-13 years, that students 'thinking and reasoning skills are lower than desired at secondary, high school and university levels and that students' thinking skills do not develop naturally by itself during basic education. Therefore, the desire to develop thinking skills is a problem that many countries have tried to solve in recent years. (as cited in Güneş, 2012). The present research reveals that the decision-making skills perceptions of third and fourth grade primary school students should be improved. Although primary school is a period when very important decisions are not made, it can be considered as a period of forming a good foundation for other periods. In Turkey, the results of some studies conducted with older sample (for example, Tok, 2010) suggest that decision-making skills do not naturally develop spontaneously.

Results regarding the decision-making skill levels of third grade and fourth grade students in primary schools by gender, age, grade level, inclusion of the student in the decision-making process by the teacher or family

The results obtained according to the variables in the study are classified and discussed below.

- *There is a significant difference by gender in the decision-making skill perception of students, in favor of male students.*

Gender is a variable that affects the thoughts and behaviours attributed to individuals by culture in addition to the biological structure, and it is in question that to be affected by the roles assigned by the society as much as possible. Firstly, the family and then the school play an active role in the adoption of these roles, so that girls and boys learn the roles assigned to them and turn them into behaviour. Male children in Turkish society appear to be more active from past to present at all levels in the political, economic and cultural life and they are especially kept much more in the foreground in the family environment. Considering all these cultural characteristics, though a conclusion emerges in favour of men in the perception of decision-making, one of the important results of the research can be interpreted as an expected situation within the sample boundaries, different results are also noted in literature studies.

Tekin and Ulaş (2016) used the Decision Making Skills Evaluation Scale in their research on the decision-making skills of primary school fourth grade students. As a result of the research, a significant difference was not observed in the sub-dimensions of making dependent decisions in terms of the gender variable and in making decisions having considered their desires and in making decisions based on their skills, a significant difference was found in favour of female students in the independent decision-making sub-dimension. The result of the research suggests that female students attending the fourth grade of primary school act according to their own opinions when faced with a decision compared to male students. Karakaş-Günal (1999) conducted a research by using the four-factor scale (dependent decision- making, independent decision- making, decision- making according to their abilities and decision- making by taking into account their wishes) developed by fourth and fifth grade students to solve problems in daily life. Differences were observed in decision-making skills according to gender, items and factors within the scope of the scale. A difference was found in favour of girls in the first and third sub-dimensions of the scale, and in favour of boys in the fourth sub-dimension (making decisions based on their wishes). In the research conducted by Ersoy and Deniz (2016) with gifted five, six, seven and eighth grade students, it was found that the decision-making skills of female students were higher than that of boys.

Uçar (2019) collected data from first-year primary school students in his research titled "An Investigation of the Decision- Making Skills of First Grade Students in Terms of Various Variables". In the research, the difference between the arithmetic mean scores of the total and none decision- making conduct sub-dimension scores of male and female students (being determined, independent decision-making, emotions in decision- making, and difficulty in decision) was not found statistically significant. In other words, students' decision-making characteristics do not change according to their gender. Çakmakçı (2009) could not find a difference in all sub-dimensions (dependent decision-making, independent decision-making, making decisions based on their abilities, and making decisions based on their desires) of the scale which he used in both pre-test and post-test results in the research that he conducted an experimental study with fourth-grade students Wolfson and Nash (1968); designed their research to determine how teachers and students perceive classroom decision-making opportunities, at the first, second, and third grade levels. They stated in their research that although there was no difference in students' decision-making perceptions in terms of gender, girls perceived themselves more than boys when making decisions.

As can be seen, while some researches did not find a significant difference in decision-making skill levels or perceptions according to gender variable as different from the results of this study, and also the results are obtained in favour of girls in some researches. This suggests that further research should be conducted on childhood decision-making skills.

- *The decision-making skill perception of students differs significantly while there is no meaningful difference in terms of grade and asking the student's opinion in decision-making processes at home and school.*

Uçar (2019) reached the conclusion that the decision-making characteristics (total and all sub-dimensions) scores of primary school first grade students do not differ according to the age variable. Similarly, Wolfson and Nash (1968) concluded that there is no difference in decision-making perceptions of first, second and third grade students in terms of age. These results are similar to the results of the present research. However, in some of the researches in the literature, significant differences were found in terms of age in favour of later age. For example; Davidson (1991), worked with primary school students aged 7-14 years in his research that he examined children's decision-making skills. As a result of the research, it was observed that the decision-making skills of children differ at the age level. It was concluded that the prior knowledge of the children also affects the decision- making. It has been determined that as children grow, they use less information and make more precise decisions at the decision-making level. Levin, Weller, Pederson, and Harshman (2007) examined the decision-making adaptation of children of different ages. They divided the children into groups as 5-7 and 8-11 years old in the experimental study.

They presented risky situations to children using materials and asked them to make choices among them and make decisions. According to the results of the research, while children aged 5-7 years achieved more uncertain results in decision-making situations, children aged 8-11 reached more specific decisions. Denise (1989) conducted a research with primary school second, fifth and eighth grade students on decision making and examined how students' decision strategies changed depending on their decision situation. According to the findings of the research, he reached the conclusion that second grade students cannot use decision strategies effectively, but fifth and eighth grade students can use rational decision strategies (as cited in Öncül, 2013). These studies do not coincide with the present research in terms of their results. It suggests that the present research may have resulted from the fact that it was conducted in a short age range (8-11 years).

Although there is no exact research questioning the decision-making status of the teacher and the family according to the variable of getting the student's opinion in the case of decision among the studies examined in the literature, Kaskaya, Calp, and Kuru (2017) stated that teachers and families are the factors that affect decision-making in their research that they did with primary school fourth-grade students. According to this research, family has an effect on both the reasons for preference and the preference itself Yet, in the research conducted by Deveci (2011), it was stated that the support provided by the family to the individual has positive results in the decision-making process of the individual and this support affects the decision-making style of the individual (Kaskaya, Calp, & Kuru, 2017). These emphasizes do not resemble with the present research. Wolfson & Nash (1968) found wide differences in perception of students' decision-making roles in the research that he did with first-year students. At the same time, students 'perceptions were found to be different from their teachers' perceptions on average. Although the differences in the students still continue at the end of the school year, the students saw themselves more decisive (Wolfson & Nash, 1965).

Some suggestions are given below based on the results of the research.

• It is noteworthy that the number of studies on elementary school decision making skills is limited in Turkish literature. It may be recommended to plan studies on decision-making skills especially at primary school level.

• Decision-making skills perceptions of primary school third and fourth grade students can be determined by new researches in the context of private and public schools and intermittent grade levels (by using different sample groups).

• In this research, while students' perceptions of decision-making skills show a significant difference in favour of male students according to gender, but some researches in the literature did not find a difference and in some studies, it was found a difference in favour of girls. From this point of view, further studies can be conducted on how the gender variable affects the decision-making situation in primary school students.

• Based on the results of the current research, it is synthesized that the results related to the variables other than the gender variable also differ. For this reason, it may be recommended to carry out further studies on decision-making skills according to various variables.

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A New Step Towards Narrowing the Achievement Gap in Turkey: "1,000 Schools in Vocational Education and Training" Project

Mahmut Özer[a*]

[a] Prof. Dr., Ministry of National Education, Ankara/Turkey, (http://orcid.org/0000-0001-8722-8670) * mahmutozer2002@yahoo.com

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Abstract

Systematic steps have been taken to improve the quality of vocational education and training (VET) in Turkey after the publication of the country's Education Vision 2023 document, resulting in short-term positive outcomes. These actions expanded the scope and scale of the collaborations with these sectors, as well as establishing a quality assurance system in VET. Additionally, the greater proportion of on-the-job training programs established through these reforms have increased students' skill development. Research and development centers focusing on intellectual property were established as centers of excellence in VET, and patent, utility model, design, and trademark productions and registration processes were also prioritized during this period. At this point, the Ministry of National Education (MoNE) has taken a new step to improve the quality of VET and alleviate the achievement gap by starting the "1,000 Schools in Vocational Education and Training" Project. The present study introduces this project and discusses its aims and scope in detail. The project implements a holistic approach towards narrowing the achievement gap, aiming to improve the infrastructure and educational environments of VET schools through considerable investments in school development, as well as building teachers and executive leaders' capacities. Additionally, students' educational and personal development will be supported in a multifaceted way to compensate for deficiencies in basic skills. Parents will also be supported through planned lifelong learning mechanisms. When the initial project has been completed after one year, the improvement in VET will be scaled up to expand to all schools in Turkey. Ideally, the 1,000 Schools Project will help to narrow the achievement gap between high schools in Turkey.

Keywords: Education vision 2023, vocational education and training, basic skills, achievement gap, equality in education

Türkiye'de Okullar Arası Başarı Farklarını Azaltmaya Yönelik Yeni Bir Adım: "Mesleki ve Teknik Eğitimde 1.000 Okul" Projesi

Öz

Türkiye'de 2023 Eğitim Vizyonu sonrasında mesleki eğitimde kaliteyi artırmaya yönelik sistematik adımlar atılmış ve kısa sürede sonuçları alınmaya başlanmıştır. Sektörlerle kurulan iş birliklerinin kapsamı ve ölçeği genişletilmiş ve kalite güvence sistemi kurulmuştur. Mesleki eğitimde işletmelerde beceri eğitimi güçlendirilmiş ve uygulamalı eğitime ağırlık verilmiştir. Mesleki eğitimde mükemmeliyet merkezleri olarak kurulan AR-GE merkezlerinde fikri mülkiyet çalışmaları odağa alınmış ve bu kapsamda patent, faydalı model, tasarım ve marka üretim ve tescil sürecine ağırlık verilmiştir. Milli Eğitim Bakanlığı mesleki eğitimde kaliteyi yaygınlaştırmak ve okullar arası başarı farkını azaltmak için yeni bir adım atarak 'Mesleki Eğitimde 1.000 Okul Projesi'ni başlatmıştır. Bu çalışmada bu proje tanıtılmakta ve proje kapsamında atılacak adımlara değinilmektedir. Proje kapsamında mesleki eğitimde seçilen okulların altyapısı ve eğitim-öğretim ortamları iyileştirilecek ve zenginleştirilecektir. Diğer taraftan öğrencilere yönelik temel beceri eksikliklerini telafi etmeye yönelik eğitim desteği ve kişisel gelişim destekleri verilecektir. Ayrıca öğrencilerin velilerine yönelik hayat boyu öğrenme kapsamında eğitim desteği verilecektir. Süresi bir yıl olarak belirlenen proje başarılı bir şekilde tamamlandığında Türkiye'de mesleki eğitimde yaşanan iyileşme tüm okullara yayılmış ve toplam bir iyileşme sağlanmış olacaktır. Ayrıca, mesleki ve teknik Anadolu liseleri ile diğer lise türleri arasındaki başarı farkları da azalacaktır.

Anahtar kelimeler: 2023 eğitim vizyonu, mesleki ve teknik eğitim, temel beceriler, okullar arası başarı farkı, eğitimde eşitlik

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1 | INTRODUCTION

Countries attach great importance to vocational education and training (VET) for meeting the human resource needs of their labor markets. Many countries have seen reforms in their VET systems to make these institutions compatible with the transformations in labor markets (Coenen et al., 2015; Fuller, 2015; Hanushek et al., 2017; Özer & Perc, 2020; Rözer & Werfhorst, 2020; Sahlberg, 2007; Shavit & Müller, 2000). The main purpose of such revisions in VET is to support students with skills that can easily be adapted to the dynamic demands of the labor market. Therefore, VET systems are restructured to train students with broader general "soft" cognitive and social skills, as well as vocational skills (Özer, 2020a). Such reforms ease graduates' school-to-work transition and decrease youth unemployment rates (Allmendinger, 1998; Bol et al., 2019; Breen, 2005; DiPrete et al., 2017; Muja et al., 2019a, 2019b).

In recent years, the expansion and growing accessibility of higher education has increased students' demands for higher education. Moreover, the fact that higher education graduates have better employment opportunities and access to prestigious professions fuels this demand (Korber, 2019). Therefore, students tend to prefer forms of secondary education that facilitate their transition to higher education. Consequently, high schools with academic programs, rather than vocational or alternative modes, are preferred more by students. In the long term, this trend restricts the student transition to VET in most countries, and VET high schools are at risk of becoming remedial institutions where relatively low-performing students are grouped (EQAVET, 2015). Even countries with traditionally strong VET systems, such as Germany, are affected by this inclination (Deissinger, 2015; Özer, 2020a; Solga et al., 2014). On the one hand, VET shoulders the responsibility of rapidly transforming the skills it cultivates in students, based on the widespread proliferation of automation and artificial intelligence in the production and service sectors; but on the other hand, it also bears the responsibility of helping students with deficiencies in basic social and academic skills to adapt to new conditions (Acemoğlu & Restrepo, 2018; Özer & Perc, 2020; Perc et al., 2019).

Turkey is experiencing similar trends and faces nearly the same problems with its VET system as other countries. Relatively high-performing Turkish students tend to select high school types that facilitate their access to higher education. While this inclination already creates critical challenges for VET, additional interventions intensified these challenges in Turkey. The coefficient regulation, introduced in the Turkish university entrance exam by the Council of Higher Education in 1999, restricted the transition of VET graduates to higher education from 1999 to 2012, thus reducing the number of high-performing students choosing VET (Özer, 2020b). This regulation, which was applied for more than ten years, negatively impacted VET and thus the labor market. Due to the regulation, high performing students who wished to enroll in VET ended up changing their preferences towards high schools with academic programs, due to the potential disadvantages that VET could pose when transitioning to higher education. After this policy ended in 2012, VET experienced a second impediment without sufficient time to recover from the coefficient regulation. This new intervention, the Transition from Primary to Secondary Education (TEOG) system, placed all students into high schools based on a central test score, which led the widespread tracking of low performing students into VET high schools (Bozgeyikli, 2019). Both of these interventions increased the flow of low performing students into VET and created a more disadvantageous environment in VET schools. The negative consequences of these interventions were not limited to the VET system, however: they also affected other components of the Turkish education system. These practices led to an increase in the achievement gap and thus inequalities in education (Bölükbaşı & Gür, 2020). Consequently, PISA results show that VET high schools are the school type most negatively affected by achievement gaps across Turkey (Cingöz & Gür; 2020; Suna et al., 2020a; Suna, Tanberkan, & Özer, 2020).

The Turkish Ministry of National Education (MoNE) has made great efforts to improve the VET system in recent years. Solid steps taken by MoNE, especially after the Education Vision 2023 announced at the end of 2018, have quickly alleviated many problems in VET (Özer, 2018, 2019a, 2019b, 2020c; Özer & Suna, 2019, 2020). The VET curriculum has been revised in all vocational areas in collaboration with select

economic sectors and aligned with national vocational standards. The MoNE also established a quality assurance system for VET with contributions from various sector representatives. In addition, the fields and branches of VET were simplified based on demands of the labor market, and additional attention was paid to the weight of general skills when designing the new curricula. Digital literacy skills were also emphasized in the new programs and curricula, to bolster students' ability to adapt to technological developments (Canbal et al., 2020). Broader collaborations between the MoNE and various sectors of industry has improved students' attitudes towards VET, and the number of students who enrolled in VET programs between 2018 and 2020 increased by 63%. Moreover, the enrollment rates of VET high schools based on their central test scores have increased, and the minimum scores for enrollment in these high schools have also increased dramatically (Özer, 2020b). For the first time in a long while, a significant proportion of high performing students have indicated a preference for VET high schools. This is an important indicator of the recovery of the VET system from the negative impacts of both the coefficient regulation and TEOG policies.

These improvements in VET stemming from the Education Vision 2023 have also buoyed the performance of VET schools during the COVID-19 pandemic. Almost all of the products needed across Turkey during the pandemic period (e.g., personal protective equipment, disinfectants, etc.) were produced by VET high schools (Özer, 2020d, 2020e, 2020f; Özer & Suna, 2020). In this context, diverse products from disinfectant to masks, to protective face shields to ventilators were produced and delivered to people in need, through the labor of VET students and graduates.

The performance of VET high schools has not only positively affected individuals' attitudes towards VET; it has also led to an increase in the self-confidence of VET students and teachers after a long-period of being perceived as less important. In addition, the positive outcomes of broader collaborations with industry sectors for the last two years have increased employers' confidence in their cooperation with the MoNE, and the mutual trust developed between education and industry has enabled the development of new projects.

One of the most persistent and critical problems faced by the Turkish educational system is the achievement gap. The MoNE has designed and provided several support programs to mitigate the adverse effects of this gap over the years. Turkey considers the issue a multifaceted problem and therefore supports narrowing the gap through a holistic approach. For example, support programs such as the "Remedial Education & Support Programme in Primary Education" (İYEP) and Supporting and Training Courses (DYK) aim to compensate for students' deficiencies in academic and basic skills. On the other hand, policies for closing the achievement gap in Turkey not only focus on differences in academic achievement—they also consider the social and economic support of students. In this context, support policies such as special education programs, free distribution of textbooks, transportation of students to schools, free-food support, hostel and scholarship support, and conditional education support have been implemented regularly for many years. Since VET is the education type most negatively affected by the achievement gap, the MoNE developed a new project focusing on alleviation of the achievement gap in VET. This study discusses in detail the aim and scope of this project, called "1,000 Schools in Vocational Education and Training." In addition, the effects of this project on the quality of VET and its contribution to the alleviation of the achievement gap are addressed.

Although its scope is smaller, the 1,000 Schools Project shares some characteristics with similar sweeping international initiatives and policies, such as the No Child Left Behind Law (USDE, 2002), which was implemented in the United States between 2001–2015 and prioritized supporting disadvantaged students; the education support of the Hamilton Project, implemented in the United States since 2006 (Ander et al., 2016); support projects in the UK with a total budget of 28 million pounds, combining the resources of governmental and non-governmental organizations to support the education and training of young people (UK Department of Education, 2018); and the Rutland Street Project, which has supported

early preschool interventions in Ireland since the 1960s (Educational Research Center, 1998). In this context, the current project aims to alleviate the achievement gap by supporting disadvantaged students and providing them equal opportunities in education.

PROJECTS TO NARROW THE ACHIEVEMENT GAP

The achievement gap between schools in Turkey is one of the largest issues contributing to educational inequality across the country. This achievement gap may originate from both structural problems inherent in the education system and non-school factors linked to demographics (Özer, 2020g). Socioeconomic status in particular becomes a key determinant of students' academic achievement in primary education. For example, differences in students' socioeconomic level explained 9% of the variation in PISA 2015 scores in Turkey (MoNE, 2016), and this rate increased to 11% in the PISA 2018 data (OECD, 2019). Many studies have been conducted on the effect of students' socioeconomic status on academic achievement in Turkey (e.g., Arslanargun et al, 2016; Coşkun & Ünal, 2006; Dinçer & Uysal-Kolaşin, 2009; Güllüpınar & İnce, 2014; Oral & Mcgivney, 2014; Özkan, 2010; Suna et al., 2020b). These studies widely demonstrate that students' socioeconomic levels have a significant effect on their academic achievement.

School tracking is the primary mechanism behind the achievement gap, which begins in primary education in Turkey and becomes stronger at the high school level (Bölükbaşı & Gür, 2020; Suna et al., 2020a). In particular the TEOG system, which placed all students into high schools based on their test scores, contributed to the achievement gap between school types more than other transition systems used in Turkey (Suna et al., 2020b). Since the relationship between students' TEOG scores and their socioeconomic status is very strong (as with many other standardized tests), students are latently clustered into high school types based on their socioeconomic levels. The tracking of students into school types based on their socioeconomic status also has important implications on educational activities and environments. Many studies in other countries have shown that teachers' expectations of students vary according to achievement levels (e.g., Oakes, 1990). Therefore, school types where disadvantaged students are clustered are negatively affected by school tracking, and they become even more disadvantageous due to teachers' low expectations of students and the corresponding negative learning environment that is created.

A new study by Cingöz and Gür (2020) shows that differences in socioeconomic level explain 38% of the variation in TEOG scores; a result indicating that socioeconomic level is a critical determinant in placement of students to high schools in TEOG system. Additionally, results show that the vast majority of students with the highest test scores in science high schools are also from the highest socioeconomic levels. On the other side, more than half of the students with lower exam scores in VET high schools are from lower socioeconomic levels. These findings on exam scores and high school types is also consistent with the results of a new study by Suna et al. (2020b). In 2018, the TEOG system was terminated and a new placement system was introduced: the LGS system. In the LGS system, only about 10% of the students transitioning into high schools in any given year are placed based on their central test score, while the other 90% are placed in high schools based on their geographic location and performance in middle school.

For many years, the MoNE has undertaken different projects to attempt to narrow the achievement gap between schools. The "Remedial Education & Support Programme in Primary Education" (İYEP) has been implemented successfully to support students with basic skill deficiencies in primary schools (Gençoğlu, 2019). Additionally, Supporting and Training Courses (DYK) continue to be offered throughout the country to support students through extra classes in middle and secondary schools. In this context, the "1,000 Schools in Vocational Education and Training" Project introduced in this study is the largest-scale project undertaken by the MoNE to close the achievement gap.

The MoNE established the "Department of National Monitoring and Assessment" (DNMA) in 2019 to increase the quality and equity of national education, as well as to monitor and alleviate the achievement

gap at both the primary and secondary level. The DNMA monitors components of the education system, as well as conducting data-based research and sharing the findings with relevant departments. The department also monitors the improvements resulting from policy changes and steps taken by the Ministry. In keeping with these goals, the DNMA has designed large-scale studies to monitor student achievement on a national level. The first research of this kind was undertaken in 2019, involving a monitoring study of student achievement conducted in 81 provinces across Turkey to assess 350,000 students in the 4th, 7th, and 10th grades at 2,865 schools (MoNE, 2019a). Also in 2019, the DNMA began an assessment study to evaluate students' four key skills in the Turkish language: reading, writing, speaking, and listening (MoNE, 2019b). Finally, the department has also conducted a monitoring study of 5th to 12th grade student achievement in Turkish, mathematics, science, and foreign language courses, collecting data at the end of each semester for students who participate in DYK courses. These studies performed by the DNMA examine the reasons behind the achievement gap and support the development of data-driven interventions to alleviate these disparities.

SCOPE AND GOALS OF THE PROJECT

In Turkey, VET is structured as a four-year education program at the high school level and offered to students through two different options. In the first option, VET is mainly undertaken in schools, particularly vocational and technical Anatolian high schools (VTAH), and while some skill training takes place in companies. In the second option (Vocational Training Center, or VTC), VET is provided at the school one day a week, while skill training takes place in companies on the other days. Traditional apprenticeship, journeyman, and mastership trainings are also offered in VTCs. Currently, the VET institutions in Turkey are comprised of 3,259 VTAHs and 332 VTCs. Approximately 1.5 million students are enrolled in these 3,591 VET institutions, and these students account for approximately 36% of the students enrolled in secondary education nationally. VET is mainly provided through VTAHs, with only 8% of the total VET students enrolled in VTCs.

Within the scope of "1,000 Schools in Vocational Education and Training" Project, 1,000 schools were selected from the national total of 3,259 VTAHs based on pre-defined criteria, including rates of absenteeism, disciplinary problems, academic achievement, grade repetition, and school drop-out rates. Approximately 600,000 students are enrolled in these 1,000 selected schools. The general aim of the project is to extend the improvements implemented by the MoNE in recent years to all VET high schools, and to increase the overall quality of VET across Turkey. Since vocational training is the most disadvantageous type of education in terms of the achievement gap, the project aims to close this gap by providing support to the most disadvantaged VET schools. The estimated duration of the project is one year, with a required budget allocated accordingly.

This project aims to support administrators and teachers, to improve the educational environment in VET schools, and to support students to compensate for their deficiencies in basic skills and personal development. In addition, educational support will be provided to students' parents within the scope of lifelong learning. In this context, the project aims to support all stakeholders in VET—including students, teachers, and students' families in the selected schools—simultaneously with various resources. Therefore, this initiative focuses on generating holistic improvements in both the in-school and out-of-school factors affecting the achievement of the schools selected, using the following strategies:

SUPPORTING ADMINISTRATORS AND TEACHERS: The project aims to organize trainings for the administrators and teachers at the selected schools within the scope of the program's goals. For this purpose:

a) Trainings will be organized for all schools in order to increase awareness of the project, and inform the administrators and teachers in the schools about the scope of the project.

b) Personal development and leadership trainings will be organized for school administrators.

c) Trainings to increase the efficiency of the project will be organized for all teachers in the schools.

d) All vocational teachers in the schools will be provided with on-the-job and professional development training during the project period.

IMPROVING EDUCATIONAL ENVIRONMENTS: The project aims to improve the educational environments of the selected schools. For this purpose:

a) Maintenance and repair of the schools will be prioritized.

b) A library will be structured in each school, and these libraries will be enriched with information and communication technologies (ICT).

c) At least one new laboratory will be established in each school.

d) Current laboratories in the schools will be updated with modern equipment and resources.

e) Production capacity of the schools will be increased through revolving funds. As a result of this increased production capacity, students in the schools will be able to receive wages up to the minimum wage in proportion to their contribution to production, and teachers can also receive additional compensation up to twice the minimum wage.

f) At least one new design and skills studio will be established in these schools within the scope of the "Design and Skills Studio Project in Schools" started by the MoNE after the publication of the Education Vision 2023.

g) Each school will be supplied with at least two smart boards.

BASIC SKILLS EDUCATION SUPPORT: VET students have critical deficiencies in their basic skills originating from primary education, which need to be remedied. Higher levels of deficiency in this area have been observed in the VET schools selected for this project; thus, the project aims to provide support for students to overcome these deficiencies. For this purpose:

a) A remedial program has been developed to compensate for the basic skill deficiencies of the students in these schools. The planned areas of emphasis in these remedial programs include Turkish, mathematics, and science literacy.

b) In this context, necessary materials will be prepared and delivered to schools.

c) In the scope of DYK courses, additional educational programs will be provided to the students in the selected schools.

d) Science and Art Centers (BİLSEM), which are located in 81 provinces and provide educational support to gifted and talented students, will also support the schools in project planning and development in 2021.

PERSONAL DEVELOPMENT SUPPORTS: Multi-dimensional personal development supports will be provided to the students in the schools within the scope of the project. For this purpose:

a) First aid training will be provided to all students.

b) Psychosocial development support will be provided to all students.

c) Swimming courses will be organized for the students who would like to participate.

d) Life centers, which offer individual and group sports activities, will be established in all schools.

e) Career days will be organized at least once a month in all schools to share the experiences of role models in fields such as science, culture, arts, sports, and industry.

f) All students will participate in cultural activities such as theater and cinema at least once during the project period.

g) Events will be organized against drug addiction in the schools.

h) VET schools involved in the project will be matched with Anatolian fine arts and sports high schools in their area. Within this collaboration, culture, arts, and sports events will be organized together to increase involvement with the community and sharing across different types of schools.

SUPPORT FOR PARENTS OF STUDENTS: Students' parents will be supported academically and socially within the scope of lifelong learning. For this purpose:

a) Public education centers will organize trainings in fields requested by parents, and these parents will receive certifications after completing trainings.

b) It will be ensured that parents can continue their education and professional development through distance education programs.

c) Parents within the scope of the project will be given priority for the "Vocational High Schools Meet Families" project, which has been successfully implemented by VET high schools for years. In this context, VET students from neighborhood schools will help care for parents within the project by repairing old furniture and home goods and supporting them in other daily needs.

2 | Discussion and Conclusion

VET has contributed greatly to the economic development of Turkey by training the human resources demanded by the labor market for years. For this reason, particular attention has been paid to the development of VET since the first years of the Turkish Republic. Many policy documents, especially Development Plans, have attributed great importance to VET since then (Özer, 2020b). Another indicator of the importance attached to VET is the research conducted on vocational education by many institutions and stakeholders, especially non-governmental organizations. Therefore, both the public and private sector agree on the importance of VET for economic development.

However, most current problems faced by VET in Turkey are similar to those in other countries. In most countries, students tend to prefer pursuing an academic track instead of a vocational track, and consequently vocational training is mostly preferred by students from lower socioeconomic levels, and VET institutions suffer from higher absenteeism rates. Additionally, both the coefficient regulation, which restricted the access of VET graduates to higher education, and the TEOG, which placed all students in high schools based on their central test scores, intensified the magnitude of problems for VET in Turkey compared to other countries. For years, the MoNE has tried to eliminate the negative effects of these interventions through many countermeasures. These efforts have become more systematic after the announcement of the Education Vision 2023, and considerable progress has been made in a short time since then.

The most important characteristic of the period after the Education Vision 2023 has been the scale and scope of collaborations with various industry sectors. For the first time, sector representatives have been encouraged to apply their experience comprehensively to all components and processes of VET in Turkey. In this context, cooperation with the leading sector representatives in each vocational field has been successfully maintained since the 2023 vision was released, producing significant results in a relatively short time period. The performance of VET after this transformation, combined with VTAH and VTC's critical industrial production during the COVID-19 pandemic, has positively shifted Turkish citizens' and employers' perception of VET. Consequently, the number of students who enrolling in VET high schools increased by 63% between 2018 and 2020. As a result, the average test scores of students

enrolling in VET high schools, as well as the number of high-achieving students enrolling in these schools, have increased. Therefore, VET high schools are now perceived as institutions worthy of enrollment for high-performing students. Additionally, while 2,5000 teachers were enrolled in on-the-job and professional development trainings in 2018, this number increased to 43,000 over two years with the support of industry sectors. Very important progress has been made with the backing of Turkish industries to increase the quality of teachers, which is the most important factor determining students' educational outcomes. Hence, many different indicators point to significant improvements in the Turkish VET system.

The MoNE also implemented two new and important projects to improve the quality of VET during the COVID-19 pandemic. First, research and development centers with strong infrastructure and human resources were established in 40 vocational and technical Anatolian high schools (VTAHs) to further increase the production capacity of VET, which already strengthened greatly during the COVID-19 pandemic. By structuring these centers to focus on intellectual property, they could now focus on registering patents, constructing utility models, and producing designs and brands. Second, although VET is the education type most negatively affected by the achievement gap, no specific project has focused on narrowing this gap in VET until now. A thousand schools were identified among the vocational and technical Anatolian high schools that had the largest problems in absenteeism, dropout rates, and academic achievement nationally. The "1,000 Schools in Vocational Education and Training" Project, which includes a comprehensive support package for these schools, has been started to improve the quality of VET across Turkey.

The "1,000 Schools in Vocational Education and Training" Project aims to increase the quality of VET on the one hand, and to close the achievement gap on the other hand. The project includes 1,000 VET high schools in 81 provinces, enrolling approximately 600,000 students. This is the largest scaled project designed by the MoNE to narrow the achievement gap. The project aims to compensate for the deficiencies in students' basic skills, increase their sociocultural capital, and support their holistic personal development. The educational environment of the schools will be improved and enriched through diverse resources within the scope of the project. In addition, remedial education and personal support in the fields of culture, arts, and sports will be provided for students in these schools.

The OECD (2012) has shown that the most effective interventions to support disadvantaged students involve eliminating schools' physical and administrative deficiencies, creating a supportive school atmosphere, increasing teacher qualifications, improving classroom teaching methods, and increasing interactions between the school and parents and non-governmental organizations. As mentioned by Carter (2018), because inequalities in education are related to multidimensional problems, the solutions to such inequalities must also be multidimensional. Associating the inequalities in education solely with academic achievement will not solve the problem, it will merely perpetuate the inequalities (Haas Institute for a Fair and Inclusive Society, 2017). For example, within the framework of the No Child Left Behind Law, which prioritized disadvantaged students in the USA, focusing intensely on test scores to decrease the achievement gap did not solve the problem, and instead led to test score inflation and unfair penalties for lower-achieving schools (CEP, 2007; Koretz, 2005). Therefore, policies for supporting disadvantaged students should consider the school climate, sociocultural context, and community factors as a whole.

In this context, one of the most important features of the "1,000 Schools in Vocational Education and Training" Project is that disadvantage is considered according to a multi-dimensional perspective, and the project plan is structured in coherence with this perspective. This project is also differentiated from similar interventions because does not just focus on students, but also administrators and teachers in schools, as well as families. A study by Cingöz and Gür (2020) suggests that policies investing in parents' education levels should be prioritized to alleviate the achievement gap in Turkey. Since parents' educational background is an important factor determining students' academic achievement, steps for increasing parents' education level are included in this project for improving VET across Turkey. Therefore, project

resources have been strategically allocated in coherence with the purpose of compensating for the disadvantages of both students and their families.

The progress and outputs of the project will be thoroughly monitored by the DNMA and shared with the public through published reports. When the project is successfully completed, the improvements in VET will expand to all VET schools to improve educational outcomes for all Turkish vocational and technical students. As a result, the achievement gap between VET and other high school types will decrease nationwide. Lastly, it is expected that the experiences from this project will lead to the improvement of the various planned interventions and supports, as well as the development of new initiatives that aim to narrow the achievement gap.

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Curriculum Development in Singapore and Turkey: Reflections of Administrative Structure and Educational Reforms

Gülçin Tan-Şişman[a], Yasemin Karsantık[b*]

a*, Asst. Prof. Dr., Hacettepe University, (0000-0002-3806-6086)

b, Res. Asst., Trabzon University, (0000-0002-5261-0295) * ybaykin@gmail.com

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Abstract

The purpose of the study was to investigate the curriculum development process in Singapore and Turkey comparatively regarding administrative structure and educational reforms. As a qualitative descriptive research, this comparative study is expected to contribute to evaluation of possible strengths and weaknesses of the two countries in curriculum development and support the adoption of effective policies and practices by policymakers. Considering the purpose of the study, the data were collected through document analysis. Content analysis was utilized to analyze qualitative data gathered from the official documents and research reports. Results revealed similarities and differences in terms of centralized approach, administrative units and their missions in Singapore and Turkey with respect to administrative structure of curriculum development. Regarding the reflections of educational reforms on curriculum development process and policies, it was found that although the educational reforms were implemented for similar purposes in the two countries, the way of implementation and sustainability demonstrated considerable differences in terms of conditions such as planning, delivery, timing and monitoring. It is recommended that regulations should be made in Turkey such as establishing research mechanisms to systematically study on the integration of curriculum policy and practice to fill in the gap between them.

Keywords: Comparative education, curriculum development, educational reforms

Singapur ve Türkiye'de Yönetsel Yapı ve Eğitim Reformları Bağlamında Program Geliştirme Süreçleri

Öz

Bu çalışmanın amacı, Singapur ve Türkiye'deki program geliştirme süreçlerini yönetsel yapı ve eğitim reformları bağlamında karşılaştırarak incelemektir. Betimsel nitelik taşıyan bu nitel karşılaştırmalı eğitim çalışmasının program geliştirme açısından iki ülkenin olası güçlü ve zayıf yönlerini değerlendirme boyutunda alana katkı sağlaması beklenmektedir. Çalışmanın verileri dokuman incelemesi yoluyla toplanmıştır. Resmi belge ve araştırma raporlarından elde edilen verilerin analizinde içerik analizinden yararlanılmıştır. Çalışmadan elde edilen bulgular program geliştirmede yönetsel yapı açısından Singapur ve Türkiye'nin merkeziyetçi yapı, yönetsel birimler ve görevleri bağlamında benzerlik ve farklılıklarını olduğunu göstermektedir. Eğitim reformlarının program geliştirme uygulamalarına yansımaları bakımından ise iki ülkede de eğitim reformlarının benzer amaçlara hizmet etmesine rağmen reformların uygulanışı ve sürdürülebilirliğinin planlama, zamanlama ve izleme gibi konularda farklılıklar gösterdiği görülmektedir. Bu bağlamda Türkiye'de politika ve uygulama bütünlüğünü sistematik olarak inceleyecek araştırma mekanizmalarının kurulması gibi düzenlemelerin yapılması önerilmiştir.

Anahtar kelimeler: Eğitim reformları, karşılaştırmalı eğitim, program geliştirme.

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1 | INTRODUCTION

Business world has particularly been influenced by the changes in social and economic fields as a result of globalization, and a competitive environment has become more tangible in global economy. Within this framework, quality workforce and human capital are considered as the driving force in ensuring economic development, expansion, and sustainability. The significance of the 21st century skills such as creativity and cooperation has increased to develop that force, which, in turn, reflects in the field of education. Goals that countries set for attaining a place in the global world are achieved through education. Considering the role of education in growing up new generations, curriculum is regarded as a route map for establishing the future of a country. "In every school where teachers are instructing students, a curriculum exists" (Oliva, 1997, p. 3), in other words, "the institution of education is activated by a curriculum" (Oliva, 1997, p. 22). Since the nature of curriculum is characterized by future orientation (Moore, 2015), the meaning of curriculum for a country is that the objectives, skills and values determined in curriculum development policies and practices reflect the intended human profile in the future. As Pinar (2004) points out, regardless of specific content areas, curriculum incorporates historical, political, theological, racial, aesthetical, social, and international aspects with an emphasis on educational experiences. Considering those aspects, curriculum development policies and practices adopted by countries become increasingly essential for economic development, scientific and technological advances, social cohesion, and sustainability in the global world.

A curriculum is developed and implemented coherently with the specific social, economic, and political conditions as well as the present education system of a country. Not only curriculum is a product and reflection of the education systems of the societies in the national context, it is also among the primary criteria that are utilized for explaining achievement and failure in education when taking other countries into consideration (Mullis et al., 2016; Organization for Economic Co-operation and Development [OECD], 2016). To this end, education systems, curricula and teacher education systems of the countries with sustainable and high levels of achievement in international large-scale assessment studies such as Trends in International Mathematics and Science Study (TIMMS), Programme for International Student Assessment (PISA) and Progress in International Reading Literacy Study (PIRLS) have attracted considerable attention and comparative education studies have gained increasingly more importance.

Comparative education, strongly associated with globalization as a dynamic process, is broadly defined as an explanatory and interpretive field of study whose purpose is to understand and interpret characteristics of national education systems and their development (Kazamias, 2009). In other words, understanding education systems and practices of different nations not only provides significant findings in terms of directing educational policies of different countries (Zhao et al., 2008), but enables to watch the world outside, as well (Bray & Jiang, 2014).

The present study focusing on comparative investigation of curriculum development process within the framework of administrative structure and educational reforms in Turkey and Singapore is considered important in terms of understanding the role of curriculum policies and curriculum development for the success of education systems. As given in the Table 1, various comparative studies have been conducted in the context of Singapore and Turkey in terms of different aspects such as curricula and textbooks for different courses, teacher education systems, education systems and higher education systems.

Table 1. Aspects of Comparative Studies in Singapore and Turkey

The Focus of the Comparison	Studies
Curricula for different courses	see Baildon et al. 2016; Derman and Gürbüz 2015; Huang and Bond 2016; Şeker 2014; Yaman and Göçen 2014
Textbooks for different courses	see Erbaş et al. 2012; Fan and Zhu 2007; Lianghuo and Yan 2007
Teacher education systems	see Erbilgin and Boz 2013; Göçen Kabaran and Görgen 2016; Hairon and Tan 2017; Lloyd et al. 1998; Orakçı 2015; Rasmussen and Bayer 2014; Seng et al. 2008
Education systems	see Bal and Başar 2014
Higher education systems	see Marginson 2011; Mok 2000; Sanders 2018

Addressing curriculum development in terms of administrative structure and educational reforms may be significant in order to increase the quality of education. Singaporean education system appeals attention with the impact of achievement in international assessments; however, Turkey has not reached the desired level of achievement in those assessments yet. Comparative studies regarding curriculum development in both Singapore and Turkey are expected to contribute to evaluation of possible strengths and weaknesses of curriculum development process and support the adoption of effective policies and practices by policymakers and stakeholders in education in those countries. Accordingly, the present study is also considered to contribute to literature in terms of comparison of curriculum development process in Singapore and Turkey. Lastly, the study is expected to provide an insight into national and international discussions regarding the reflections of administrative structure and educational reforms upon curriculum development.

To contextualize the discussion that addresses curriculum development in the two countries regarding administrative structure and educational reforms, firstly brief information is provided about education systems in Singapore and Turkey.

Contextual framework: The education system in Singapore and Turkey

Singapore, which is a far-east country and not a member of OECD, has become a country that has a share in global economy, promotes innovation and research, and appealed attention of scientists and scientific institutions worldwide for 1990s (OECD, 2010). Being one of the Four Asian Tigers because of the achievements created in the field of economy in 1980s, Singapore achieves significant breakthroughs in education in the 21st century, as well (National Institute of Education [NIE], 2012).Singapore, participating in TIMMS in 1995 (Singapore Ministry of Education [SME], 2004), in PIRLS in 2001 (SME, 2007) and in PISA in 2009 (OECD, 2016) for the first time, has attained achievements consistently till now. In 2011 TIMMS and PIRLS studies, Singapore was the only country where more than half of the students attained high international level of achievement in all the three domains (i.e. science, mathematics and reading) (Mullis, 2013).

On the other hand, Turkey, which is one of the candidate members of European Union (EU), attempts to achieve the goal of ensuring quality in education by concentrating on educational reforms within the framework of adaptation to EU. However, considering the international assessments, it is observed that Turkey scored below the average points of the all participating countries in general in science, reading and mathematics literacy in the four applications from 2006 to 2015 (Ministry of National Education [MoNE], 2016a), and similarly scored below the average points in mathematics and science in 2015 TIMMS (MoNE, 2016b). However, 2018 PISA results indicated that Turkey was one of the three countries that increased the scores in reading, mathematics and science literacy significantly compared to PISA 2015 results; yet Turkey was still below in the ranking among OECD countries (MoNE, 2019).

Taking education systems into consideration, 359 schools were located according to 2018 data in Singapore (SME, 2018, p.2), whose population was 5888926 according to July 2017 data. (Central Intelligence Agency [CIA], 2018). 228670 students are enrolled in primary schools and 152687 students are enrolled in secondary schools (SME, 2018, p.2). Students are enrolled in the compulsory primary schools at the age of seven and primary schools last for six years. Although secondary schools are not compulsory, almost all the students graduated from primary schools continue to secondary schools that last for four or five years. English is the language of instruction in all courses and levels except for mother tongues (Mullis et al., 2016).

In Turkey, whose population was about 81 million according to the data in 2016 (Turkish Statistical Institute [TUIK], 2018), there were 24967 primary schools, 18745 lower-secondary (middle) schools and 11783 upper-secondary schools, and the number of registered students was 5104599 at primary schools, 5590134 at lower-secondary schools and 5689427 at upper secondary schools (National Education Statistics, 2017/2018). Compulsory education was extended to 12 years divided as four-year primary school, four-year lower secondary school and four-year upper secondary school with the legislation numbered 6287 accepted in 2012 (MoNE, 2012). According to the MoNE Pre-School Education and Primary School Institutions Regulation, it is compulsory for children who are no more than 72-month-old to be enrolled in primary school; however, minimum 60-66-month-old children can be enrolled in primary school with their parents' consent (MoNE, 2014). Turkish, the formal language of Turkey, is the medium of instruction. Thus, Singapore and Turkey are differentiated in terms of population, the schooling age for compulsory education, the number of schools and students in line with population and language of instruction.

In this context, the purpose of the present study was to investigate curriculum development process in Singapore and Turkey regarding administrative structure and educational reforms (i.e. regulations, changes, projects, etc.) comparatively, and to identify similarities and differences between the two countries. The following research questions were sought for an answer:

(1) How is curriculum development process constructed in terms of administrative structure in the education systems of Singapore and Turkey?

(2) What are the reflections of educational reforms in Singapore and Turkey on curriculum development process?

2 | Method

Research design

The present study is basically a descriptive research which is identified by Neuman (2014) as a research that "…presents a picture of the specific details of a situation, social setting, or relationship." (p. 38), "…starts with a well-defined issue or question and tries to describe it accurately." (pp. 38-39) and "…focuses on 'how' and 'who' questions…" (p. 39). Lambert and Lambert (2012) argue that qualitative research designs such as phenomenology or grounded theory can be not only descriptive but explanatory as well, and the term, qualitative descriptive research, can also be used "… instead of incorrectly naming the research approach used by another method (i.e., phenomenology, grounded theory, ethnography)" (Lambert & Lambert, 2012, p.256). Qualitative descriptive research "… tends to draw from naturalistic inquiry, which purports a commitment to studying something in its natural state to the extent that is possible within the context of the research arena" (Lambert & Lambert, 2012, p. 255). The study, which is a qualitative one by nature, aims to investigate curriculum development process in Singapore and Turkey; therefore, it is a qualitative descriptive research.

Data collection tools and procedures

Considering the purpose of the study, the data were collected through document analysis, which is defined as analyzing systematically either electronic or printed materials about the phenomena or events to be investigated (Bowen, 2009). Document analysis can be conducted in several ways. Bowen (2009) states that it entails three phases which are skimming, reading thoroughly and interpreting. In this study, however, document analysis was conducted in five phases in total, which are recommended by Forster (1995) as (1) obtaining documents, (2) checking the originality of documents, (3) understanding documents, (4) analyzing the data obtained from the documents, and (5) using the data (as cited in Yıldırım & Şimşek, 2013, p. 223). Table 2 summarizes the phases of document analysis and the procedures followed in the study:

Table 2. Phases of Document Analysis and Procedures

Phases of Document Analysis	Procedures
1.Obtaining documents	The documents needed for answering research questions are all written documents, either printed or electronic, about administrative structure, educational reforms (reforms, projects, legitimate changes, curricula, etc.) and curriculum development process in Turkish and Singapore education systems. Thus, academic articles obtained from national and international databases such as EBSCO, Web of Science and ULAKBIM by searching the relevant keywords (curriculum development, educational reform, organizational/a administrative structure, etc.), national and international reports for the two countries, development plans and documents from the official websites of the ministries of education are included in the study.
2.Checking the originality	Original, official and academic documents obtained from the official websites of Ministries of Education in Singapore and Turkey, and the relevant ministerial departments (https://www.moe.gov.sg; http://www.meb.gov.tr; http://ttkb.meb.gov.tr), official websites of international organizations (https://www.oecd.org), official websites in which the reports of international assessments are published (http://timssandpirls.bc.edu) and national and international databases such as EBSCO and ULAKBİM were used as the dataset. Additionally, it was constantly checked that whether the documents in the dataset indicated coherent information or not.
3.Understanding documents	In order to analyze the documents systematically and comparatively, a preliminary review of the documents of each country was carried out and an organizational structure was established for the scope of the research questions.
4.Analyzing the data	Documents represented the whole dataset in the study and content analysis was utilized in analyzing the obtained data.
5.Using the data	Since the data set of the study comprised documents published in the official websites of the institutions/organizations in each country and academic papers indexed in national/international databases, it is open access. The results of the study were reported based on the scientific rules and ethical conducts.

Data analysis

In cases where documents constituted the dataset alone, a comprehensive content analysis was required (Bowen, 2009). Content analysis, which enables written materials to be categorized into smaller, more purposeful and manageable content units (Weber, 1990), aims to find out core meanings via the consistent themes and patterns obtained from those materials (Patton, 2002).

The Content Analysis Form (CAF) developed by the researchers in line with the research questions was utilized in the study for guiding the data analysis process. As presented in Table 3, categories in CAF were attempted to be determined in a way that they are explicit and independent from each other. In addition, words and their meanings in context are selected as analysis unit.

Table 3. Dimensions of CAF

Dimensions/ Sub-dimensions	Administrative Structure					
	Administrative approach	Authorized institution / organization	Responsible unit / headquarters	Missions and responsibilities of unit / headquarters	*CD-oriented missions and responsibilities	Other missions and responsibilities
	Educational Reforms					
	Period when it was put into practice	Focus of reform			*Reflections on CD	

*CD: Curriculum Development

The formula, Reliability = Number of agreements / (Total number of agreements + disagreements) x100 (Miles & Huberman, 1994) was used for determining inter-rater reliability of the obtained data. Three different documents (academic article, national report, international report) that were selected randomly for each country were analysed independently by the researchers based on CAF and rate of agreement calculated for each country was determined as over 85%. The rate of agreement 70% and over is acceptable for reliability of a study (Miles & Huberman, 1994). Therefore, the codes and themes determined by different coders are regarded to be compatible with each other at a good rate.

3 | Findings

In line with the research questions addressed in the study, the results are organized under two main themes: a) administrative structure of curriculum development process and b) reflections of educational reforms on curriculum development process.

Administrative structure of curriculum development process

Administrative structure of curriculum development process in Singapore

In Singapore, with a centralized education system, Ministry of Education is responsible for developing, implementing, monitoring, and supervising educational policies for structure of schools, curricula, pedagogy and evaluation in all levels of education including higher education (SME, 2016a). Whereas Singapore education system displays a centralized structure in various fields such as national education policies, national curricula and constructing school system, schools are provided with autonomy and responsibility in administration and in some professional areas like educational practices compatible with learners' needs (Mullis et al., 2016). By this understanding of autonomy, it is intended to encourage innovation in administrative practices of schools (OECD, 2010) and enable national policies and curricula developed by the related headquarters of ministry to be implemented more effectively in accordance with school

conditions. The related headquarters of the ministry monitor schools to guide school development in areas such as learning, instruction and school leadership, and a close cooperation is established between schools and the ministry (Mullis et al., 2016). In this context, there is an alignment between national curricula, examinations, opportunities provided for learners, and accountability criteria for teachers and school administrators (OECD, 2010).

In Singapore, curriculum development, implementation, monitoring and evaluation studies are carried out by three headquarters, called Curriculum Planning & Development, Curriculum Policy Office and Student Development Curriculum, which are incorporated in SME. Those headquarters directing curriculum studies fulfil several complementary missions and responsibilities such as developing policies which shape national curriculum, designing, developing, and revising curriculum, and supervising other institutions and foundations in curriculum-related issues (SME, 2017).

ADMINISTRATIVE STRUCTURE OF CURRICULUM DEVELOPMENT PROCESS IN TURKEY

In Turkish education system with a centralized and hierarchical structure, MoNE takes responsibility for the missions as part of eight spheres of activity. Those eight spheres of activity are (1) organizing and conducting education and training; (2) science, culture, arts and sports; (3) measurement and evaluation; (4) human resources management (teacher appointment, in-service training, etc.); (5) research and development studies; (6) administration and inspection; (7) international affairs; and (8) physical and technological infrastructure activities (MoNE Department of Strategy Development, 2015). Other missions of MoNE are listed as determining, implementing, and auditing national policies and strategies; and designing, implementing and updating curricula and training programs in all levels (pre-school, primary and secondary) except higher education (Official Gazette, 2011).

The responsibilities of MoNE for those broad and different areas are performed by hierarchically structured central governance, local governance and abroad governance (Official Gazette, 2011). All activities related to curriculum development, implementation, monitoring and evaluation processes are carried out by Board of Education (BoE) (MoNE Regulations, 2012). Among seven departments incorporated in BoE, Department of Curriculum and Department of Monitoring and Evaluation are the basic units that direct studies on curriculum implemented throughout the country (BoE, 2017a). Those two departments that conduct curriculum development and evaluation studies fulfil the missions and responsibilities such as identifying procedures and principles about curricula, and monitoring and evaluating curriculum implementation processes (BoE, 2017b, 2017c). Together with those departments, Headquarters of Secondary Education (see http://ogm.meb.gov.tr), Primary Education (see http://tegm.meb.gov.tr) and Vocational and Technical Education (see http://mtegm.meb.gov.tr), which are the units of MoNE, take role in curriculum development process through their monitoring and evaluation departments. However, the main responsibility belongs to BoE in all curriculum issues.

Table 4 summarizes the administrative approach, authorized institution, headquarters for curriculum development and their missions and responsibilities in Singapore and Turkey.

Table 4. The Administrative Structure of Curriculum Development Process in Singapore and Turkey

Singapore	Turkey
Administrative Approach	
Centralized governance	Centralized governance
Authorized Institution	
Singapore Ministry of Education (SME) (all levels)	Ministry of National Education (MoNE) (except higher education)
Headquarters for Curriculum Development	
Curriculum Planning & Development (CPD); Curriculum Policy Office (CPO); Student Development Curriculum (SDC)	Affiliated with BoE, Department of Curriculum (DoC); Department of Monitoring and Evaluation (DoME)
Missions and Responsibilities of Headquarters for Curriculum Development	
CPD Curriculum development-related (CD-related) *Designing, developing and revising curriculum; designing and implementing special curriculum programs such as gifted education program; supervising other institutions and foundations in curriculum-related issues Other responsibilities * Designing, implementing and monitoring instruction and assessment processes; managing resources, school library and language centers	DoC CD-related *Determining procedures and principles about curriculum; ensuring the alignment of curricula between school types and levels; following procedures for prepared, developed or renewed curriculum Other responsibilities * Performing other missions assigned by BoE
CPO CD-related * Developing, renewing and updating policies that shape the national curriculum Other responsibilities * Developing policies for achieving curriculum, instruction and assessment practices in a balanced, purposeful and effective way	DoME CD-related * Monitoring and evaluating curriculum, teaching materials and educational and instructional practices in education system Other responsibilities * Preparing monitoring and evaluation reports, sharing them with relevant people, institutions and organizations, and performing other missions assigned by BoE
SDC CD-related * Overseeing formal curriculum and co-curricular programs in the areas such as arts education, character and citizenship education, sports and outdoor education and co-curricular activities; designing and implementing national programs that complement and enrich school curricula; supporting and guiding schools for the implementation of holistic programs that will develop students in all areas such as cognitive, affective and physical domains.	

REFLECTIONS OF EDUCATIONAL REFORMS ON CURRICULUM DEVELOPMENT PROCESS

REFLECTIONS OF EDUCATIONAL REFORMS ON CURRICULUM DEVELOPMENT PROCESS IN SINGAPORE EDUCATION SYSTEM

Singapore education system with approximately 50-year-history has reached its present level through the reforms implemented within the scope of four basic phases, which are survival-driven (1959-1978), efficiency-driven (1979-1996), ability-based (1997-2011) and student-centric, values-driven (2012-present), respectively (SME, 2012a).

In survival-driven phase between 1959-1978, when the first steps were taken for transformation to nationalize the system remained from the colonial period, the reforms were characterized by schooling, teacher education and education system (SME, 2010). The changes that stood out in that phase consisted of making bilingualism compulsory since 1966, teaching English language to all students along with their own mother tongue from the first grade, and having made the second foreign language learning compulsory from the seventh grade to the tenth grade since 1969 (SME, 2010).

In efficiency-driven phase between 1979-1996, firstly education system was inclusively evaluated for making it sustainable in terms of students' social development and responsive to all students' needs in 1978. Consequently, through structural changes, curricula were implemented that will enable learners to progress in their own pace in separate groups devoted to academic achievement and meet their learning needs (SME, 2010). In that phase, the most significant development focusing on curriculum was the foundation of the Curriculum Development Institute of Singapore, which was responsible for developing all curricula and teaching materials to improve the quality of all instructional materials in 1980 (Gopinathan & Deng, 2006; OECD, 2010; SME, 2010). Since 1980, school evaluations have been conducted that focus on structure of the school, curriculum, extra-curricular activities, and health of learners (SME, 2010).

In ability-driven phase from 1997 to 2011, significant reform movements occurred that shaped Singapore education system and curriculum. Among them, the most inclusive and fundamental one was the Shaping Our Future: Thinking Schools, Learning Nation vision, which was implemented by Prime Minister Goh Chok Tong in 1997. This reform movement whose purpose was to enable every child to put his / her own potential into practice at the utmost level, emphasized culture of thinking and continuous learning (Koh, 2002) and as a requirement of that emphasis, curriculum was revised in the framework of teaching and enhancing thinking skills, creativity, independent learning habits, citizenship and information technology skills (Koh, 2004; SME, 2010; Tan, 2008). Moreover, content was reduced and thinking skills was included in the curriculum (SME, 2010).

In 1997, another reform on formal education process was the determination of the Desired Outcomes of Education. Desired Outcomes of Education, which were characterized as the qualities that each student must possess at the end of the formal education process, were acknowledged as a national framework that directed educational policies and curriculum (SME, 2010). Through that framework, Singaporean students were intended to become self-confident individuals, autonomous learners, active participants in teamwork, and concerned citizens who are conscious of citizenship. On the other hand, Key Stage Outcomes were the transformed form of Desired Outcomes of Education into developmental goals and indicated the expected goals from students at the end of primary school, secondary school and higher education (post-secondary) (SME, 2015).

Program for Rebuilding and Improving Existing Schools (PRIME) was launched in 1999 for achieving Desired Outcomes of Education and Key Stage Outcomes, which were the important steps for determining national standards. Through that program, school conditions were intended to be enhanced such as establishing libraries including new media sources and classrooms in which strategic use of information and communication technologies (ICTs) is promoted. The School Excellence Model, which was introduced

in 2000, offered the criteria for schools' self-evaluation. Additionally, full-time schooling initiated at all secondary schools in 2000 and extra (non-academic) programs enabled students' holistic development. In 2003, SME focused more on strengthening Innovation and Entrepreneurship, which was a dimension of Desired Outcomes of Education, and emphasized to develop students' life skills. Flexible School Infrastructure reform, introduced in 2005, intended to redesign the use of the present areas at schools and transform the areas out of the classrooms into effective learning areas (SME, 2010). Even though those improvement studies were carried out for increasing the quality of education at the macro level, they were of vital importance for achieving the national standards, and enhancing and evaluating the effectiveness of the curriculum prepared for meeting those standards at the micro level.

In 2005, SME started a transformation movement that was grounded in learning and focused on the interaction between teacher and student together with the supporters of that interaction such as school leader and school conditions. Thus, SME implemented the Teach Less, Learn More initiative, which was regarded as a reflection of Thinking Schools, Learning Nation vision. The purpose of the initiative was to create a learning-teaching process in which classroom interaction was promoted, students experienced life skills and effective teaching approaches were utilized via the autonomy and flexibility given to schools rather than an examination-focused instruction (SME, 2010). In this context, a reduction was made in subject areas of the content and 10-20 percent of space was left to teachers for enabling school-based flexibility in curricula. Teachers were given opportunity to use that space according to their own students' needs, and to design their courses by utilizing several teaching and evaluation approaches. Additionally, schools were allowed for designing their own curricula. Resource support and counselling service from curriculum experts were provided for them, as well (SME, 2010). Another change intended with Teach Less, Learn More initiative was about evaluation and a balance was intended to be established between evaluation of learning and evaluation for learning (SME, 2010). For instance, evaluation is considered as a part of teaching and learning process in primary mathematics curriculum. Monitoring problem-solving process, asking questions effectively and using methods such as performance assessment, rubrics and self-evaluation are promoted (SME, 2012b).

In 2008, SME focused on the information, skills, and competences that students would need in the future and concentrated on the need to develop 21st century skills of students. To this end, developing those competencies was intended from the very beginning of the primary school (SME, 2010). Therefore, 21st century skills including critical and creative thinking, collaboration and information skills, communication skills, consciousness of citizenship, intercultural skills and global awareness competence were considered as a part of curriculum (SME, 2016b). For instance, a relationship is established between 21st century competencies including citizenship literacy, global awareness, and intercultural skills; critical and creative thinking and information and communication technology skills, and science literacy (SME, 2013).

The plans for the integration of information and communication technologies into education were implemented in a three-stage period. In the first plan completed between 1997 and 2002, all schools were provided with the basic infrastructure and teachers were trained. In the second plan between 2003 and 2008, the integration of information and communication technologies into curricula was improved and technology was intended to be used in a more effective and productive way. In the third plan having been implemented since 2008, more integration of information and communication technologies into curriculum, instructional practices, and evaluation (school evaluation and national evaluation) were emphasized. With respect to infrastructure, more flexible and mobile options were encouraged to be utilized (SME, 2010). For instance, information and communication technologies are integrated into learning activities by teachers and their use is promoted in online discussion activities and in making abstract concepts concrete with simulations in primary science curriculum (SME, 2013).

In recent years, creating multiple educational means appropriate for students' abilities have been emphasized. Educational reforms highlight variation, flexibility, and choice dimensions in the system. The

flexibility found in curriculum through different educational options give an opportunity to implement school-based curricula relevant to students' needs (SME, 2010). School-Based Curriculum Development (SBCD) movement, which can be said to be largely grounded in Teach Less, Learn More initiative and Bottom-Up Initiative, Top-Down Support philosophy (Hairon et al., 2018), is regarded as one of the most significant changes that have been put into practice in the curriculum field recently. Whereas curriculum development in Singapore has a centralized structure with national curriculum and central curriculum agencies, SBCD is considered a consequence of the continuous reform initiatives. SBCD gives schools more autonomy for planning and designing educational experiences by not only adapting national curriculum materials, but also creating their own materials according to their own conditions and needs (Gopinathan & Deng, 2006). However, it can be stated that the effects of centralization, such as hierarchy, less shared decision making and less student voice, have been felt on both understanding and implementation of SBCD in Singaporean centralized-decentralized education system (Hairon et al., 2018).

In student-centric, values-driven phase from 2012 to present, a program called as Values in Action was launched to encourage students to be active citizens and a spirit of volunteerism was emphasized. Community involvement was also encouraged for more sustainable learning (SME, 2012a).

REFLECTIONS OF EDUCATIONAL REFORMS ON CURRICULUM DEVELOPMENT PROCESS IN TURKISH EDUCATION SYSTEM

With the establishment of Republic of Turkey in 1923, significant steps were taken in the modernization policies through education (Varış, 1976), hence, Mustafa Kemal Atatürk, the founder of the Republic of Turkey, firstly invited John Dewey to Turkey and took his ideas on how to implement education in a democratic system and how to train teachers to enable them to adopt to the new system (Ata, 2001). In this context, Dewey was charged with building the fundamentals of the education system in Atatürk's period (TEDMEM, 2015).

After proclamation of the Republic, Law on Unification of Education (Tevhid-i Tedrisat) was enacted in 1924 and all educational institutions were connected to MoNE as well as curricula were undergone comprehensive changes. The underlying concepts of those changes were secularism, positive sciences, and western orientation, thus the standardized first five-year curriculum was prepared (Varış, 1976). Between 1924 and 1930, the first studies on curricula were carried out and teaching the basic principles of the republic regime to the new generations was adopted as a fundamental philosophy of all curricula (MoNE, 1990; as cited in Yüksel, 2003).

BoE was established with the law enacted on 3rd April 1926 under the name of National Education Bureau as a scientific advisory committee and decision-making body with the responsibility to make regulations for improving the quality of national education. BoE functions as a legislative unit of MoNE by approving curricula and course books via making regulations and directives (Erdoğan, 2012). In 1928, the national Turkish alphabet based on Latin alphabet instead of Arabic was accepted with the Alphabet Reform which has had an important role in the development of language, science, and culture in Turkey. Beyond just an alphabet change, Alphabet Reform was of a vital importance in terms of the national language and culture (Korkmaz, 1998) and it was reflected on the curriculum as the use of pure Turkish vocabulary rather than vocabulary of foreign origin and elimination of Arabic and Persian language courses (Savaşkan-Akdoğan, 2010). Whereas the rate of literacy of the general population in Turkey was 8.16% in 1927 (Başgöz & Wilson, 1968; as cited in Tongul, 2004, p. 126), after the Alphabet Reform, a quarter of the population became literate between 1928 and 1935 (Kodamanoğlu, 1964; as cited in Tongul, 2004, p. 128).

From the proclamation of the republic to 1950, completely curriculum-oriented studies were conducted for achieving the quality in education considering the opportunities and conditions of the country. However, understanding of curriculum in this period was to list the subjects based on courses

and timing of those subjects (Yüksel, 2003). Until 1948, different curricula were implemented at urban and rural primary schools. Since that case had a negative effect on the equal opportunities in education, the distinction between urban and rural curriculum was eliminated with the 1948 primary school curriculum (BoE, 2009). The 1948 primary school curriculum was implemented for twenty years, then it was substituted by 1968 curriculum which was developed in accordance with the requirements of Primary School Law enacted in 1961. With the advent of that curriculum, the understanding towards curriculum moved away from subject-list oriented curriculum to the curriculum shaped by the framework of key constituents (Demirel, 1992). Whereas the procedures and principles that must be taken into consideration in curriculum development process were determined through the model adopted by BoE in 1983, those decisions were not transferred into practice (BoE, 2009).

National Education Development Project was introduced by MoNE with the contribution of the World Bank in 1990 and lasted for seven years. Through that project, it was intended to achieve the quality and achievement standards like OECD countries in primary schools, secondary schools and teacher education, to develop administrative practices of MoNE and to enable to use resources in an effective and efficient way (Department of Research and Development of Education [DRDE], 1999; Kılıç, 1998). Founded as a product of that project in 1992, DRDE (EARGED) was charged with following the latest developments in the fields of education and instruction in both national and international levels, and investigating, and developing curricula (Kılıç, 1998). With the advent of DRDE, the developments such as proposing a new curriculum development model in 1993 (Gözütok, 2003a), establishing Curriculum Laboratory Schools in 1994 (Kılıç, 1998) and developing curriculum for those schools (DRDE, 1999) can be acknowledged as an indicator of the importance attributed to research on curriculum development process and procedures in Turkey.

In 1997, compulsory education was extended from five years to eight years with the changes in education system. The eight-year compulsory education reform led to the changes in the curricula and syllabuses of some courses and course books in accordance with students' interests and abilities. For instance, in 1998-1999 academic year, some courses such as foreign language (the 4th and 5th grades) and citizenship and human rights education (the 7th and 8th grades) were implemented, elective courses were determined for the grades between four and eight, and the 6th-7th grades national history and national geography courses were integrated into social sciences course (MoNE, 2000; as cited in Erdem, 2005).

The 58th Government Program, which was announced in 2002, addressed the need for an education reform to increase the quality of education and international competitiveness, to diverge from rote learning and to raise independent individuals (Ministry of Development [MoD], 2014). In fact, one of the most effective rationales behind the need for reform was the low achievement levels in both international tests such as TIMMS and PIRLS, and national tests such as Student Achievement Test. Therefore, all curricula for the courses at primary schools were redeveloped in 2004, since the present curricula did not include the knowledge, skills and values required in the 21st century to overcome the problems and deficiencies in the education system (DRDE, 2005). The approach, objectives, content, teaching and learning processes, and measurement and evaluation dimensions of the primary school curriculum underwent changes within the framework of curriculum reform (Aşkar et al., 2005). The new primary school curriculum that emphasized individual differences and learner-centred approaches such as constructivism, active learning and multiple intelligences, was piloted in nine cities and 120 schools in 2004-2005 academic year (Akınoğlu, 2005; MoD, 2014). The renewed curriculum was introduced to be implemented throughout the country in 2005-2006 academic year (DRDE, 2005).

In 2010, two different reform movements were introduced. The first one, Reconstruction of Secondary School System comprised of the transformation of all common high schools to Anatolian high schools (i.e. schools that last for four years and provide intensive language instruction) or Anatolian vocational high schools till 2014. Through this transformation, it was intended to minimize the quality differences among schools and reduce the school variation (MoD, 2014). Secondary physics, chemistry, biology, and

mathematics curricula for 9th - 12th grades were updated in 2013 as a reflection of this reconstruction (MoNE, 2013b). The other reform introduced in 2010 was FATIH Project (Movement of Enhancing Opportunities and Improving Technology) which was the most comprehensive technology project in the history of Turkish education. The purpose of the project was to ensure all schools throughout the country to have equal technological infrastructure, to improve the technological opportunities at schools and to ensure all students throughout the country to benefit from those technological opportunities equally within the scope of equal opportunity principle in education (MoD, 2014; MoNE, 2016c). Active use of information technologies along with their integration into teaching and learning process were achieved based on accessibility, efficiency, equal opportunities, measurability, and quality guidelines in this regard. The fundamental components of FATIH Project were identified as (1) the provision of equipment and software infrastructure (provision of the tools such as high-speed and secure internet, interactive whiteboard, tablet pc); (2) provision and administration of electronic pedagogical content (development of course materials such as electronic interactive content, animation, simulation, education and information network videos and visuals and e-books); (3) in-service training of teachers (in-service training practices on effective use of information technologies during the courses); (4) conscious, secure, manageable and measurable use of information technologies (teaching and evaluating secure use of information technologies tools and internet); and (5) active use of information technologies in curriculum (integration of technological equipment and electronic content into curriculum and teacher guidebooks in a way to be used actively). Thus, it was expected to develop students' use of technology, problem solving, effective communication, analytic thinking, collaboration which are considered as 21st century skills (MoNE, 2016c). As a reflection of that project, for instance, mathematics curriculum for 5th-8th grades which was updated in 2013 incorporated information and communication technologies skills as a part of the skills intended to be developed (MoNE, 2013a).

In 2011, central organization of MoNE was restructured and quality of education was intended to increase. Department of Monitoring and Evaluation was founded as a reflection of this reconstruction to curriculum development (MoD, 2014) and the department was charged with monitoring and evaluating all educational and instructional practices along with curriculum (BoE, 2017c).

According to the law numbered 6287, which was enacted in 2012 and led to radical changes in Turkish education system, compulsory education was extended from eight years to twelve years as three periods each of which lasts for four years (MoD, 2014). The 12-year compulsory education was constructed as 4-year primary school as the first stage, 4-year lower secondary school as the second stage and 4-year upper-secondary school as the third stage, and it became mandatory for pupils who turned 72 months to begin primary school. The change in the system led to the arrangements in primary school, lower-secondary school and upper-secondary school curricula based on the needs and characteristics of new group of ages. Therefore, all curricula were intended to be updated by giving priority to the courses at the first grade for primary schools, the fifth grade for lower-secondary schools and the ninth grade for upper-secondary schools since 2012-2013 academic year (MoNE, 2012).

After the 12-year compulsory education reform implemented in 2012, a completely curriculum-oriented study named as Updating Curriculum for Primary School, Middle School and Secondary School was conducted and draft curricula for 51 courses in total were published for opinions of the stakeholders from teachers to parents on 13th January 2017 (MoNE, 2017a, 2017b). In January 2018, they were updated again based on public opinion. The renewed curricula were implemented in 2017-2018 academic year for the first, fifth and ninth grades. In 2018-2019 academic year, the new curricula started to be implemented for all grades and all courses (MoNE, 2017b). The major change prominent in the new curricula is the inclusion of Values Education and Turkish Qualifications Framework (TQF) into all curricula. For instance, the basic competences within TQF, which are communication in the mother tongue, communication in the foreign language, mathematical competence and basic competencies in science and

technology, digital competence, learning to learn, social and civic competence, initiative and entrepreneurship, cultural awareness and expression, are associated with the objectives of the mathematics curriculum for primary and lower-secondary school (MoNE 2018a). Additionally, core values, which are justice, friendship, self-control, honesty, respect, patience, responsibility, love, altruism, and patriotism, are included in the new curricula such as mathematics and English language curricula (MoNE, 2018a, 2018b).

4 | Discussion and Conclusion

The purpose of the current study was to investigate the reflections of administrative structure and educational reforms on curriculum development process in Singapore and Turkey. The results indicated that curriculum development process is administered by the departments of Ministries of Education in both Singaporean and Turkish education system in a centralized structure. However, there seems clear differences. The structure in Singapore is hierarchically more flexible, more curriculum development oriented and more complementary when the authorized departments of the two countries and their missions and responsibilities are compared. Whereas curriculum development studies are carried out by the related headquarters of SME (i.e. Curriculum Planning & Development, Curriculum Policy Office and Student Development Curriculum) in Singapore, they are coordinated by the sub-units of BoE (i.e. Department of Curriculum and Department of Monitoring and Evaluation), which is one of the central institutions of MoNE in Turkey. When the administrative structures of the two countries are compared in terms of missions and responsibilities, it is obvious that the common points are to design, implement, monitor, evaluate and develop curriculum which incorporates the knowledge and skills required in the 21st century. However, whereas separate headquarters are responsible for both developing curriculum policies that shape the national curriculum, and conducting complementary and enrichment curriculum studies for the holistic development of students in Singapore, there are not any separate departments responsible for developing policies for curriculum or preparing enrichment programs in Turkey.

Although more authority has recently been given to schools, Singapore education system still displays a centralized structure (OECD, 2010). However, implementation of curriculum prepared by the ministry in accordance with school conditions is promoted to establish a balance between centralization and decentralization in Singapore education system (Hairon et al., 2018; Mullis et al., 2016) and mechanisms are developed for providing autonomy to schools and school districts to some extent for making centralized structure more manageable (OECD, 2010). In Turkey, education and school systems are characterized by a highly centralized structure (OECD, 2013; TEDMEM, 2015). On the other hand, that understanding of centralized administration leads to difficulties in meeting the demands of schools (TEDMEM, 2015) and the centrally prepared standardized curriculum fail to satisfy the needs of local schools and students (DRDE, 1997). Therefore, it is recommended for Turkey to adopt a semi-centralized or semi-decentralized administration system which benefits from both the strengths of centralized administration (i.e. centrally-prepared curricula as the common ground of education) and strengths of decentralized administration (i.e. participation of schools in decision-making) (TEDMEM, 2015).

When addressing the educational reforms in Singapore and Turkey in terms of their reflections on curriculum development practices, it is evident that the reforms that were introduced in Singapore during survival-, efficiency-, ability-driven and student-centric, values-driven phases (SME, 2012a) are implemented in a complementary and systematic way with the long-term goals. The outcomes of reforms such as Thinking Schools Learning Nation vision, Teach Less Learn More movement and 21st century skills are asserted to be directly reflected on curriculum (see Koh, 2004; SME, 2010; SME, 2016b; Tan, 2008). It can be stated that the reflections of those systematic reforms particularly on national curriculum contribute to the achievement in education in international context. In Turkey, however, it is possible to maintain that educational reforms are related to system in general and they are usually disconnected from each other without considering the required conditions broadly. Although curriculum innovations were

based on systematic needs analysis such as 1936 or 1948 primary school curriculum studies, and pilot studies were at the heart of curriculum development as in Curriculum Laboratory Schools (Gözütok, 2003a, b) or curriculum innovation in 2005, the procedures in developing curriculum have not been informed by MoNE as in 2005 curriculum innovation since 2005. One of the greatest obstacles to increasing the quality of education in Turkey is considered as the implementation of policies regardless of comprehensive evaluation and investment, and adoption of another policy without assessing the effects of the previous one (MoD, 2014). On the other hand, systematic studies are conducted in Singapore such as planning, getting feedback from stakeholders, piloting, teacher training, monitoring the implementation and evaluating performance, capacity and support (SME, 2012a), which might be one of the factors behind its recognition and success in education.

It is important to ensure the sustainability and consistency in reforms for achieving their goals (Şirin & Vatanartıran, 2014). It is possible to infer that the sustainability and consistency in educational reforms are ensured in Singapore. Curriculum reform initiatives had some challenges in Singapore such as the need to make more realistic policies considering cultural and social dynamics rather than to base the initiatives solely on curriculum visions (Deng, Gopinathan, & Lee, 2013). However, Singapore attempts to overcome those challenges and improve education through ways such as adoption of evidence-based practices regarding curriculum and integration of vision and leadership (OECD, 2010). Since educational and curriculum reforms were considered effective in promoting and sustaining national development, reform initiatives responded to different issues in different phases in a complementary way in Singapore (Tan, 2008). On the other hand, it is concluded that educational reforms in Turkey cannot complement each other due to political reasons to a large extent and cannot be implemented with a holistic perspective (TEDMEM, 2015). To overcome this situation, it is recommended to make evidence-based and systematic reforms and review the reform-making process in Turkish education system (Şirin & Vatanartıran, 2014; TEDMEM, 2015). As one of the latest studies in terms of curriculum development and presented to public opinion in 2017, the new curricula in Turkey are stated to be developed by considering the comprehensive and systematically collected data such as the results of national and international tests and comparative studies (MoNE, 2017a), which can be evaluated as an indicator that curriculum development studies are started to be addressed more systematically by the ministry. However, it is possible to state that curriculum update and innovation studies conducted successively after the curriculum reform in 2004 were carried out with the approach of eliminating the old and implementing the new one without conducting curriculum evaluation studies. Therefore, consistent, sustainable, and complementary curriculum development studies cannot be conducted (TEDMEM, 2015).

In Singapore, a close relationship seems to be established between educational policies and practice (Mullis et al., 2016). Curriculum policies approach is adopted for achieving the national and international goals of curriculum, which is like the case in Thinking Schools Learning Nation vision. The curriculum policies headquarter of SME can be regarded as an indicator of that approach. In Turkey, however, it is evident that studies related to curriculum change and innovation are conducted in the form of making changes in course names, subjects of the courses and course hours. Implementation of new courses or integration of some courses into a new construct with the advent of eight-year compulsory education in 1997 can be considered as an indicator of this understanding. Therefore, it is possible to state that curriculum policies that are not developed adequately lead to the frequent innovation and updates in curriculum.

In Singapore, some skills such as critical thinking, use of information technologies, creative thinking and independent thinking are highlighted within the scope of Thinking Schools Learning Nation vision introduced in 1997 (Koh, 2002; SME, 2010; Tan, 2008); then critical and creative thinking, collaboration and information skills, communication skills, civic literacy, global awareness and intercultural skills considered as 21st century skills (SME, 2016b) are reflected on curriculum. Similarly, some skills such as

critical and creative thinking, problem solving, decision making, communication, research, use of information technologies and entrepreneurship were emphasized in curriculum change in 2004 in Turkey (Aşkar et al., 2005). Considering this similarity, it can be stated that particularly thinking skills are integrated into curriculum in both Singapore and Turkey. However, whereas teaching the 21st century knowledge and skills through the curriculum in both countries is one of the primary goals of education, only Singapore is proved to achieve that goal indicated in large- and small-scale assessment studies. It is possible to maintain that some of the reasons behind this case can be listed as monitoring and evaluating curriculum during implementation, developing long-term policies on curriculum, implementing complementary and enrichment programs, and adapting national curriculum to school conditions.

Further, in Singapore, the three-phased plan for the integration of information and communication technologies into educational practices have ensured to create technology infrastructure at schools, to integrate technology into curriculum, teaching and learning process and evaluation, and to provide teacher training since 1997 (SME, 2010). Similarly, in Turkey, FATIH Project introduced in 2010 have led to provide schools with equipment and software infrastructure, to integrate information technologies into curriculum, and to provide teacher training on the use of technology in teaching and learning process (MoNE, 2016c). Therefore, it is possible to maintain that integration of technology into educational practices is emphasized and reflected on curriculum in both Singapore and Turkey. However, whereas Singapore started to integrate information and communication technologies into education in 1997 and carried out this process in a three-phased plan that extended from the preparation of infrastructure to teacher training and curriculum (SME, 2010); Turkey introduced the Project in 2010 and implemented it right after piloting. It can be considered as an indicator that more comprehensive and long-term planning is conducted in Singapore whilst planning process in Turkey is rather rapid without studies on all its dimensions such as infrastructure and teacher training. This can be supported by several research studies in terms of teacher concerns or problems basically related to hardware and software tools and inefficiency of in-service training (see Ayvacı, Bakırcı & Başak, 2014; Çiftçi, Taşkaya & Alemdar, 2013).

It is also evident in Singapore that qualifications expected from each student after the completion of formal education were determined beforehand through the desired outcomes of education. Additionally, key stage outcomes, which are the transformed forms of desired outcomes of education into developmental outcomes in each key stage, were identified (SME, 2015). In Turkey, the 10th Development Plan (2014-2018) presents the fundamental policy towards curriculum as the evaluation and development of curriculum continuously by determining meaningful learning objectives. Therefore, the need for determining the qualifications expected from alumni is emphasized (MoD, 2014). Compatible with the European Qualifications Framework, Turkish Qualifications Framework also classifies the intended competencies in all levels including basic education, secondary education, and higher education in the areas of knowledge, skills and proficiency (Professional Qualifications Institution, 2015). Thus, it is obvious that the need for determining the qualifications expected from students at the end of formal education has recently been recognized in Turkey; on the other hand, this need was met and the desired outcomes of education were determined approximately 20 years ago in Singapore.

In conclusion, Singapore and Turkey have several similar and different characteristics in terms of administrative structure, educational reforms, and their reflections on curriculum development, which may be affected by several social, economic, political, educational, and geographical factors. Since curriculum takes a role as a bridge in enabling students to achieve the goals of schools, society and their own goals (Ornstein & Hunkins, 2017) and in progressing towards the objective of nurturing individuals of the 21st century, curriculum development should be viewed as never-ending, dynamic, and systematic process in which each decision should be based on research-based data rather than the results obtained from a trial-and-error process (Oliva & Gordon, 2013; Ornstein & Hunkins, 2017; Varış, 1976). Considering the curriculum development and educational reform movements in general in Turkey, it can be stated that majority of the factors leading to achievement in Singapore education system are taken into consideration; even both countries addressed curriculum and syllabus in similar ways. The term curriculum is used for the

courses such as mathematics, and the term syllabus is addressed as the yearly plans from the first to twelfth grades or from primary to university education in both countries (Mullis et al., 2016). However; there is still a gap between the goals and implementation, in other words policies and practices. This may be the result of the fact that Department of Research and Development of Education, which was one of the former departments of MoNE, was closed in 2011 and research and development missions were distributed to other departments (Education Reform Initiative, 2012). Therefore, it is recommended that the necessary regulations should be made for filling in the gap between policies and practices in such as establishing research and monitoring mechanisms to systematically study on the integration of curriculum policy and practice. It is also recommended to give priority to conducting needs assessments, piloting process, curriculum evaluation studies, and monitoring the effects of policies on practice to address that gap.

The present study included findings limited to the data obtained from document analysis. Therefore, it is recommended that future studies should address the issue broadly by such as taking stakeholders' opinions to gain an in-depth insight into the effects of educational reforms and administrative structure on curriculum related issues.

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Instructional Design of a Computer Literacy Course via Distance Education

Emine Cabı [a*]

[a*] Assoc. Prof. Dr., Faculty of Education, Başkent University, Turkey (http://orcid.org/0000-0002-7488-0309) * eminec@baskent.edu.tr

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Abstract

In the implementation of the Computer Literacy (CL) course with face-to-face education, there were many problems encountered such as huge number of students who could not reach the education, and the inability to use the physical facilities of the university and the workforce effectively. For the solution of these problems, there was a need for a distance learning environment that is independent of time and space, equipped with rich learning experiences and using new technologies. In this study, a course design was prepared to be taught by distance education by following a systematic process according to the analysis, design, development, application, and evaluation stages of ADDIE model. ADDIE teaching design model was utilized in the study design development, which was carried out using the design-based research method. First, a problem analysis was conducted in order to determine the current situation, the expected situation, and the learner characteristics. During the design process, subject titles were created by considering the basic module of International Computer Driving License (ICDL), purpose analysis was done according to Bloom's taxonomy, and assessment tools were developed by taking into account the time allocated to the subject with the purpose analysis. In the development process, the teaching material, that is, the digital course content, was prepared in accordance with the goals of the course. The design was evaluated in every process from problem analysis to assessment, especially in the final stage, process and product evaluation were made more comprehensively. Semi-structured interview form and students' academic achievements were used to gather data from the students and instructors. According to the analysis of the data on which pilot and product evaluations are made, the improvement of the instructional design of the course supports the required learning environment. The study is believed to contribute to instructional designers, trainers and experts who want to conduct the course with distance education.

Keywords: Distance education, instructional design, instructional design for distance education, computer literacy

Uzaktan Eğitim ile Bilgisayar Okuryazarlığı Dersinin Öğretim Tasarımı

Öz

Bilgisayar Okuryazarlığı (BO) dersinin yüz yüze eğitim ile yürütülmesinde öğretimin ulaşamadığı öğrenci sayısının fazla olması, üniversitenin fiziki imkânlarının ve öğretim elemanlarının iş gücünün etkili kullanılamaması problemleri yaşanmıştır. Problemlerin çözümü için, zaman ve mekândan bağımsız, zengin öğrenme yaşantılarıyla donatılmış ve yeni teknolojilerin kullanıldığı uzaktan öğrenme ortamına ihtiyaç duyulmuştur. Bu çalışmada, analiz, tasarım, geliştirme, uygulama ve değerlendirme aşamaları ile ADDIE modeline göre sistematik bir süreç izlenerek uzaktan öğretim ile verilecek bir ders tasarımı hazırlanmıştır. Tasarım tabanlı araştırma metodu kullanılarak yapılan çalışmanın tasarım geliştirilmesinde ADDIE öğretim tasarım modelinden yararlanılmıştır. İlk olarak mevcut durum, olması gereken durum ve öğrenen özelliklerinin belirlenmesi için problem analizi yapılmıştır. Tasarım sürecinde, Uluslararası Bilgisayar Yetkinlik Belgesi'nin temel modülü dikkate alınarak konu başlıkları oluşturulmuş, Bloom'un taksonomisine göre amaç analizi hazırlanmış ve amaç analizi ile konu anlatımına ayrılan süre dikkate alınarak ölçme araçları geliştirilmiştir. Geliştirme sürecinde, dersin hedeflerine ve uzaktan öğretim ortamına uygun öğretim materyali yani ders içeriği hazırlanmıştır. Problem analizinden değerlendirme aşamasına kadar her süreçte tasarım değerlendirilmiş, özellikle son aşama olan değerlendirme aşamasında süreç ve ürün değerlendirme daha geniş kapsamlı yapılmıştır. Öğrenci ve eğitmelerden yarı yapılandırılmış görüşme formu, öğrencilerin akademik başarıları ile veriler elde edilmiştir. Pilot ve ürün değerlendirmelerin yapıldığı verilerin analizine göre dersin öğretim sistemleri geliştirilmesi gereksinim duyulan öğrenme ortamını desteklemektedir. Çalışma uzaktan eğitim ile dersi yürütmek isteyen öğretim tasarımcılarına, eğitmenlere ve uzmanlara katkı sağlayacağı düşünülmektedir.

Anahtar kelimeler: Uzaktan eğitim, öğretim tasarımı, uzaktan eğitimde öğretim tasarımı, bilgisayar okuryazarlığı

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1 | INTRODUCTION

Technological developments in the world and has changed the structure of the education-training process as well. As a support or complement to formal education, distance learning environments where technology's superior aspects are integrated with educational environments have started to take place in educational institutions. Arranging the necessary structures and organizations in distance education is one of the most important factors (Anderson & Elloumi, 2004). It can be clearly observed that this approach has the potential to develop our lives in ways we could not anticipate. For example, while technological classroom practices were recently limited to devices such as movies, television, slideshows, radio, today's students can use simulations of environment and events in normal classrooms, receive education from far-distance institutions, communicate with them, and interact with broad-based information systems (Schunk, 2009).

An instructional design model guides people on how to learn and how the instructional designer organizes instruction. Models help us to visualize a system or process visually (Gustafson and Branch, 2002). Instructional design is the systematic process followed to reach the solution of an instructional problem. According to the core design of the instructional design, the detailed procedures in all models are expressed in five basic stages. These stages are analysis, design, development, implementation and evaluation and are expressed as ADDIE (Analyze, Design, Develop, Implement, Assess, Evaluate). The ADDIE model provides guidance to teaching that focuses on learning outcomes, meets students' needs, and facilitates active learning (Reinbold, 2013). The ADDIE process is used to introduce an approach to instruction design that has a proven record of success (Branch, 2009).

Instructional design is a system approach to develop educational programs consistently and reliably (Gustafson & Branch, 2002). It is about helping people learn better. Seels and Glasgow (1997) address the instructional design model in five stages. At each stage, the designer is looking for answers to the following questions;

- Analysis: What is the problem? How do we solve the problem? What are topics, tasks and assignments? What should we teach?
- Design: What are the instructional strategies to achieve the goals? Which methods make learning effective? How should the qualification of the material be determined?
- Development: What effect does the materials have on the user? What can students learn from the materials?
- Implementation: Are the students ready to take this lesson?
- Evaluation: Did the design contribute to the solution of the problem? Can it be used in the future? Are changes and revisions necessary? If necessary, which stages should be revised?

The stages of ADDIE aim at the definition of educational needs, learning tasks, performance criteria and the best delivery method (Reinbold, 2013). The needs of the students are determined during the analysis phase. At this stage, the educational goals are established and what should be taught to reach the educational goals is revealed. During the design phase, a broad overview or plan is prepared explaining how to give instructions to achieve the goals set during the analysis phase. During the development phase, each training component reveals practical details as much as possible to meet the plan created during the design phase. During the implementation phase, educators perform the task first with a smaller beta or pilot study. Finally, during the evaluation phase, educators receive feedback about the program. They make the changes and arrangements suitable for the curriculum according to these feedback (Cheung, 2016).

During the COVID-19 pandemic, it has changed the traditional education system to the educational technologies model, where teaching and assessments are conducted online (Joshi, Vinay and Bhaskar,

2020). Teachers who try to do whatever it takes to educate their students in this process emphasize that they need instructional design in distance education for their long-term professional development (Marek, Chew & Wu, 2021). Since we are not free to move and experience during the epidemic, our senses are limited to a few environments. The task of the educators is to provide instructional design for students to gain creative thinking, reasoning, and self-regulation skills. On the other hand, attention should be paid to ensuring digital equality in students' access to learning environment. The followings are the instructional design recommendations of Aquilar (2020) to eliminate the digital inequality experienced during the COVID-19 process: Assign students "big picture" projects that draw on a variety of disciplines, rather than trying to recreate a school-like structure that is difficult to achieve at the best of times; Embrace asynchronous activities, as the ubiquity and availability of live lesson technologies can place a huge burden on students and families; Find ways to connect with students outside of concurrent activities (such as cell phones and emails);

The study is also functional by addressing the distance education teaching design that teachers need during the COVID-19 pandemic conditions and presenting the steps for solving the current instructional problem in a systematic process.

The Purpose of the Study

The purpose of this study is to reveal how to use the instructional design model known as ADDIE for a course to be carried out by distance education. It was aimed to prepare an instructional design that will meet the educational needs by determining the needs within the scope of this course and to evaluate the instructional design. Conducting the course with distance education will have many benefits for both the institution and the students.

For the university, the benefits are the followings:

- With the use of rapidly developing technology in education and training, distance education, which facilitates mass education, can be offered to more students with a rich educational environment with less cost.
- The distance learning environment will provide a new and different research environment for both researchers and academic staff working within the university.

For students, the benefits are as follows:

- The proposed distance education model will provide students with a unique education opportunity independent of time and place and will increase the knowledge and skills of every student who is motivated to learn.

Having a unique education experience at the undergraduate level will make important contributions to learners as part of lifelong education and provide them with privileges.

2 | Method

Design based research method was preferred within the scope of the study. Design-based research has a very important potential, especially in the design and research of e-learning environments. There is a design process in these environments, and existing research methods are mostly not interested in the design process (Kuzu, Çankaya & Mısırlı, 2011). Although design-based research is powerful, it has several limitations. First of all, design-based research is a compact research that needs to be done longitudinally. In design-based research, a large amount of data is gathered and analysed. The data collected are mostly qualitative data, and revealing the data obtained during the design process can bring a great workload to researchers.

In design-based research that aims to transform from theory to learning environments that encourage practice, new and complex methodologies are needed to capture the systematic nature of learning,

teaching, and assessment. The outputs of previous studies are very important in reorganizing school and work environments (Brown,1992). Design-based research embodies theories about teaching-learning and helps to understand the relationship between theory, design, and practice.

ADDIE instructional design model was used while developing the instructional design in this study. Among the instructional design models, it has been observed that the most studies are related to ADDIE Model (Özerbaş & Kaya, 2017). Although the stages of the ADDIE model may seem like a linear sequence, it consists of an interactive and circular process in itself. All stages intersect, affect each other, and work simultaneously (Reinbold, 2013). For example, a change in the analysis phase can affect the evaluation phase, and a change in the development phase can have an impact on the design phase. Additionally, the aims of the stages in ADDIE model is to guide a designer to the roadmap to achieve the best possible educational solution. The following explanations of the ADDIE model are written in linear order. However, as stated in the study, most of the stages were studied simultaneously.

Problem Analysis

It is the first stage of instructional design. Problem analysis helps us find important needs and their degrees of importance. It reveals the elements between the current situation and the target situation (Mattson, 1995; Cheung, 2016). During the analysis phase, educators identify the knowledge, skills or attitudes that learners should attain and collect more information about what should be taught. It is important to eliminate unnecessary information carefully to reach the educational goal and to focus time and resources better on the necessary learning needs (Cheung, 2016).

In the problem analysis of this study, the problems experienced in CL course conducted with face to face education were examined. CL course is a compulsory course for students to graduate from undergraduate and associate degree programs except for some departments (engineering) at the university where the study is conducted. As a result of interviews with course instructors, coordinator and examination of the course archive records, the following problems were identified:

- Of the nearly 1000 students enrolled in the course in the 2015-2016 academic year, 26% of the students (N=262) failed due to absenteeism. According to these data, education could not be provided to about a quarter of the students.
- The course is carried out in computer labs where there are approximately 25 computers that each student can use. Since the number of students who do not attend the classes is high, the workforce of the university's physical facilities and faculty cannot be employed effectively.
- Since CL course is a common course taken by students in different departments / programs, there are problems in using computer labs during lesson hours suitable for both students and faculty.

In order to solve the current problems, CL course is planned to be given by distance education using new technologies equipped with rich learning environments, independent of time and space. As a result of the needs analysis, it was determined that huge number of students that the education could not be provided, and the physical facilities of the university and the workforce of the teaching staff were not utilized effectively in conducting CL course face to face. There is a need for a distance learning environment using new technologies equipped with rich learning environments independent of time and space.

Learner analysis

Since CL course is a compulsory course for undergraduate students, the target audience for whom the course was designed was the students studying at the undergraduate level. The vast majority of students were born between 1990 and 2000. Today's youth, born in the 1990s, are the most familiar generation with technology among the generations ever existed (Cabı, 2016). In today's conditions where digital

technologies have become an indispensable part of life in every field, we see it in the generation that uses these technologies actively and in a mixed manner and is called the "Generation Z" or "Generation Z" (Taş & Demirdöğmez, 2017). In Prensky's (2001) published article, he referred to this generation as digital natives. Students in this age group are native speakers of the Internet, video games, computer, and digital languages. On the other hand, Brown and Czerniewicz (2010) state that they found the concept of digital natives incorrect by taking a further step. According to them, those with such features are an effective digital elite. Instead of the old analog generation, an Internet generation using new live information and communication technologies effectively has been growing. Therefore, it can be said that students who use information and communication technologies effectively have the ability to take courses with distance education.

Design

The design phase includes choosing the teaching method (s), setting learning objectives, assessment and evaluation activities. Opinions and suggestions of 6 instructors who are experts in the field of educational technologies and who take part in the conduct of the course for at least 5 years were taken for the design of the course planned for 14 weeks. In the course syllabus, the topics have been determined by taking into consideration the ICDL (International Computer Driving Licence) basic module and standard module renewed with the changes of society and technology after 2013. In addition to the basic and standard modules of ICDL, special topics for the use of digital resources of the university are included in the scope of the course.

Goal Analysis and Development of Assessment Tools

The aim of the course (general purpose) and the objectives (sub-goals) of the course should be determined before the development of assessment tools. In this regard, by analyzing Bloom's (1979) learning taxonomy, goal analysis was conducted. The goals determined according to the cognitive classification steps are given in Figure 1.

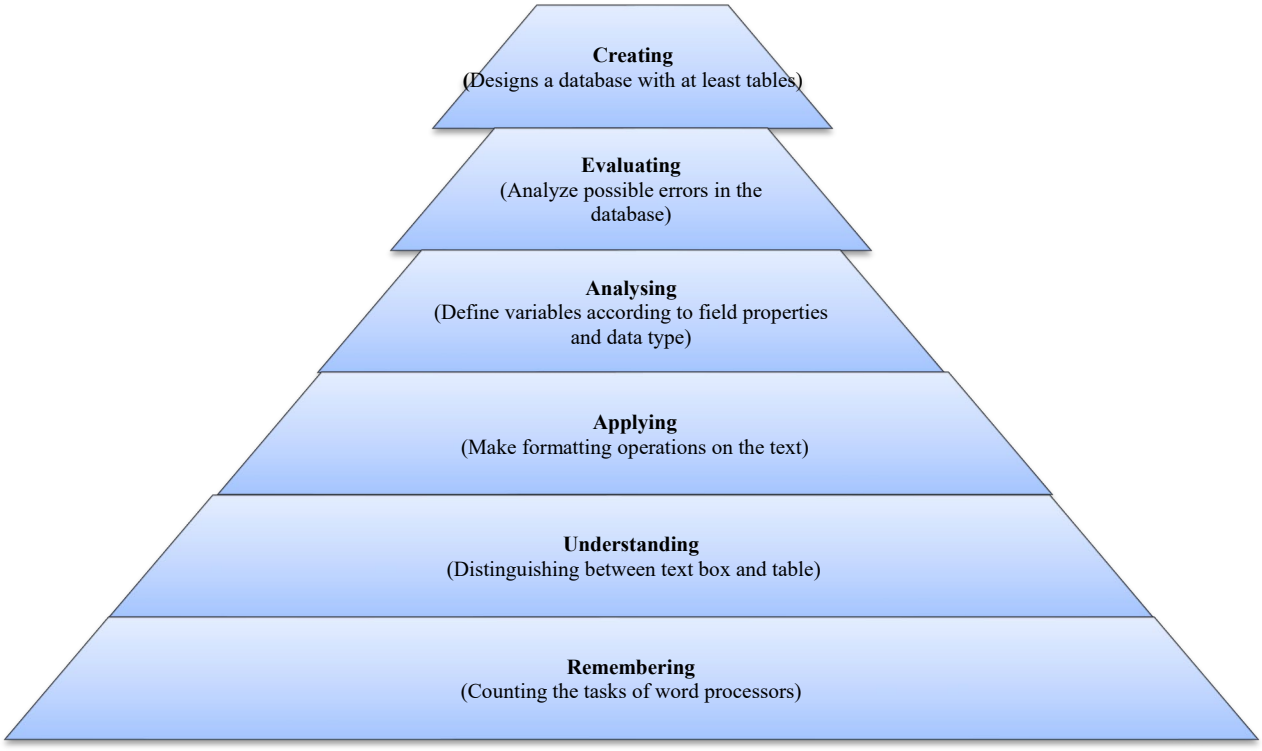

Figure 1. Determining the goals according to Bloom's taxonomy

At the end of the Goal Analysis, assessment tools were developed for these purposes. Multiple choice tests were preferred in the final and exemption exams. Multiple choice tests are preferred in cases where the number of people to whom the exam is applied, and the reliability and validity of the test should be high (Güler, 2017). In Figure 2, examples of multiple-choice tests developed according to goal analysis are given.

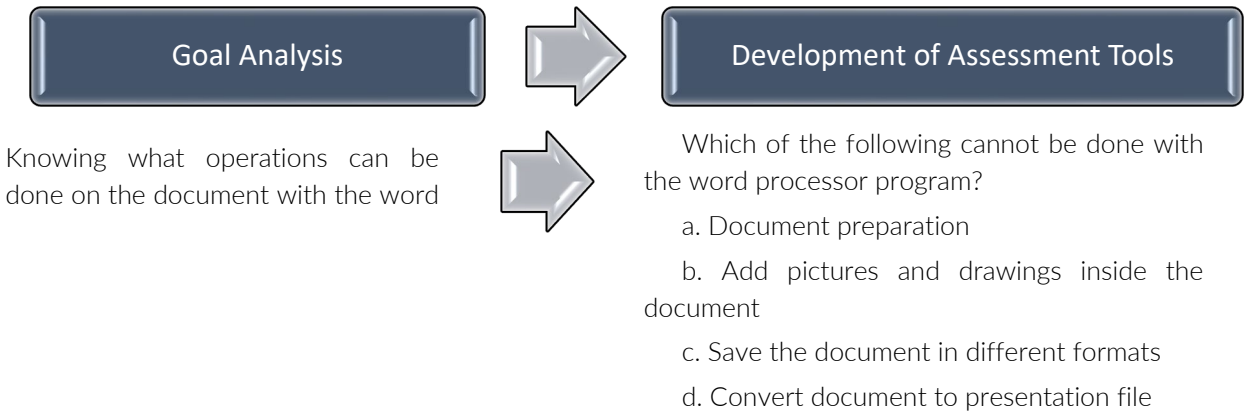

Figure 2. *Development of Assessment Tools According to Goal Analysis*

In Turkey, according to the Principles and Procedures Regarding Distance Education in Higher Education Institutions published by Higher Education, "The effect of the unattended assessment and evaluation activities of the courses given by distance education on general success cannot be more than 20% in distance education" (CoHE, articles 12-3). Taking this situation into consideration, a study was conducted on the distribution of evaluation points; 20% of the assignments given during the semester and 80% of the final exam is planned to affect overall success. Homework is planned unattended while final exam is supervised. In order to comply with the scope validity of the number of questions to be prepared for the final exam, the time allocated to the topics and the objectives of the course were taken into consideration.

Planned Assessment Tools

Self-evaluation: It was prepared for the purpose of self-assessment of the student within the scope of the subject. According to the subject of the week, any question type such as question-answer, multiple choice, true / false can be used. Two different types of assessment are used; multiple choice test questions which were prepared with teaching and content management system- Moodle's homework activity module. The computer-based exam is activated by the course instructor by regulating the access periods for the exam. The student is expected to answer the questions within a certain period of time, and when all questions are answered, they are transmitted to the system. The student can see the correct and incorrect answers in detail from the results page.

Interactive application (drag-and-drop): The interface with questions prepared with Captivate software is shared with the student via Moodle. There are activities such as drag and drop and matching in each page. If the student answers the question correctly, they can move to the next page.

Homework: The question, which includes an application similar to or equivalent to application question solutions in Word, Excel, PowerPoint and Access, is given to the student as an assignment in this section. The effect of each assignment on the grade is 5 points, and the homework must be announced to the student by SMS or via a Moodle. Each assignment is expected to be uploaded to the relevant week by the student within the time determined by the instructor. Teachers can submit feedback comments and upload

files such as marked student submissions, documents with comments, or spoken feedback when reviewing assignments thanks to teaching and content management system used. Assignments can be graded on a numerical or custom scale, or by advanced grading, such as letters. In Figure 4, the view of this process on Moodle is given.

Midterm: An applied exam including the topics covered until the midterm exam week in the academic calendar will be held. In the midterm exam, students are expected to answer the practice questions in the previously announced computer labs. It is aimed to maintain the student's interest in the course.

Final: Final exams will be announced on the academic calendar and will be held on the printed paper, on the same day and at the same time with all sections. Multiple choice question type will be used. It is compulsory for the student to take the exam at the place and time previously announced.

Development

The development phase consists of creating and editing learning material to be used during teaching. Educators take the draft or overview created during the design phase and think step by step how to present each feature of this process in practice (Cheung, 2016). The development process is the step where the features considered are applied.

Teaching and content management system - Moodle has been found suitable for giving the course with distance education. This system is a comprehensive website where the course contents (readings, discussion lists, short films, presentation files, etc.) are presented to the students who attend the courses by connecting to the Internet from their homes or workplaces. Teaching and content management system is a system used in distance and mixed education in many universities where it can increase students' perception, support learning communities, and increase student participation and success (Macfadyen & Dawson, 2012). In this study, students can enter Moodle with their user name and password. The open source Moodle system has been organized by the university by customizing its interface and activities. This system meets all needs in content sharing in the field of distance education, and it can provide service to thousands of users (including students and faculty members) 24/7.

Content Development

In this process, selection and development of teaching materials suitable for the objectives, content and distance education environment of the course were made. There are learning objectives on the course page with the topics every week. Students can see what knowledge and skills they will acquire after the topic of the week is completed. Figure 3 gives an example of the weekly course content on Moodle.

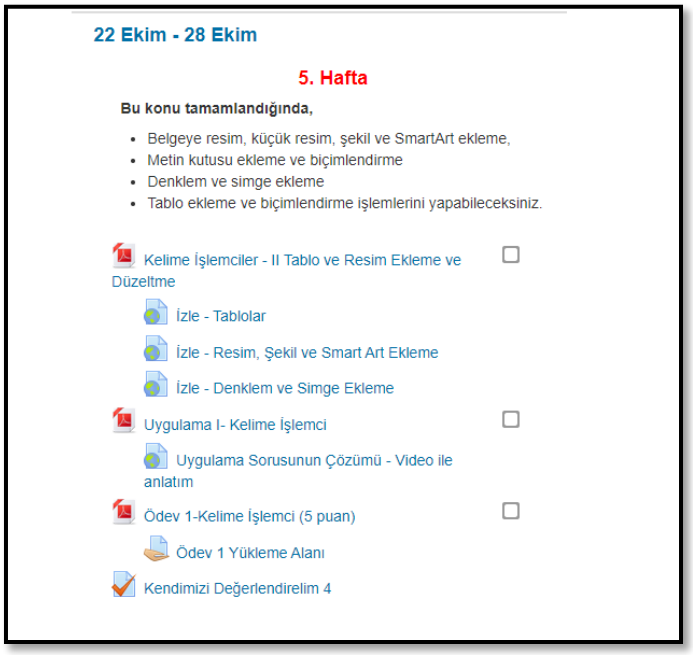

Figure 3. *Weekly Course Content on Moodle*

There exist descriptive text-based course contents under the title of ***Read (text).*** Video and presentation evaluation activities were prepared in line with the course contents. In text-based teaching, content analysis is ordered according to specific characteristics by performing task analysis in accordance with the objectives of teaching; cover page, goals, contents, lecture, summary, let's think - discuss, multiple choice questions and resources. The ordering and formal design of the content were designed based on the uniform connectedness principle.

Watch (video): The topic of the week is explained and recorded by the instructor. Video recording was done with Camtasia Recorder, and Camtasia Studio software was used for video montage and publishing. In order to ensure integrity in all videos, a video interface template was prepared by the instructor designer and all videos were prepared by the instructors according to this template. The following specific features were taken into account when recording and montaging videos:

- Home page (music) → Objectives → content presentation → summary → What did we learn? → Exit page (music)
- The whole video should not exceed 15 minutes, if it will take longer, it should be recorded separately,
- Recording should be done with full screen of 1280x720 and publishing should be in .mp4 format.

Application and Solution: CL course is a course that requires practice. In face-to-face education, it was tried to be integrated into the distance learning environment where the teacher gives applications to the students in the classroom and explains how this application is done step by step with the help of projection. In the application link, descriptive question text and instructions of the activity are included. In link of the solution of the application question, the solution of the problem is explained in detail by the instructor via the video. The question solution is recorded on video and presented to students offline on Moodle. There are four sample question solution records: Word, Excel, PowerPoint and Access.

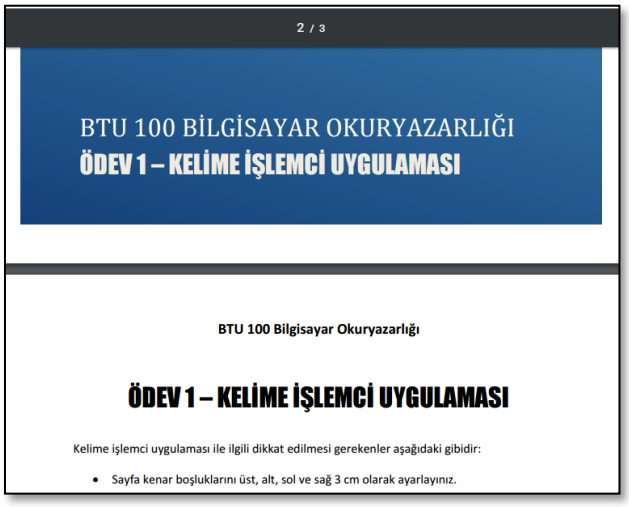

Figure 4. *The View of Instruction for Homework*

Live Course Connection and Recording: The lecturer will share the meeting invitation of the live course with the students via Moodle and SMS every week using the video conference system. The live lesson will last about one course hour when the students are eligible (on weekdays, evenings or weekends), and will be recorded by the lecturer to present these records to the students. Every week, during the "live lesson" hours of the lesson, students will be able to attend to virtual classes to take courses based on teacher and student interaction. During live lesson hours, a summary of the topic of the week, question-answer, let's evaluate ourselves and homework activities can be included.

Application and Evaluation

Assessment tools have been used to determine whether the program has achieved its learning outcomes from the problem analysis to the assessment phase and what is required to develop the program, if any. In the evaluation phase of the instructional design, it is done more comprehensively. Two evaluation types are taken into consideration as evaluation of the process and product (Smith & Ragan, 2005).

Process Evaluation

Expert Evaluation: Before using teaching materials, expert evaluation is applied. Information about the product being developed is collected from content experts, instructional designers, subject area experts or teachers (Smith & Ragan, 2005). In the instructional design made in this direction, the experts' opinions were obtained by providing that the evaluation of the materials prepared by the 6 experts in the process was done by other experts. The text contents were examined by the field expert in terms of grammar and spelling. In addition, each stage of the instructional design was shared with the participation of the expert group in the instructional design and with the participation of the course coordinator, who conducted the course face to face, and the opinions and suggestions of the stakeholders were received.

Pilot evaluation: Educators who want to practice in a long and complex process using a large group of instructors and students can make a pilot assessment that covers a real-time and smaller group before the application. Here, several participants, students and instructors follow the course before implementation, provide feedback after each step in the process, and reveal unforeseen difficulties in practice. Thus, problems in practice, especially time constraints, can be discovered and corrected (Cheung, 2016). In the pilot evaluation conducted for the target group, data on the effectiveness of teaching, the detection of learning problems, whether or not the learning objectives have been achieved, student satisfaction, and how the teaching will be realized without the intervention of the designer are collected (Yalın, 2012).

In this study, a pilot application was carried out for the distance education of Computer Literacy course in the spring semester of 2015-2016.

Study Group

A pilot study was carried out with a total of 200 students in 2 sections each consisting of 100 students. In the 14-week course, the study was conducted with 25 students in the first section and 24 students in the second section attending the exams and all activities. The pilot study of the designed course was done by 2 instructors. At the end of the study, quantitative and qualitative data were obtained from the students who joined the group. In the collection of quantitative data, answers to the following questions or uncertainties were sought.

Product Evaluation

It is carried out to determine the effectiveness of a curriculum after implementation (Yalın, 2012). In the evaluation of product in the context of instructional design, the purpose of product evaluation is to collect and analyze data to determine whether the instructional design is effective and then evaluate the results.

Gathering Data

A semi-structured interview form was used for obtaining the data based on the nature of the problem. The interview form approach includes the sequence of questions or topics to be examined during the interview (Patton, 1987). The titles or contents to be handled were determined in advance, and a template was prepared. This template increases the scope of the data and becomes systematic for each participant (Büyüköztürk et al., 2011). The questions in the semi-structured interview form are given below:

- What are the opinions and suggestions of the students and instructors regarding the course conducted with distance education?

Study Group

In 2016-2017 Spring Semester, the course was implemented with 1666 students - 30 branches (50 students per branch) - 17 Instructors. Regarding the course, the opinions and suggestions of 85 students and 12 instructors, 8 of whom were female while 4 of whom were male, were taken. A semi-structured interview form was used for collecting the data.

Data Analysis

Data were analyzed by using content analysis approach. Content analysis is used to describe the data systematically (Schreier, 2012). This approach is proposed for interviews and analysis of data from open-ended questions. Predefined steps are used in content analysis. These steps include identifying the research problem, sampling the data, coding, and interpreting and presenting the results.

Limitations

Design-based study is a compact research that needs to be done longitudinally. Lots of data need to be collected and analysed. On the other hand, there are many subsystems which affect each other in the ADDIE model. For this reason, elements such as presenting all the data obtained, determining the goals, methods, and techniques of each week of the course, reflecting the message design principles used in creating digital content were excluded from the scope of the study. The phases of the ADDIE model were sometimes concurrent, sometimes multiple, as the evaluation is done at each phase. However, the stages and operations are presented in a linear order. A team consisting of an instructional designer, subject area specialist, teacher, and assessment and evaluation specialist should be involved in the development of teaching systems (Morrison, Ross, & Kemp, 2001). The instructional designer of this study also works as a subject area expert.

3 | FINDINGS

What is the Effect of Different Evaluation Method on Student Success?

The effects of different evaluation methods on academic achievement were evaluated. The number of students and evaluation methods are given in Table 1.

Table 1. Number of Students and Evaluation Methods

	Number of Students	Evaluation Method
Group 1	25	Homework (20 points) (unattended) + Midterm (10 points) +Final exam (70 points) (supervised)
Group 2	24	Homework (20 points) (unattended) +Final exam (80 points) (supervised)

According to the table, different evaluation methods were used in two different sections. The t-test result of the students' academic scores obtained at the end of the semester according to different evaluation methods is given in Table 2.

Table 2. Effect of Different Evaluation Methods on Student Success

Factor	Sections	N		ss	df	t	Sig.
Success	1. Group	25	67.06	6.197	47	.396	.694
	2. Group	24	65.78	14.887			

According to Table 2, students' achievements did not show a significant difference according to different process evaluation groups (t (47) =.396, p>0.05). According to this finding, both evaluation methods can be used. However, it was stated that it would not be useful to have a midterm exam as it was expected that there would be a large number of students to take the exam within the scope of CL course. Therefore, the evaluation method for 2nd group students is recommended by the experts involved in instructional design.

Is there a relationship between the navigations on teaching and content management system and academic success?

Navigation data of students on teaching and content management system can be accessed through reports / log on the interface of the system. The relationship between the number of navigations on the system and their academic achievements at the end of the semester was examined (Table 3).

Table 3. Correlation Values Between Success and Navigations

	Success
Navigation	.727**
**<.05	N =25

According to Table 3, it was seen that there was a positive and meaningful relationship between students' navigation on teaching and content management system and their achievements.

Which time do you prefer most for live course hours?

Students only take the designed course from afar and have other courses in face to face format. Apart from face-to-face lessons, three choices of live lessons were presented, and students' opinions were taken (Table 4).

Table 4. Students' Live Course Hours Preference

Weekday evening		Weekend evening		Weekend daytime		Total	
f	%	f	%	f	%	f	%
27	57.4	17	36	3	6.4	47	100

According to Table 4, 27 of 47 students (57%) wanted live course time in the evening during weekdays. According to this finding, the majority of students preferred live lessons in the evening on weekdays.

Opinions and Suggestions for the Usefulness of Instructional Design

In pilot evaluation, it was aimed to obtain detailed information about the evaluation of the process by gathering quantitative data as well as qualitative data. Opinions and suggestions were received from the students regarding the usefulness of the learning environment, course instructors, structure of the design, motivation and learner experiences. At the end of the education, the views of 21 students regarding the usefulness of the instructional design are presented in Table 5.

Table 5. Students' Opinions and Suggestions for the Usefulness of Instructional Design

Usability of Learning Environment			
	Positive (f)	Negative (f)	Sample for positive or negative views
Teaching and content management system interface (Moodle)	10	2	*"I easily adapted to the Moodle environment"* *"A very useful interface"*
Live lecture environment	8	3	*"Live lesson was fun"* *"I liked that there were practice activities in live lesson"* *"It is inefficient to attend the classes live outside of school"*
Video content	8	2	*"I was able to do revision with video recordings.*
Pdf, Resource Files	9	2	*"Pdf and resource files were effective in understanding the subject"* *"Materials in Moodle were useful when studying for the exam"*
Assignment	7	2	*"I benefitted a lot from homework and documents"* *"I had a hard time completing the homework assignments"*
Let's evaluate ourselves	8	1	*"I revised the subject with the exercises""* *"Exercises and explanations should be added for the final exam"* *"At the end of each topic, there should be tests about that topic"*
Course Instructor			
Giving Feedback	10	2	*"I received timely / quick feedback"* *"I could not get an explanatory feedback"*
Communicating	10	2	*"I was able to communicate with the teacher of the course"* *"I prefer communicating with the teacher in the classroom environment"* *"I would expect my teacher to be in contact so I can follow the lesson"*
Seeking help	7		*"I was able to communicate whenever I wanted"*
Facilitating learning	8	1	*"Sample question solutions, PDF, homework instructions made it easier for me to do tasks"*
Guiding	11	1	*"The course contents helped me understand the subject"*
Structuring the Course Instructional Design			
Achieving the Objectives	6	0	*"To me, the objectives of the course have been achieved"*
Materials	7	1	*"A rich content presentation was made"*
Visuals	6	1	*"More interesting materials should be included"*
Testing and evaluation	4	3	*"That final exams constitute 80% of total grade was hard for us"* *"I prefer all exams to be practice based"*
Motivation and Learner Experiences			
Satisfaction	10	1	"I was satisfied with the lesson" *"I would like to attend the live lesson by phone"*
Skill / contribution	8	2	*"I improved my skills / computer skills"* *"I don't believe that online lessons improve my digital skills"*
Request to take lessons with distance education	4	4	*"I recommend taking lessons with distance education"* *"I prefer the face-to-face environment"*
Technical Specifications			
Help	5	-	
Guideline	7	-	
Computer & the internet	4	2	*"There are difficulties in accessing OYİS at certain times."* *"There are problems with video and audio in live lessons"*

As seen in Table 5, it was observed that the opinions of the students about the usefulness of the learning environment, the course instructor, the structure of the course teaching design, the experiences about the lesson and the technical features are generally positive. Solution suggestions for negative opinions are given below.

- As stated by students, "There are problems with video and audio in live lessons" was also reported by the instructors.
- It is thought that this problem will be solved with an up-to-date, effective and high-capacity video conference software. It was forwarded to the authorized units to overcome this problem that could be solved by management. In addition, the new video conferencing system should support the students' demand which is to "attend the live lesson by phone".
- In order to solve the negative opinion of "I had difficulties in completing the homework", it was decided to extend the homework submission deadlines from 1 week to 2 weeks.
- The view that "it is compulsory to attend live lesson" is not in line with the design of distance education environment.
- Taking into account the view that "adding exercises and explanations for the final", video and practice activities were included.
- There is currently no solution to the view that "exams should be practice based." While the number of students taking the course is expected to be around 2000, it is not appropriate to apply an application-oriented exam to each student on the computer. This view can be taken into consideration in the future.
- Considering the opinion that "there should tests related to the topic at the end of each topic", it was deemed appropriate to add an activity to evaluate ourselves in each week of the course.
- As a solution for the view that "I would expect my teacher to be in contact so I can follow the lesson", it was suggested that before the live lessons, to inform the place and time of the final exam, to share the homework and to send warning messages via SMS close to the end of the homework deadline.

Product Evaluation

All the compulsory CL courses throughout the university were conducted remotely in the fall semester of 2016-2017. For 1160 students registered, 14 Instructors taught at 25 branches, each of which has 50 students. In product evaluation, the effect of distance and face-to-face learning environment on students' academic success was examined. The academic success of students who took the course conducted in the face-to-face learning environment in the previous term and the course conducted in the distance learning environment were compared (Table 6).

Table 6. Academic Success of Students Taking Courses in Distance and Face to Face Learning Environment (Last Two Semesters)

	Distance Education 2016-2017 Fall (Final)	Face-to-Face 2015-2016 Spring (Final)
Number of Students Enrolled	1153	892
The number students in Final exam	825	561
Participation Rate for Final Exam (%)	71.55	62.892
Average of Success (%)	65.9	62.893

As seen in Table 6, students who took courses with distance education were higher than the students taking face-to-face courses (71.55%), and their average of success (65.69%) was also higher than the ones in face-to-face course. It was an important finding that the average of success of students in distance education is higher. This finding gave us a sign that instructional design has an impact on success. In the product evaluation, an in-depth analysis was made for the answers of the questions given below.

In this study, the data obtained from the predefined semi-structured questions were coded and presented with frequencies in tables. It was also reflected by quoting individuals' opinions. The students were asked semi-structured questions for product evaluation regarding taking course via distance education, content of the lesson, and achieving learning objectives (Table 7).

Table 7. Students' Opinions

	Yes		No		Partially		Total
	f	%	f	%	f	%	
Are you satisfied that you took this course with distance education?	61	72.62	23	27.38	0	0	84
Are the examples compatible with the applications, "let's evaluate ourselves", and the content of the course?	70	92.11	2	2.63	4	5.26	76
Are teaching materials effective in attaining learning objectives?	60	89.55	4	5.97	3	4.48	67

The vast majority of students reported that they were satisfied that they took the CL course with distance education (Table 7). Additionally, although the students had the following positive views "It was new experience for me", "It is a very nice method that gives students a sense of comfort, it makes more sense to teach with different methods instead of constantly teaching at school" and "We have the opportunity to listen again to the parts which we could not understand with the help of distance education more efficiently", they also stated their negative thoughts like the following "It could have been more efficient with face to face education." In addition, they indicated that the sample, application and self-evaluation activities given in the course content were compatible with the course content and that the teaching materials were effective in attaining the learning objectives. Moreover, students expressed their opinions like the followings: "There is content in every respect, which positively affects our success." "The fact that various data such as video, text and application speeded up the learning process."; "I find it very successful, I can easily work on issues I missed whenever I want"

The responses given to the question of "What are the positive and negative aspects of the course taking course with distance education?" were examined. The common themes and the frequency distribution of the themes are given in Table 8.

Table 8. The Positive and Negative Aspects of Taking Lessons with Distance Education

Positive Aspects	f	Negative Aspects	f
Easy access to the material	8	Difficulty in entering the system / internet	8
Easily asking questions to the teacher in the live lesson	5	High number of homework assignments	6
To receive education independent of the location	5	Lecture being at late hours	5
Taking courses via the internet	4	Not being able to attend to live class	3
To be able to communicate effectively with the teacher	4	Live broadcast freezing	2
Saving time	3	Not being able to do the applications face to face in the laboratory	2
No obligation to attend	2	No reminders for live lessons and assignments	3
Diversity of the learning environment	2	Not being able to ask questions in the live lesson	1
Learning in a systematic structure	2	I didn't like it. There is none.	34
To follow the lesson by phone	1		
No views	6		

The main positive aspects of distance education, according to student views, were easy access to the material, and it was easy to ask questions to the teacher (Table 8). Again, the negative aspects were having difficulty logging in to system / internet, the high number of homework, and the lesson starting at late hours.

Instructors were also asked semi-structured questions regarding content and accomplishment of learning objectives for product evaluation (Table 9).

Table 9. Instructor Feedback

	Yes (f)	Partially (f)
Moodle (logging in the system, access to course materials, assignment submission,…) is a suitable management system for the course.	9	3
Virtual classroom management software, where live lessons are held, meets the need.	12	0
Teaching materials (pdf files, videos, assignments, applications…) are sufficient.	9	2
Assignments, practices and self-evaluation are compatible with the course content.	11	1

According to instructor responses (Table 9), the instructional management system and virtual classroom management software used were suitable for the course and met the need. The majority of the views on teaching material and activities indicated that they are also sufficient.

The positive views of the instructors were as follows: "It is providing students with the opportunity to watch and read again and again at their own pace at any time, as well as learning independent of time and place."; "Including correctly prepared and planned activities simultaneously in a systematic framework with the contents of the previously prepared lessons."; "The fact that all materials have been added (pdf

documents, video narratives, tests and applications prepared for students' self-assessment, etc.) facilitates this process quite easily", "Teaching lessons with a different experience for students", "The process is very well structured, the activities and course contents are planned correctly"; "Students can advance at their own pace."

One of the instructors who gave "partially" as a response to the course content "I think teaching the topic "Excel" is insufficient. It can be planned to give Excel as a one-semester long course, not within the CL course. The same is true for Access. However, compared to Access, teaching Excel to the student is more important for the student's future professional life." On the other hand, the other instructor expressed his opinion by stating that "The videos were adequate, but can videos go above the baseline?" In addition, one of the instructors said, "It would be good to review some of the pdf files (spelling) and the answers of the tests in 'let's evaluate ourselves' part." "Decrease in the number of students participating in live connection at the beginning of the semester towards the end of the semester" is among the negative aspects related to the course.

4 |Discussion and Conclusion

This section of the study covers research results and suggestions offered accordingly.

Conclusion

In order to carry out the CL course which aims to provide basic knowledge and communication skills throughout the university by using distance education technologies, an instructional design was prepared with the ADDIE model that is appropriate for educational goals and objectives and will meet the educational needs by identifying the needs within the scope of the course. Firstly, problem analysis was performed to determine the current situation and the situation that should be present, and learner characteristics. In conducting the course in face-to-face format, it was determined that the number of students who could not reach the education was quite high, that the physical facilities of the university and the workforce of the academic staff could not be used effectively, and a distance learning environment using new technologies equipped with rich learning environments was required. The design process was initiated by considering the basic module and standard module of the European Computer Competence Certificate. According to Bloom's taxonomy, goal analysis was prepared, and assessment tools were developed. Homework assignments were planned unattended while final exam is supervised. In order to comply with the scope validity of the number of questions to be prepared for the final exam, the time allocated to the topics and the objectives of the course were taken into consideration. The selection and design of teaching materials suitable for the objectives, content and distance education environment of the course were made in the development process. Teaching and content management system - Moodle were found suitable for giving the course with distance education. The content of 14-week course including text-based explanatory information, presentation, video, solution of application question, let's evaluate ourselves, homework and simultaneous activities was developed.

Assessment tools were utilized to determine whether the program has achieved its learning outcomes from the problem analysis to the assessment phase and what is required to develop the program, if any. During the process evaluation phase, the expert opinion was obtained by providing that six experts who prepared the materials evaluated each other's materials. The text contents were examined by the field expert in terms of grammar and spelling.

In pilot evaluation, the effect of different evaluation methods on academic success was examined, no significant difference was detected. In addition, the relationship between students' browsing Moodle and their academic achievement was examined, and it was found out that there was a positive and meaningful connection. In a similar study Song, Rice, and Oh (2019) who examined the participation of the student on teaching and content management system, he analyzed the frequency and duration of access to the course, discussion board and chat correspondence and final grades. It showed that the frequency and

duration of access to the lesson, the amount and quality of discussion and chat recordings were significantly related to the student's success. In pilot evaluation, it was aimed to obtain detailed information about the evaluation of the process by collecting quantitative data as well as qualitative data. It was observed that the opinions of the students about the usability of the learning environment, the course instructor, the structure of the course teaching design, the experiences about the lesson, and the technical features were generally positive. The negative opinions of the students were that the video conference system is not efficient, the assignment submission periods are short, the exercises, practices and explanations regarding the final exam and given assignments are insufficient and not reported to the students.

In product evaluation, the effect of distance and face-to-face learning environment on students' academic success was examined. The academic success of the students who took the course in the face-to-face learning environment and the course given in the distance learning environment was compared. Compared to students taking face-to-face courses, students who take courses with distance education had a higher rate of participation and higher average of success in the final exam. It is an important finding that the average success of students in distance education is higher. This is because students who do not attend classes can take the final exam. Additionally, an in-depth analysis was made with qualitative data in product evaluation. The students stated that they were satisfied with the distance education, the examples given in the course content, the application and the self-evaluation activities were compatible with the course content and that the teaching materials were effective in attaining the learning objectives. Again, according to the students who gave their opinions, the main positive aspects of distance education were the convenient access to the material, asking questions easily to the teacher in the live lessons, the negative aspects were having difficulty in logging in to the system / internet, the high number of homework, and the lesson starting at late hours.

During the product evaluation phase, all the course instructors had positive thoughts about the course given by distance education method. The teaching management system and virtual classroom management software used were suitable for the course and met the need. On the other hand, the instructors raised the problems of enriching the topics of the spreadsheet and database program and the gradually decreasing number of students attending the live lesson towards the end of the semester.

The fact that the CL course was given by distance education has contributed to the effective use of both the teaching staff and the related employees' workforce, and the physical facilities of the university. The content of the course was presented to a great number of students with a rich educational environment. It has been observed that distance education design made with ADDIE model increased the knowledge and skills of every student who is motivated to learn by providing a unique education opportunity independent of time and place. Successful results were obtained in the studies conducted using the ADDIE model. Wang, and Hsu, 2008, who designed the Second Life activities according to the ADDIE model, stated that this model constituted a systematic method that would enable the instructor to function as a teaching and learning tool that helps them design their learning tasks. In addition, ADDIE model was used in library teaching design. It has been found that the model can lead to a teaching that focuses on student learning outcomes, meets the needs of students and facilitates active learning (Reinbold, 2013).

According to the analysis of the data obtained from students and instructors on the design of the course with distance education, management or design-oriented solution suggestions are given below;

- The impact of homework (unattended) and final exam (supervised) on overall success in the final evaluation is 20 points and 80 points respectively,
- Due to the high number of students, the final exam is done with multiple choice test,

- The students' browsing through Moodle is taken into consideration in student assessment,
- Live courses should be conducted in the evening on weekdays,
- Provision of up-to-date, effective and high-capacity video conferencing software makes live lessons more efficient,
- Extending the assignment deadlines and giving explanatory feedback,
- Adding more exercises, practices and explanations for the exam and homework on the Moodle page of the course,
- Instructor should send alert messages to students before live lessons, exams and sharing assignment,
- Students who want to practice should be advised to use the computer laboratories to be allocated,
- Increasing the storage areas reserved for assignments with visual and audio files on Moodle,
- Allotting sufficient time to Excel or reviewing the content,
- Reviewing the compatibility of the text file content and application in Access,
- The lecturer has authority and responsibilities in the situations specified in the management of the course (content of the last week, classroom performance grade, having make-up sessions, etc.),
- According to the literature review, the opinions, and suggestions given above, a "Course and Instructor Evaluation Form" is created and student opinions are received at the end of each semester,
- Planning the live lesson hours given through the internet should not be too late in the evening on weekdays,
- In order to prevent the decrease in the number of students participating in the live sessions from the beginning of the semester towards the end of the semester and to ensure the active participation of the student, different methods and techniques are included. For example, instead of the one-to-one explanation of the pdf document, the subject is summarized, then the application is done about the subject, the interactive learning environment with the subject is provided to the students by preparing a questionnaire about the subject on video conferencing system, sharing the homework sent to the system on the screen, giving feedback on the homework by sharing the homework sent to the system on the screen, and including the question-answer technique.
- The trainer who will take part in distance education should review the course material before the live lesson, be willing to teach lessons, be knowledgeable and experienced in the field and information technologies, if necessary, they should be informed about this process before starting the distance learning process, giving necessary explanatory feedback to the assignments, to provide guidance for the student who will request an interview by determining office hours,
- The content of the course should be constantly renewed and improved in parallel with the developing technology. Therefore, in addition to preparing instructional designs, it is recommended that the assistance and support of the teaching staff of the Department of CEIT continue in the updating of the content.

SUGGESTIONS

The data obtained from the evaluation studies as a result of the instructional design developed will be used for the renewal and improvement of the next lesson. Indeed, teaching design should be evaluated in a constantly revised cycle. The study of undergraduate course instruction design to be given by distance

education is expected to set an example for the different courses planned to be taught via distance education.

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An Analysis of Turkish Pre-service Preschool Teachers' Self-image on a Science Education Course

Volkan Atasoy[a*] Berat Ahi[b]

a, Asst. Prof. Dr., Kastamonu University, (http://orcid.org//0000-0002-2515-3770) *vatasoy@kastamonu.edu.tr

b, Assoc. Prof. Dr., Kastamonu University, (http://orcid.org//0000-0002-8744-7213)

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Abstract

The purpose of the current study is to investigate the changes of self-image occurring in pre-service preschool teachers during a course of science education. The study employed the phenomenological research method within the framework of a qualitative perspective. A total number of 75 pre-service preschool teachers participated in the study on a voluntary basis and they were asked to draw a picture to reflect their state during the science education course and to explain it. The findings derived from these drawings were found to be subsumed under four categories: cognitive, implementation, affective and social. It was also found that the pre-service preschool teachers had difficulties in understanding science while emphasized a teacher-centered approach to its teaching. Moreover, inconsistent feelings and attitudes towards the subject were observed and social interaction was not depicted very much. In the light of the findings, it is suggested that preschool teacher education programs should be revised to provide effective science education. It is thought that teacher educators and mentors play an important role in pre-service preschool teachers acquiring adequate knowledge and skills and developing positive attitudes.

Keywords: Science education, preschool, phenomenology, drawing.

Türk Okul Öncesi Öğretmen Adaylarının Fen Bilgisi Eğitimi Dersine İlişkin Öz İmajlarının Analizi

Öz

Bu araştırmanın amacı, okul öncesi öğretmen adaylarında fen bilgisi eğitimi dersi sırasında meydana gelen öz imajlarındaki değişiklikleri incelemektir. Çalışmada nitel bir bakış açısı çerçevesinde fenomenolojik araştırma yöntemi kullanılmıştır. Çalışmaya gönüllü olarak toplam 75 okul öncesi öğretmen adayı katılmış ve fen eğitimi dersi süresince kendi durumlarını yansıtacak bir resim çizmeleri ve açıklamaları istenmiştir. Bu çizimlerden elde edilen bulgular bilişsel, uygulama, duyuşsal ve sosyal olmak üzere dört kategori altında toplanmıştır. Bulgular ayrıntılı incelendiğinde, okul öncesi öğretmen adaylarının bilimi anlamakta güçlük çektikleri, öğretmen merkezli bir yaklaşımı vurguladıkları görülmüştür. Ayrıca öğretmen adaylarının fen eğitim dersine yönelik tutarsız duygu ve tutumlar sergiledikleri gözlemlenmiştir. Fen eğitiminin önemli bir unsuru olan sosyal etkileşiminde çok fazla tasvir edilmediği bulunmuştur. Elde edilen bulgular ışığında okul öncesi öğretmen yetiştirme programlarının etkili fen eğitimi sağlayacak şekilde revize edilmesi önerilmektedir. Okul öncesi öğretmen adaylarının yeterli bilgi ve beceriye sahip olmalarında ve olumlu tutumlar geliştirmelerinde öğretmen yetiştiricilerinin ve danışmanların önemli rol oynadığı düşünülmektedir.

Anahtar kelimeler: Fen eğitimi, okul öncesi, fenomenoloji, çizim

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1 | INTRODUCTION

Today, contemporary education systems aim to educate scientifically literate individuals (Brown, Reveles, & Kelly, 2005; National Research Council [NRC], 1996). Among the characteristics to be possessed by the individual educated in such a system is knowing basic scientific concepts and understanding its nature, using scientific processing skills, and having positive attitudes towards the subject (Ministry of National Education [MoNE], 2018). Research has shown that the preschool period is of critical importance in developing such characteristics (e.g., Harlan & Rivkin, 2004; Watters, Diezmann, Grieshaber, & Davis, 2000). When examined in more detail, it can be seen that the science education received at an early age facilitates the ability to develop scientific knowledge in the years after (Eshach & Fried, 2005). At the same time, it is emphasized that the preschool period is an important period in developing scientific process skills. Due to the curiosity and discovery instinct that is inherent in children, it has been observed that it is easier to impart scientific processing skills to them- e.g., observation, inference, and inquiry- that are conducive to having access to scientific knowledge (Öztürk-Yılmaztekin & Erden, 2017). The early childhood period is also of vital importance in understanding the nature of science. It is generally felt that understanding the nature of science by targeting the characteristics of scientific knowledge will be thoroughly successful when its foundations are laid during preschool education (Akerson, Buck, Donnelly, Nargund-Joshi, & Weiland, 2011). Moreover, it is argued that the early childhood period is highly suitable for developing positive attitudes and beliefs towards the subject that can considerably affect children's scientific achievement in the years that follow (Saçkes, Trundle, Bell, & O'Connell, 2011). In short, science education in early years gives a direction to the lives of children by motivating them to learn about the subject, as well as imparting science-related knowledge and skills to them.

Although it yields such important returns, science education applied in preschool education has problems both in terms of quantity and quality (Eshach & Fried, 2005; Peferson & French, 2008). For example, Seefeldt and Galper (2007) stated that teachers do not trust themselves in science teaching and avoid engaging their students in related activities. Similarly, Pendergast, Lieberman-Betz and Vail (2017) asserted that feelings of inadequacy and anxiety influence their teaching science. On the other hand, Greenfield et al. (2009) reported that little time is devoted to science activities in preschool classes compared to other activities. It has also been reported that most of the applications conducted in the name of science activities are in fact unrelated to the subject (Tu, 2006). These conditions are thought to be caused by problems about preschool teachers' competences (Olgan, 2015). In this context, the science content knowledge of teachers is a subject that has been widely researched. Content knowledge is described as teacher's understanding concerning the structure of subjects (Shulman, 1986). Garbett (2003) stated that teachers do not have sufficient knowledge of scientific concepts to teach them during the preschool period. As a result, it is felt that they cannot provide scientific explanations to their students' questions during science activities (Kallery & Psillos, 2001). On the other hand, it has also been observed that teachers do not like doing activities related to some science subjects. Saçkes (2014) argues that while emphasis is placed on subjects such as life sciences, world and space or physical science is overlooked. Overall, the empirical findings suggest that preschool teachers have limited knowledge about scientific concepts.

Preschool teachers also have problems about another certain science-specific competence named pedagogical content knowledge of teachers. It refers to skills and knowledge for teacher to develop their teaching quality (Shulman, 1986). Concerning this topic, Kallery and Psillos (2001) explained that teachers had some difficulty in transferring scientific knowledge to students and that they had shortcomings regarding how science teaching should be conducted. In this context, Tahta and Ivrendi (2007) argued that teachers should be able to use different methods to provide rich science experiences. In the same vein, Karamustafaoğlu and Kandaz (2006) noted that teachers mostly focused on techniques such as lecturing and drama. Tunnicliffe (2016) emphasized that students can learn scientific concepts effectively through inquiry-based education including discussion, research, and active participation. In general, preschool

teachers seem to not be qualified in implementing student-centered teaching methods although they are aware of their benefits on children's learning science.

Preschool teachers' competences are shaped by their attitudes and beliefs towards science teaching. Preschool teachers may experience problems in teaching the subject because of negative attitudes and beliefs (Conezio & French, 2002). Not liking and believing that they are not successful in teaching it, they become further demotivated towards doing so (Huinker & Madison, 1997). It has been reported that these negative attitudes and beliefs find reflections in classroom practices. This is believed to lead to many negative situations such as the hindering of students' natural disposition to wonder and explore and the avoidance on the part of teachers of conducting scientific activities (Olgan, 2008). In addition, these beliefs might affect teachers' teaching style. Teachers with negative beliefs about science used more traditional methods in their classroom (Finson, Pedersen, & Thomas, 2006). As a result, preschool teacher's attitudes and beliefs have a significant influence on their behaviors and instructional preferences in the classroom.

These competences (science content knowledge, pedagogical content knowledge) were investigated in the context of pre-service preschool teachers. For example, there were some studies related to analysis of science content knowledge. S. Timur (2012) investigated the knowledge of pre-service preschool teachers concerning force and speed. It has been observed that there are certain problems in explaining and using certain concepts such as acceleration, friction force and gravity addressed within this subject. Similarly, Saçkes and Trundle (2014) revealed that pre-service preschool teachers have misconceptions about the phases of the moon. In addition to studies aimed at science content knowledge, there are also some that focus on pre-service teachers' attitudes and beliefs. B. Timur (2012) found that positive science education experiences and strong content knowledge have a significant effect on the teachers' attitudes towards the subject. In addition to such studies wherein a single factor has been addressed, there are more comprehensive studies. For example, Thulin and Redfors (2017) found that by redesigning science teaching course, pre-service preschool teachers changed negative attitudes, focused on topics within physics, chemistry, and biology equally and adopted students-centered teaching methods. Parallel to this, Eckhoff (2017) carried out a study that brought pre-service preschool teachers and preschool children together within the context of a course. Compared to the beginning of the semester, pre-service preschool teachers gained correct and valid information about the subjects taught during the semester and they developed themselves in terms of inquiry-based teaching and enhanced their self-efficacy beliefs to teach science. Overall, the pre-service preschool teachers have similar problems about teaching science as preschool teachers caused by inadequate of science content knowledge and negative attitude and beliefs. With professional development, pre-service preschool teachers seem to change their beliefs, attitudes and teaching style.

When the studies related to teacher competences of pre-service preschool teachers are reviewed, it can be seen that in general, data have been collected by questionnaires, interviews and in-class observations (e.g., Erden & Sönmez, 2011; Menon & Sadler 2016; Moran, 2007; Pendergast et al., 2017) as well as various documents such as activity plans and diaries (e.g., Brenneman & Louro, 2008; Echoff, 2017; Lippard, Tank, Walter, Krogh, & Colbert, 2018). In addition to these techniques, drawing method has been used to elicit people's ideas, feelings, and thoughts around a subject for decades. First of all, Chambers (1983) developed Draw-a-Scientist-Test to assess students' ideas about scientists through an analysis of their drawings. Research used the instrument showed that people had stereotypical images about scientists such as wearing lab coat, glasses, being male, working alone in lab, doing experiments (El Takach & Yacoubian 2020; Uçar, Eti, Demircioğlu, & Aktaş-Arnas, 2020). Then, this test has been modified and conducted to explore the participants' conception of science learning and teaching. For example, Go and Kang (2015) investigated how the pre-service preschool teachers depicted themselves during science education course. They found that thanks to the course, pre-service preschool teachers shifted towards a display of student-centered, constructivist teaching. Katz et al. (2011) examined pre-service teachers'

professional identity development in informal science education through their drawings. They found that pre-service teachers drew some images showing collaboration, inquiry and hands-on science, and enthusiasm for science and science teaching and learning. In the current study, the effect of a science education course on pre-service preschool teachers is investigated. They are asked to draw themselves in this course to reflect ideas, emotions, and knowledge. Although there is not comparison between pre- and post-drawings like studies above, it is thought that the information related to pre-service preschool teachers and science education in this course can be achieved. In this regard, the research question of this research is worded as follows:

What are the effects of the science education course on the pre-service preschool teachers while they are taking this course?

2 | METHOD

RESEARCH DESIGN

The purpose of the current study is to understand the effects of the science education course the pre-service preschool teachers are taking from various perspectives. Thus, the study aims to reveal the pre-service preschool teachers' internal experiences of science education. The current study is built on the phenomenological approach included in the qualitative paradigm. Phenomenological research aims to elicit participants' opinions about a phenomenon by investigating their experiences (Larsson & Holmström, 2007). In the current study, the target phenomenon is science education. As the current research intends to make sense of the effect of the target phenomenon on pre-service preschool teachers, the purpose and the model of the research are thought to match.

STUDY GROUP

The study group of the current research comprises 75 pre-service preschool teachers enrolled at the Department of Early Childhood Education in a state university of Turkey in the spring term of 2017-2018 academic year. This university educates students with average or below-average scores taken from the centralized university entrance exam. The students in the Department of Early Childhood Education are the ones with the highest scores among the students of the faculty. However, these students are accepted to this department mainly with their Turkish-math and social science scores.

SETTING

As the current study was conducted from the qualitative research perspective, it is necessary to give a detailed description of the research setting. This current study was conducted on the third-year students attending the Department of Early Childhood Education. Yet the faculty which included this department is located outside the main campus of the university. The place called 'The Education Campus' is in the city center. In the faculty, students from the departments of science and math education, social studies and Turkish education, fine arts and psychological counselling and guidance education are instructed.

The campus consists of three blocks and in these blocks, students from each department have their own classes. In the campus, however, there is only one canteen so pre-service teachers interact even if they are in different departments. There is also an indoor gym and woodland on the campus. The data of the current study were collected in the classes of the education faculty. The classes have a standard structure, and each class has a capacity of about 45 students. Pre-service teachers sit at single desks. For the current study, two different classrooms were used.

ETHICS

General permission was taken from the university management to conduct the study. Required permission was also taken from the faculty administration to use the classroom. Before starting, the general

purpose of the research was explained to the pre-service preschool teachers and an informed consent form was signed by each participant. It was clearly stated on the form that they should participate in this study voluntarily. No grading was performed on basis of the activities performed and their relationship with the researchers would not deteriorate. It was also stated that participants have the right to leave at any stage of the research. In addition, the e-mail addresses of the participants were collected, and they would receive a copy of the article after publication.

Data Collection Tool

In the current study, the 'draw and write' technique was used to collect data. This technique is one of the techniques that allows individuals to reflect the information they obtain from everyday life with their unique personal cognitive structure (Horstman, Aldiss, Richardson, & Gibson, 2008). Therefore, it is a very suitable data collection technique for phenomenological research. In the current study, pre-service preschool teachers were asked to draw themselves by considering all the experiences they had while they were studying science. Then they were asked to explain their drawings in detail. The technique was developed from the "draw a scientist test" (Chambers, 1983) and used as the technique of drawing oneself while giving science instruction.

Data Analysis

Analysis of the drawings

These drawings were analysed through the Science Teaching and Learning Portrayals of Professional Practices (STLP3) Scoring Rubric developed within the context of Project Nexus. The dimensions in the rubric are explained below and the rubric can be accessed via this address- (http://www.drawntoscience.org/researchers/scoring-rubric/rubric.html).

- Dimension 1: Affective – its indicators include excitement experienced during learning and motivation to learn the subject. Humans' smiling faces and specific indicators of excitement and motivation are in speech bubbles.

- Dimension 2: Cognitive – Evidence in concepts – important scientific ideas, explanations of how events occur, the comparison of alternatives and visuals with three-dimensional models in learning experiences and arguments related to research.

- Dimension 3: Implementation – Manipulation – access to materials, the existence of test equipment, discovery – active participation, predicting, questioning and observation.

- Dimension 4: Social Interaction – Evidence of participating with others in scientific and instructional activities –the use of scientific terminology, emphasis on interaction and group work.

STLP3 evaluates these dimensions by assigning a score in the range of 0-4. When the evaluated target behaviour is not observed at all, 0 points are given and when it is observed at the highest level, 4 points are assigned. When a high score is given to the participant, it means that he/she thinks that the science education received has had a positive effect. Information about scoring and sample drawings scored can be gained at the following address (http://www.drawntoscience.org/researchers/scoring-rubric/index.html). The drawings collected in the current study were analysed according to the criteria stated in STPL3 both for each dimension separately and as a whole. A sample data analysis application is presented in Figure 1.

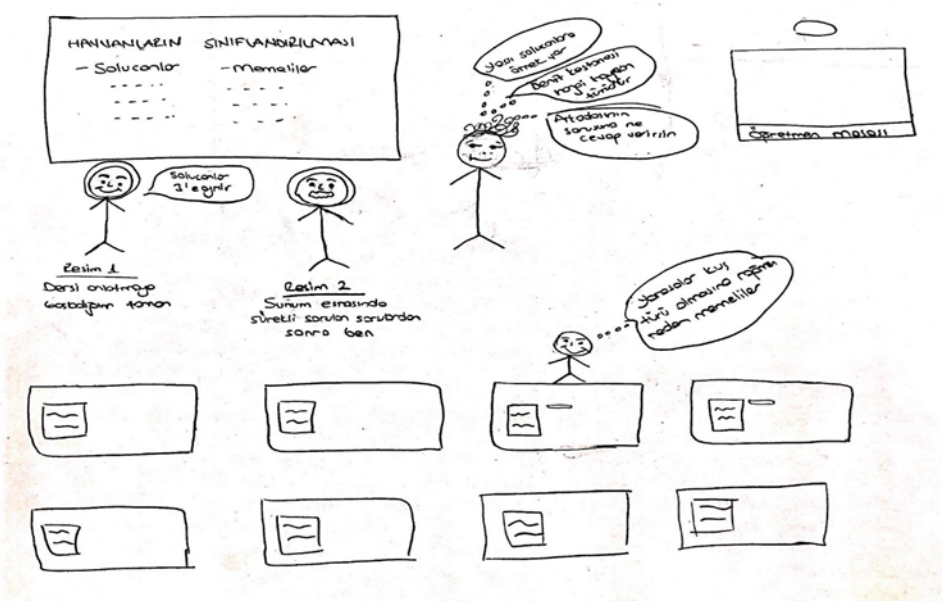

Figure 1. *STLP3 Analysis Application*

Explanation: In the Drawing 1, there are smiling and happy faces that are evaluated in the affective dimension. The affective dimension score: 3. Cognitively it is seen that the individuals in the drawing are making inquiries about science and attempting to draw conclusions. These are shown in three different speech bubbles. The cognitive dimension score: 3. In terms of the implementation dimension, it can be seen that at least one of the figures in the drawings is questioning. The implementation score: 1. In terms of social interaction, at least one figure is making a scientific inference in the speech bubble and is interacting. The social interaction score: 3. Thus, the total score taken from this drawing is: 10.

Analysis of the Written Texts

In the current study, the pre-service preschool teachers were asked to explain their drawings. They made these explanations using their own handwriting. Then the explanations made by the 75 pre-service school teachers were transferred to the computer environment. After that, the word counts were completed. As in the STLP3 rubric, the words that related to each dimension were counted one by one. For example, for the affective dimensions, words such as: 'I (don't) love', 'I (don't) like', 'I am (not) happy' etc. were searched for. For the cognitive dimension, words such as: 'I have recognized', 'I have thought' etc. were searched for. For the implementation dimension, words such as 'I do', 'experiment', 'observation' etc. were searched for and lastly for the social dimension, words such as 'friend', 'group', 'together' etc. These words were elicited by strictly following a data-oriented approach.

Trustworthiness

For the credible and honest analysis of the collected data in the current study, the authors adopted a researcher-centered approach. Moreover, this was planned to be conducted on the basis of the hypotheses of the postpositivist/systematic paradigm. As stated by Creswell and Miller (2000), in such cases the triangulation method is used. In the most general sense, triangulation can be defined as using more than one source to conduct qualitative research (Bogdan & Biklen, 2007). Triangulation can be performed over data sources, theories, or data collection methods (Creswell & Miller, 200). In the current study, triangulation was conducted over data collection methods. While drawings and written texts constitute two dimensions, the third is made up of various statistical tests belonging to the findings. The statistical part consists of the following: the correlation of the dimension scores within the total score and seeking expert opinions for the codes formed, a kappa measure of agreement index was found between the researchers and expert opinions as .93 for the drawings and .89 for the written texts.

3 | Findings

Findings Obtained from the Drawings

The pre-service preschool teachers' drawings were analysed on the basis of the dimensions in STLP3. As a result of these analyses, the scores for the sub-dimensions are presented in Figure 2.

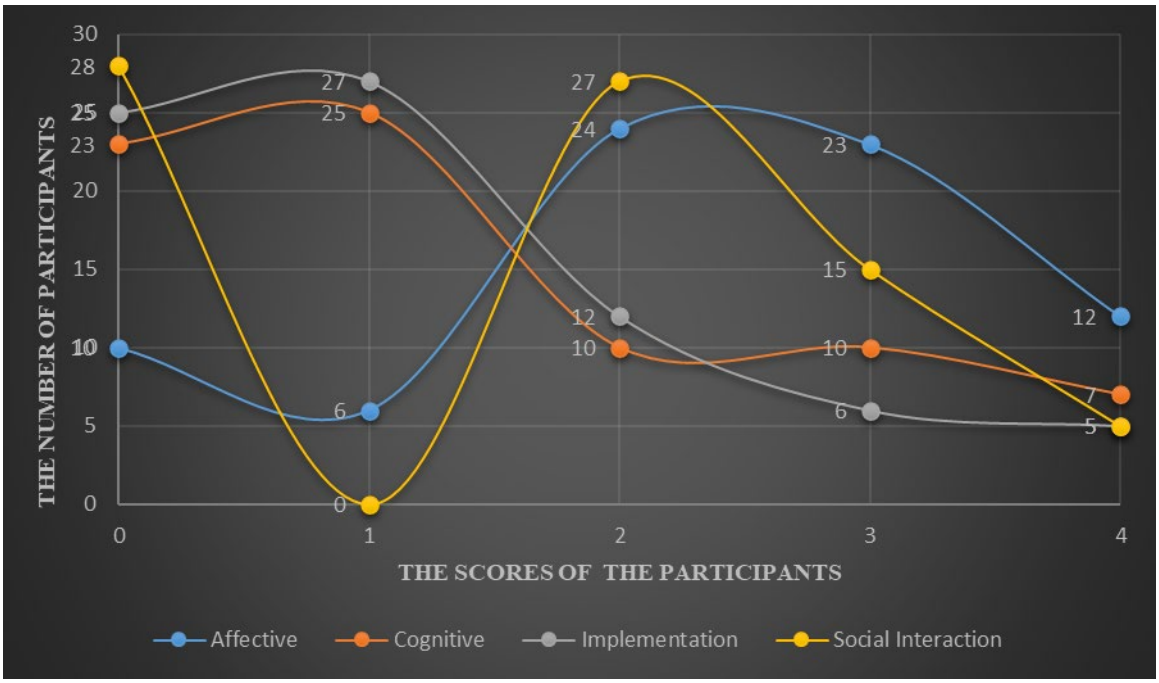

Figure 2. The Distribution of the Scores by the Participants from STLP3 Across the Sub-Dimensions

As can be seen in Figure 2, a significant number of participants (f= 86) got zero points from all the sub-dimensions. When the graph is subjected to a general analysis, it is seen that distribution is skewed to the left and thus it can be argued that the participants got low scores from the rubric in general. In the light of this finding, it is difficult to argue that the science education received by the pre-service preschool teachers had a positive effect on them. In addition, the participants taking full scores from the sub-dimensions make up a small proportion of the participants (f= 24). One of the examples from the participant having a low score is given in Figure 3.

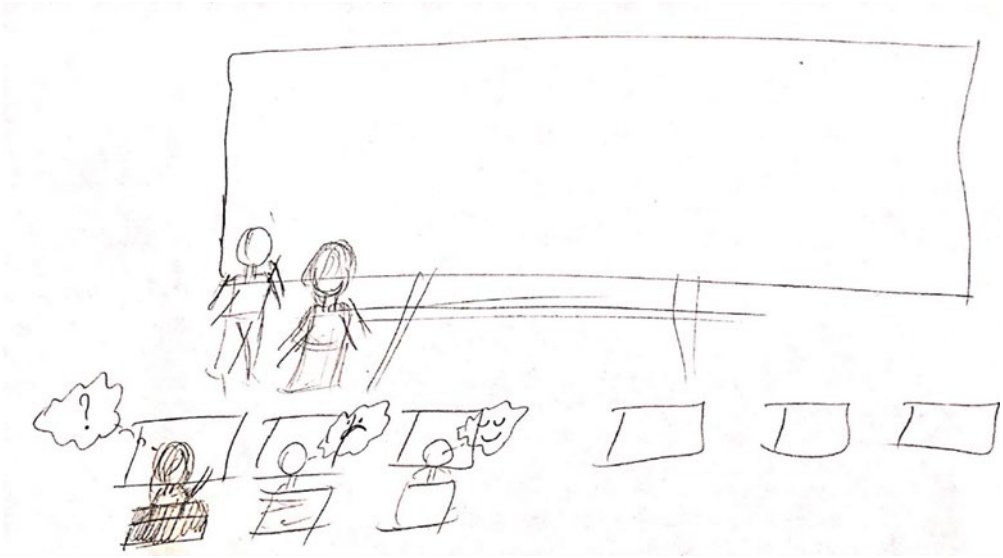

Figure 3. *A Sample Drawing from the Participant Having a Low Score from STLP3*

Explanation: In the sample drawing given above, there is no expression that can be placed into the affective dimension. There is one happy and one unhappy expression. The affective score: 2. In the cognitive dimension, only one student is depicted while questioning. The cognitive score: 1. Though in the implementation dimension there is a process conducted at the board, there is no clear statement. There is nothing like a scientific process or observation, experiment etc. The implementation score: 0. In terms of the social interaction, though a classroom setting is drawn, there is no clear evidence of interaction. Social interaction: 1. Total score: 4.

When the sub-dimensions are examined separately, it can be said that the pre-service preschool teachers perceive the effect of the science education they received as limited on the cognitive and implementation sub-dimensions. In the cognitive and implementation sub-dimensions, the numbers and scores of the students are given respectively as follows: 23 and 25 participants got 0 points; 25 and 27 participants got 1 point. More than half of the 75 participants drew the effect of science education they had received as limited on both of these sub-dimensions. It can be said that the participants find the science education they received to be most effective and meaningful in the affective sub-dimension. In a significant number of the drawings there are smiling faces or speech bubbles indicating that they are enjoying themselves (see Figure 3). In this sub-dimension, 23 students have 3 points, and 12 students have 4. In the social interaction sub-dimension, the participants show a more normal distribution. In the light of all these findings, it can be argued that the participants are of the opinion that the science education they received is not very effective in terms of cognition and implementation while they are more positive in relation to social interaction and find it most effective in terms of the affective sub-dimension. Figure 4 is an example receiving high scores from all the sub-dimensions.

When the drawings are characteristically examined, it is seen that in the majority of the drawings, happiness and pleasure come to the fore. On the other hand, there are some drawings that indicate that they are unhappy, confused and puzzled. The major shortcoming in the drawings is the lack of big scientific ideas, the lack of an explanation of how the events took place and a lack of the presentation of learning experiences. In addition, during science education, the inadequacy of the methods and techniques used to conduct experiments and observations or to gain scientific knowledge is also remarkable. Drawings in terms of social interaction generally focus on individual efforts. The presentation of activities done in groups is highly limited.

Figure 4. A Sample Drawing from the Participant Having a High Score from STLP3

Explanation: In the sample drawing, in the affective sub-dimension, the smiling faces of the figures in the drawing can be seen. The affective score: 3. In the two speech bubbles, there is scientific thinking and inferences in relation to the cognitive sub-dimension. The cognitive score: 2. In the implementation sub-dimension, there is more than one scientific tool and piece of equipment drawn. In addition, there are drawings of a rocket, planets, and an astronaut. The implementation score: 4. In the social interaction sub-dimension, the people in the drawing are working on their own yet it is seen that scientific language is used in the speech bubbles. The social interaction score: 4. Total score: 13.

Findings Obtained from the Written Texts

The 75 participants making up the study group were asked to explain their drawings in writing. In this way, it was intended to realize the process of triangulation so as to elaborate the drawings and to enhance credibility in the determination of emotions and thoughts. In the collected written texts, there are a total of 10,694 words, which means 146 words per participant. It was determined that affective expressions were frequently used in written texts such as I love (f= 3), I enjoy (f= 15), I am having a good time (f= 23), being happy (f= 11). In addition, some of the words in the affective dimension represent negative feelings such as I do not like, I became unhappy (f= 3), I do not love (f= 5).

The cognitive and implementation sub-dimensions are the dimensions for which the lowest scores were taken from the drawings. The same holds true for the written texts. In the cognitive dimension, the participants used expressions such as understand (f=23), recognize (f=13) and learn (f=11) to indicate that they are cognitively active. However, there are also large number of negative expressions such as I don't understand (f= 17), I cannot recognize (f= 9), I cannot learn (f= 8). The same holds true for the implementation dimension. It was found that words related to skills or operations needed to conduct educational and instructional activities were scarcely included. Words such as experiment or conducting an experiment (f= 3), observation or making an observation (f= 1), explaining (f= 6) and asking questions (f= 11) are the words detected in the implementation dimension. In light of all these findings, it can be maintained that the participants felt cognitively challenged while undertaking the science education and that they were able to produce a very limited number of words in the implementation process. Moreover, the fact that "asking a question" are the words most frequently repeated in the application sub-dimension offers some insight into how the science education given to them was conducted.

Although there is a balance between the low and high score drawings in the social interaction dimension, in the written texts, words such as me (f= 13), myself (f= 28), on my own (f= 9) are seen. Words connotating social interaction such as together (f= 6), group (f= 4), team (f= 3) and squad (f= 1) were used relatively less. Samples from the written explanations of the participants are presented in Table 1.

Table 1. Samples from the Written Texts

Text 1.
In the science education course, I have learned how to deliver the lesson to my students in the future and by dreaming of delivering such lessons, I have felt really happy.
Text 2.
I have realized the mistakes which I had considered correct. I learned by doing experiments. Experiments were very interesting and amazing for me.
Text 3.
Learning science is a lot of fun. But I had some difficulties in understanding.

Findings related to Statistical Tests

Within the context of the current research, statistical operations were carried out to support the triangulation process. Thus, as the researchers did, another field expert scored the drawings and analyzed the written texts. Both results were subjected to a kappa fit index test and for the drawings, it was calculated to be .92 and for the written text, it was calculated to be .83. Moreover, by calculating the correlation between the sub-dimensions of the rubric and the total score, it was proven that the rubric is valid and reliable. In this connection, the correlation values obtained with the Pearson product-moment correlation analysis (r) are presented in Table 2.

Table 2. Total Score and Between Sub-dimensions Pearson PM Correlation Coefficients

	Affective	Cognitive	Implementation	Social Interaction	Total Score
Affective	-	.281*	.365*	.218*	.577*
Cognitive	-	-	.867*	.644*	.881*
Implementation	-	-	-	.660*	.909*
Social Interaction	-	-	-	-	.806*

* *p< 0.05*

As can be seen in Table 2, the sub-dimensions of the STLP3 rubric correlate significantly with each other and with the total score. According to Cohen (1988), the value between .1 and .29 means a low correlation, between .3 and .49 means a medium correlation and between .5 and 1.0 means a high correlation. The correlation of the total score with the affective dimension is medium and with all the other dimensions, it is high. Thus, the findings obtained from the rubric statistically overlap with the results obtained from the written texts. All the sub-dimensions refer to the changes experienced by the pre-service teachers during the science education they have received. Thus, it can be said that all the sub-dimensions had some effects on the pre-service teachers' perception of the science course (total score) they took to some extent.

4 | Discussion & Conclusion

The purpose of the current study was to investigate the changes occurring in pre-service preschool teachers during the science education course through the 'draw and write' technique. The findings derived from both the drawings and the written texts are parallel to each other and they were gathered under four dimensions -cognitive, implementation, social and affective. First, it was found that the pre-service teachers were unable to develop themselves cognitively well within the context of this course. In this respect, it is thought that they have some shortcomings in their knowledge about scientific concepts, in explaining scientific events and in developing arguments. B. Timur (2012) and Saçkes and Trundle (2014) stated that pre-service preschool teachers use information that is not scientifically correct in explaining scientific events due to their limited knowledge of science. Thus, the pre-service preschool teachers' being weak in the cognitive dimension might be related to their weak science content knowledge. Their primary and secondary education could offer low quality and frequent science learning opportunities. Considering that especially secondary school curricula are important to transfer contents of science into the courses in pre-service teacher education (Barenthien, Oppermann, Anders, & Steffensky, 2020) it is evident that they can have difficulty in cognitive activities such as understanding science concepts, giving explanations and forming arguments. To avoid such situations, the number of science-related courses in preschool teacher education programs could be increased. Given that the higher the number of science courses taken at undergraduate level, the higher the number of science activities conducted in preschool classes (Saçkes, 2014), it can be predicted that the integration of courses directed to the development of science content knowledge into undergraduate teacher education programs will yield important gains. On the other hand, it can be seen that science courses recommended for preschool undergraduate level do not sufficiently emphasize the scientific content. In the science courses of this education programs, subjects such as the importance of science education at early ages, scientific thinking skills, the nature of science, things to be considered in planning science activities, methods used in science education and example activities are included (Turkish Council of Higher Education, 2018). Though these subjects are important, science subjects that are generally subsumed under the three headings of physics, chemistry and biology are avoided to a large extent. Therefore, it is argued that the reorganization of preschool teacher education programs could help overcome this problem.

Another important finding of the study relates to the implementation process of the science education course. The participants showed that the science education course was mostly given by a teacher-centered approach such as asking questions. It is thought that young children can learn science effectively with active participation in science activities (French, 2004). In this respect, the inquiry-based science instruction in which scientific process skills such as making observations and inferences can be developed is emphasized to be an important teaching approach for children to learn science (NRC, 2007, 2012). It is suggested that effective use of this approach by teachers in their classrooms depends on their receiving an education and gaining experience in this subject (Petersen and Treagust, 2014). In the current study, what has been understood from the drawings and written explanations of the pre-service teachers is that this approach is not usually emphasized in their training. In this respect, Eckhoff (2017) argues that teacher educators can influence pre-service preschool teachers in a positive way by creating various opportunities that involve this approach. On the other hand, it is considered that it will be important for teacher educators to apply this approach in their own practices. According to Bandura's (1997) social learning theory, people learn behaviors by taking other people demonstrating the same behavior as a role model. From this point of view, it is possible to say that pre-service preschool teachers who have the opportunity to observe a course in which the inquiry-based science learning is used adopt this approach more easily. In addition, the use of this approach by mentor teachers in their classes where pre-service teachers carry out their internship is important (Landry, 2009; Onchwari & Keengwe, 2008). Observing how this approach

is applied in a real preschool classroom environment and what is taken into consideration during this application will increase the experience of pre-service preschool teachers in this subject.

The pre-service preschool teachers reflected an environment in which social interaction was not emphasized in the context of the science education course they took. Inquiry-based science teaching also requires an interaction between people. In the light of this, creating environments where various scientific process skills can be used and discussion of the learned information can be conducted in small groups is suggested (Echoff, 2017). In the current study, it is thought that social interaction was observed very little by the pre-service preschool teachers as they had not really experienced this teaching approach. Science is the product of a joint effort and progresses with the contribution of many people (Knorr-Cetina, 1999). Therefore, it is a fact that it is important to educate pre-service preschool teachers about working in cooperation and collaboration so that they can teach this to their students in the future. In addition, it is argued that rather than assigning specific tasks to each group member so that each group member only deals with his/her own task, group members' doing everything together will be more effective (Chiriac, 2014). In this way, it is believed that the group's self-confidence will increase and more successful results will be achieved (Atasoy & Çakıroğlu, 2018). Science teaching classes integrated with such group work is thought to affect the structure of the science activities to be implemented by pre-service preschool teachers.

One of the important findings of the current study is that drawings were produced by the pre-service preschool teachers including the indicators of their interest in and enthusiasm about the science education course and also positive feelings towards it. On the other hand, it was observed that while explaining their drawings, besides positive feelings, they also expressed a considerable number of negative ones. Thus, it is difficult to conclude that pre-service preschool teachers developed positive attitudes towards science. The quality of science education is affected by teachers' attitudes towards science (Cobem & Loving, 2002). Hence, in addition to increasing pre-service teachers' science content and pedagogical content knowledge, their attitudes towards science should be developed (Pendergast et al., 2017). At this point, it should be noted that teacher educators and mentor teachers' positive attitudes reinforced with interest and enthusiasm during science teaching can affect pre-service preschool teachers.

As a conclusion, in the current study, pre-service preschool teachers tried to explain themselves through drawings within the context of a science education course. The obtained data have revealed that the science education course has a limited contribution to their cognitive, affective and social development and implementations in classroom. It was also discovered that the pre-service teachers experience difficulties in understanding scientific concepts and are instructed through a teacher-centered approach. In addition, it was also concluded that the science education course is not effective in terms of developing positive attitudes towards science and does not emphasize social interaction- something that is important for science applications. In the light of these findings, revision of preschool teacher education program is of particular importance. Furthermore, implementation of effective science instruction by teacher educators and mentor teachers in their classrooms can make positive contributions to the development of pre-service preschool teachers. Finally, in order to obtain more profound and detailed information, the drawing technique used in the current study can be supported with other data collection tools such as classroom observations and interviews. Considering the findings of the current study, it is clear that further research to investigate the science education course effectively integrated with the four dimensions would make important contributions to the literature.This section may include the discussion of your findings, and conclusions with comparison to the literature, implications, and recommendations. In addition, there are three sub-sections every manuscript must include:

Statements of publication ethics

Ethical issues were taken into consideration in the study. Participants took part in the study voluntarily. In addition, it was paid attention that there was no physical or psychological harm for the participants. They also were assured that the research data would be kept in confidence.

Researchers' contribution rate

This study was done with equal collaboration of the researchers. Therefore, they participated in every part of the research such as data collection, data analysis and writing this document.

Conflict of interest

There is no conflict of interest in the study.

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Investigation of Technological Leadership of the School Administrators in Turkey: A Meta-Analysis Study

Özlem Akın Mart [a*], Öznur Tulunay Ateş [b]

a* Teacher, Ministry of National Education, (https://orcid.org/0000-0002-1597-1200) *, oakin2409@gmail.com

b* Assoc. Prof. Dr., Burdur Mehmet Akif Ersoy University, Faculty of Education, (https://orcid.org/0000-0003-1784-7227)

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Abstract

The purpose of this research is to analyze the findings related to the technological leadership of school administrators in Turkey associated with factors derived from research via the meta-analysis method. As a result of the literature review, it was determined that the variables examined in relation with the technological leadership of school administrators varied and the data on the technological leadership of school administrators were collected from two different groups as administrators or teachers. 24 studies were reached in the study, but it was seen in some studies that both the opinions of managers and teachers were taken together. Since these were taken into consideration separately, a total of 38 studies were analyzed in this study. As a result of the analysis, it is concluded that there is a positive, moderate and significant effect between technological leadership and factors such as gender and sample size related to teachers and administrators. In studies conducted on the technological leadership of school administrators, it has been determined that the impact coefficient of the studies conducted with teachers is higher than the impact coefficient of the research conducted with administrators. Moreover, the effect size of the factors related to the research group (teacher-manager) affecting the technological leadership of school administrators did not differ statistically according to the publication year and publication mode; it has also been observed that it differs statistically significantly according to the region variable.

Keywords: Technological leadership, meta-analysis, school administrator

Türkiye'de Okul Yöneticilerinin Teknolojik Liderliklerinin İncelenmesi: Bir Meta Analiz Çalışması

Öz

Bu araştırmanın amacı, Türkiye'de okul yöneticilerinin teknolojik liderlikleri ile ilişkili etkenler konusunda yapılan araştırmalardan elde edilen bulguların meta-analiz yöntemiyle analiz edilmesidir. Alan yazın taraması sonucunda, okul yöneticilerinin teknolojik liderlikleri ile ilişkisi incelenen değişkenlerin çeşitlilik gösterdiği ve okul yöneticilerinin teknolojik liderliklerine ilişkin verilerin yönetici ya da öğretmen olarak iki ayrı gruptan toplandığı saptanmıştır. 24 çalışmaya ulaşılan araştırmada, yönetici ve öğretmenler görüşlerini alan çalışmaların yer alması nedeniyle toplamda 38 çalışma meta-analize dâhil edilmiştir. Araştırmanın sonucunda, teknolojik liderlik ile öğretmen ve yöneticilerle ilgili faktörler arasında, pozitif yönlü, orta ve anlamlı düzeyde bir etki olduğu sonucuna ulaşılmıştır. Okul yöneticilerinin teknolojik liderlikleri konusunda yapılan araştırmalarda öğretmenlerle yapılan çalışmaların etki katsayısının, yöneticilerle yapılan araştırmaların etki katsayısından yüksek olduğu tespit edilmiştir. Ayrıca araştırma grubu (öğretmen-yönetici) ile ilgili faktörlerin okul yöneticilerinin teknolojik liderliğini etkileme düzeyleri ile ilgili hesaplanan etki büyüklüğünün yayın yılı ve yayın türü moderatör değişkenlerine göre istatistiksel olarak farklılaşmadığı; bölge değişkenine göre ise istatistiksel olarak anlamlı düzeyde farklılaştığı görülmüştür.

Anahtar kelimeler: Teknolojik liderlik, meta-analiz, okul yöneticisi

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1 | INTRODUCTION

Technology, which affects many fields such as education, culture, health, science and art, is an integral part of today's world. It is a known fact that education, one of the areas affected by technology, affects the society. Therefore, technology is widely used today, technology is also included in education. Alkan (2005) explained the relationship between education and technology as follows:

> Education and technology are two basic elements in making human life more effective. Both are the two basic tools that people use to dominate their natural and social environment. Education has served to uncover the innate latent powers and abilities brought by man, his development and growth as a stronger, more mature, creative and constructive entity. Technology, on the other hand, helped people to benefit from the knowledge and skills gained through education more efficiently and to apply them more systematically and consciously. Thus, education and technology have been influential in the cultivation and development of human beings, dominating nature and its environment (p. 11).

Today, technology is frequently used in educational institutions because there is a generation that is considered as Z generation in schools and this generation grows with technology. Therefore, it is important to combine educational institutions with technology (Arslan, 2016). The integration of technology and the training personnel should be trained in this direction in order to enter and use technology to educational institutions that prepare individuals for society (Küplü, 2012). Teachers are at the top of these staff. School administrators are the ones who will ensure the technological development and training of teachers. Two important roles of school administrators in the education and training system are the “leadership” and “management” roles. While their roles should be fulfilled because of their position in the school; leadership roles are important for successful management to meet the requirements of the age. Due to the requirements of the age; technology leadership in addition to the managerial roles of school administrators (Anderson & Dexter, 2005, 2003a; Chang, 2003b; Ford, 2000; Hsieh, 2004; Irmak, 2015; Matthews, 2002; Ölez & Kılıçoğlu, 2018; Scott, 2005; Seay, 2004; Yeh, 2003) should be adopted by the school administrators.

The technology leadership role that adopts the widespread use of technology in schools has been an important step in the information and technology age (Teke, 2019). Because school administrators who are far from technological developments will cause their schools to be insensitive to keeping up with the changes (Baş, 2012). Technology leader is “the person who establishes, manages, prepares the necessary environment and prepares all kinds of educational infrastructure suitable for the innovations and developments brought by the age by educating and motivating those who will benefit” (Ulukaya, 2015, p. 10). Technological leaders are the indispensable necessity of the age, making the necessary guidance in using technology effectively and at the highest level of efficiency, influencing, and directing the organization in this regard (Tanzer, 2004); development-oriented and able to create systematic development activities in the organization with new ways, methods, plans and programs (Can, 2008); it is expressed as individuals who possess technology skills, pioneer in following and implementing developments, affect teachers, students and other people, enable the use of technology and combine technology with other fields (Gökoğlu & Çakıroğlu, 2014). Chang (2012) defines technology leader as the person who applies, manages, guides and develops technology in the organization's business and operations (field of activity) to improve organizational performance. As a result, technological leadership can be defined as the person who co-directs the necessary and effective use of technology influences, directs and manages the organization (Akbaba-Altun, 2008).

With the frequent use of technological leadership in recent years, various studies have been carried out to identify and standardize school administrators' competencies in technology leadership. One of the most comprehensive standardization studies among these is “National Educational Technology Standards for Administrators (NETS-A, National Educational Technology Standards for Administrators) prepared by ISTE. In NETS-A (ISTE, 2002), it handled the technological leadership standards in 6 dimensions, but in

2009 these standards were handled in 5 sub-dimensions by ISTE (Hacıfazlıoğlu et al., 2010, p.543-544). These dimensions can be listed as follows (Görgülü et al., 2013, p, 58):

1. Visionary Leadership: Education managers create a common vision for the combination of perfection and transformation for the integration of technology in the whole institution and support and implement the vision.

2. Digital Age Learning Culture: Education managers create and maintain a digital age learning culture that provides detailed, appropriate and interesting education to all students.

3. Perfection in Professional Practice: Training managers strengthen educators and support environments focused on professional learning and innovation to enable students to learn by combining modern technology and digital resources.

4. Systematic Development: Education managers provide digital age leadership and management for the development of the organization by using information and technology effectively.

5. Digital Citizenship: Education managers design and develop an understanding of social, ethical, legal issues and responsibilities that support the development of digital culture (Akbaba-Altun, 2008).

In the literature, the relationship between technological leadership of school administrators conducted in Turkey investigated the following issues; perceived ease of use and perceived benefit between technology leadership self-efficacy perceptions and their acceptance towards technology (Bülbül & Çuhadar, 2012), use of information technologies in management processes (Cantürk, 2016), internet and computer usage time and learning organizational culture (Banoğlu et al., 2016), positive attitudes of teachers towards the use of educational technologies (Celep-Tülübaş, 2014), school culture, support services and technology integration (Gürfidan & Koç, 2016), open leadership and digital citizenship (Akcil et al., 2016), year of service in management (Aktaş, 2016), personality traits (Çalık et al., 2018), information technologies self-efficacy perceptions (Doğan, 2018), seniority and teaching seniority (Bostancı, 2010), technological pedagogical knowledge levels (Demirsoy, 2016), lifelong learning competences (Gürkan, 2017), levels of performing knowledge management (Durnalı, 2018), computer anxiety levels (Uysal-Balaban, 2012), school climate (Baş, 2012; Erdoğdu & Umurkan, 2014), teacher-student interaction in social media (Karabağ-Köse et al., 2017), technology integration in primary education classes (Samancıoğlu et al., 2015), positive and negative attitudes of teachers (Hayytov, 2013), professional seniority of teachers (Irmak, 2015), executive effectiveness (Gerçek, 2016), the level of performing education and training works (Ulukaya, 2015). Although several studies have been conducted, the number of studies examining similar variables was not sufficient for analysis. Although there are various studies on this subject, no meta-analysis study has been found. For this reason, it can be said that there is a need for a new study in which a general evaluation of the researches is made. In addition, it was determined that data on the technological leadership of school administrators were collected from two separate groups, either administrators or teachers. For this reason, it was aimed to reveal the differences between the research conducted with teachers and administrators regarding the technological leadership of school administrators. Thus, it was aimed to reveal the situation more objectively with comparative analysis and to shed light on new research examining the technological leadership of school administrators.

2 | Method

In this study, meta-analysis method was used to determine the factors that affect the technological leadership of school administrators. Meta-analysis is the analysis of analyzes; quantitatively analyzing different studies and identifying deficiencies in existing research, suggesting new emphases for future studies in this way (Cohen et al., 2005). In another definition, meta-analysis is defined as “one of the most obvious ways to quantitatively synthesize research findings” (Chamber, 2004, p.35). Cook et al. (1992, p.

7-12) mentioned 5 steps of meta-analysis; formulating the problems, gathering the data, evaluating, analyzing and interpreting the collected data, and finally presentation. The first two steps followed are explained in detail in the data collection, the third and the fourth steps are explained in the data analysis section and the fifth step is explained in the discussion and conclusion section. In the first step, it was decided that the subject of technological leadership of school administrators should be composed of two parts as studies with teachers and administrators. Secondly, the studies examining factors related to technological leadership are investigated. Thirdly, analysis was made using percentage and frequency values according to the type of study, year of study, school type variables. Then meta-analysis was carried out with 24 studies reached. 24 studies were reached in the form of 12 master's theses, 2 doctoral theses, 10 articles. However, 14 studies were also used since opinions of both teachers and administrators were taken, totally 38 studies were analyzed with the help of meta-analysis method. Then the descriptive features and the evaluation of the studies are given in this study.

Data collection

In the research, studies examining the relationship between school administrators and technological leadership and various variables were included. In determining the data to be included in this research; YÖK thesis database, Google academic, Scopus, ULAKBİM and EBSCOhost, ERIC databases have been used. These databases have been selected in order to reach more publications, and are limited to the databases offered by the university. Scanning through these databases was performed on October 2, 2019 and then scanned twice, on October 25, 2019. In the scans, the keywords "technological leadership", "technology leadership" and "technological leaders" were used in Turkish and English. While choosing the keywords, expressions in accordance with the research purpose and the prevalence of use in publications were taken into consideration.

In the research, the studies that will be included in the meta-analysis during the screening process are written on the coding form created. Some choosing criteria should be used in determining the studies to be written on the coding form. In this study, selection criteria were determined as follows: 1) Articles published in refereed journals at national and international level between 2008 and 2019. 2) Master's theses and doctoral dissertations published at the national level between 2008 and 2019. 3) The studies on the technological leadership of school administrators and / or teachers in Turkey who works in official or private pre-school, elementary, middle and high school level were investigated. 4) Studies examining factors related to technological leadership. 5) Giving the sample number (n) and correlation values (r) of the variables examined in the study. Articles produced from the thesis that meet the selection criteria and contain the same information as the thesis are excluded from the evaluation. In addition, the papers presented at the symposiums and congresses were also excluded. Because it is thought that some of these publications have been translated into articles and the papers that are difficult to reach. As a result of the investigations, it was determined that in 24 of the studies, the relationship between technological leadership and various variables was examined and the total sample size was 9867.

Validity and Reliability

The internal validity of the meta-analysis varies greatly depending on the internal validity of the studies included in the analysis, and the external validity of the studies reached (DeCoster, 2004, as cited in Sarıer, 2016). Therefore, the validity and reliability of the studies included in the analysis to ensure internal validity were also examined and it was seen that all these studies were conducted. In order to ensure external validity, all of the determined researches were tried to be reached, and e-mails were sent to the authors to reach the 4 theses, but no feedback was received from any of them. In order to ensure the reliability of coding in meta-analysis, at least two encoders of the studies to be analyzed must be performed separately (Cooper, 2015). The only way to get better results is to increase the number of studies. For these reasons, more than 30 studies have been reached in the research, all research stages have been carried out, and the scanning and coding of the publications have been tried to contribute to reliability by two researchers

conducting this research separately. For the reliability of the data, the formula [Consensus / (Consensus + Disagreement)] x 100, which was proposed by Miles and Huberman (1994), was used. In conclusion, 92% agreement was determined among the researchers in the studies reached.

Data Analysis

Before the analysis is conducted, descriptive analysis of the studies that met the selection criteria was made. In this context, analysis was pursued using percentage and frequency values according to the type of study, year of study, school type variables. Secondly, meta-analysis was carried out with 24 studies reached.

In meta-analysis studies, there are two main approaches with various arguments. These approaches are fixed-effect and random-effect that make inferences about the average effect size obtained from a group of studies (Borenstein et al., 2009; Hedges & Vevea, 1998). There are aspects that distinguish the fixed effects model and the random effects model. In the fixed effects model, the studies included in the meta-analysis are assumed to share the true effect size (Borenstein et al., 2009). In other words, the assumption in the fixed effect model is "there is only one real effect size for all studies in meta-analysis"; the assumption in the random effects model is that the effect size can vary with various variables (Üstün & Eryılmaz, 2014, p. 13). In Q statistics, which is another method used in the selection of fixed or random effects model, the hypothesis is tested in terms of whether all studies share the general effect or not. (Ulubey & Toraman, 2015). If the significance value of the analysis result (p) is below the critical value, all studies share the overall effect and, in this case, it can be said that there is heterogeneity between the studies (Borenstein et al., 2009; Hedges & Olkin, 1985). I2 (= 97.958) statistics was found as provide information about the heterogeneity ratio. Publication bias in the study is examined with funnel plot, and in the absence of publication bias, a symmetry is expected. According to Cooper et al. (2009), if there is a publication bias, it is stated that there is an asymmetrical image on the graph and one corner of the graph remains empty compared to the other. Moderator analysis, on the other hand, is an analysis method used to determine the direction of differences of subgroups and the average effect sizes of variables (moderators) (Littel et al., 2008). The difference between the moderator variables is tested with the help of Q statistics method (Hedges & Olkin, 1985). The moderators cause interactions with the variables examined (Shadish & Sweeney, 1991, p. 883).

Rosenthal's Fail-Safe N, Orwin's Fail Safe N, Begg and Mazumdar rank correlation, Egger regression cutting, Duval and Tweedie's clipping and filling analyzes were performed and funnel scatter plots were examined in determining publication bias in the research. Moderator analyzes were made with the publication year of the research, the region where the research was conducted, and the type of publication.

In this study, the analyzes were carried out with the Comprehensive Meta-Analysis program (CMA). During the analysis, graphs and statistics related to general effect, heterogeneity, publication bias, and moderator variables were examined. While evaluating the research, p, Q, I2 values were examined. In evaluating the results, Q value and 0.05 p significance level were chosen. In interpretations in the study, I2 value was evaluated as low when 25%, moderate when 50%, and high level of heterogeneity when 75% (Cooper, Hedges, & Valentine, 2009).

In this research, the correlations between technological leadership and independent variables were calculated by converting the effect sizes calculated using "r" and sample numbers (N) to Fisher's Z value. While evaluating the findings of the analysis, they were interpreted by converting them into a correlation coefficient. No additional transformations are required in software (Dinçer, 2014, p. 118). Therefore, the following information was used in the evaluation of the analysis findings.

The interpretation of the correlation levels is as follows (Cohen et al. (2007, p. 521):

Correlation between ± 0.00 - ± 0.10: Very low correlation (week)

Correlation between ± 0.10 - ± 0.30: low level correlation (modest)

Correlation between ± 0.30 and ± 0.50: Moderate correlation

Correlation between ± 0.50 - ± 0.80: Strong correlation (strong)

Correlation Above ± 0.80: Very strong correlation (very strong)

RESEARCH ETHICS

Since the study is a meta-analysis study, it is not necessary to obtain the permissions from the ethics committee.

3 | FINDINGS

Descriptive features of the studies on the effect of gender on technological leadership on school administrators are presented in Table 1.

Table 1. Descriptive Statistics of Studies on Technological Leadership

		Frequency (f)	Percentage (%)
Type of the study	Article	10	17%
	Master thesis	12	50%
	Doctoral dissertation	2	8%
Year of the study	2010	1	4%
	2012	3	13%
	2013	1	4%
	2014	3	13%
	2015	3	13%
	2016	6	25%
	2017	3	13%
	2018	2	8%
	2019	2	8%
School level	Primary	1	4%
	Secondary	3	13%
	Primary + Secondary	4	17%
	High School	4	17%
	All	12	50%
Type of the school	Public	22	92%
	Private	1	4%
	Public + Private	1	4%

In Table 1, it is seen that between 2008 and 2019, 24 studies in the form of 12 master's theses, 2 doctoral dissertation and 10 articles are reached on the technological leadership of school administrators related factors. Since the opinions of both administrators and teachers were received in 14 studies, the data set included in the analysis consisted of 38 studies. When the publication type of the studies is examined, it is seen that the number of master thesis and article types is applied more but the number of master thesis studies is high, and these studies are mostly performed in 2016. When the types of schools in which the studies are carried out are examined, it is seen that studies in both public and private schools are mostly conducted in public schools.

Meta-analysis findings regarding the factors related to teachers and administrators affecting the technological leadership of school administrators

The first aim of the research is to determine the effect of variables originating from teachers and administrators on the technological leadership of school administrators. For this purpose, first of all, the publication bias of the studies included in the meta-analysis through graphs and statistics were examined. The funnel scatter graphic obtained is given in Figure 1.

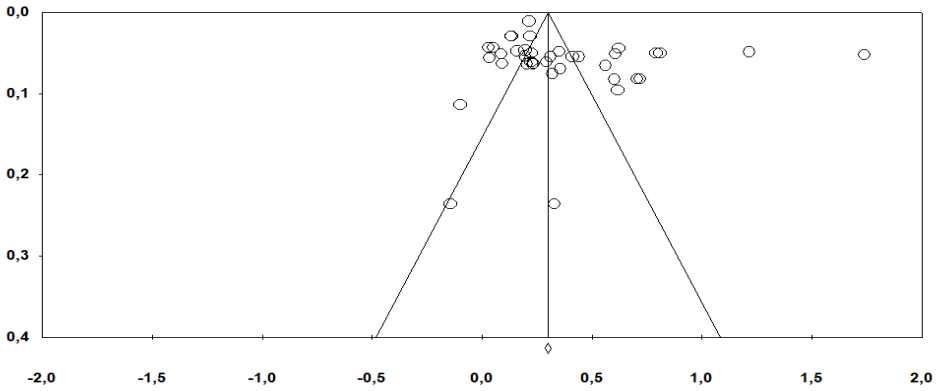

Figure 1. *Publication Bias Funnel Plot*

When the funnel graph in Figure 1 is analyzed, it is seen that the overall funnel graph shows a symmetrical distribution on both sides of the line, and some of the studies are outside the funnel graph. For these reasons, it can be said that the sample numbers of the studies are generally high. Due to the studies outside the funnel graph, the bias of the publication has continued to be examined to ensure the reliability of the study. The data obtained as a result of the analyzes are given in Table 2.

Table 2. Reliability Tests Showing the Bias of the Studies Included in the Meta-Analysis

Confidence Tests	Name of Data	Confidence Test Data
Rosenthal's Fail-Safe N	Z value for Reviewed Studies	43.855
	P value for Reviewed Studies	0.000
	Alpha	0.050
	Direction	2.000
	Z value for alpha	1.960
	Number of the studies reviewed	38
	Safe N (FSN)	8988
Begg and Mazmundar Rank Correlations	Tau	0.206
	Z value for Tau	1.823
	P value (1 tailed)	0.034
	P value (2 tailed)	0.078
Linear Regression of Egger Standard	Standard Error	1.959
	95% lower limit (2 tailed)	-0.364
	95% upper limit (2 tailed)	7.581
	t value	1.842
	df	36
	p value (1 tailed)	0.037
	p value (2 tailed)	0.074

Based on the findings in Table 2, the following comments can be made. Rosenthal's Safe N Test results show that the meta-analysis performed is statistically significant (p = 0.000). In order for the meta-analysis

to lose its significance, that is to be p> 0.05, 8988 studies with an effect size of zero are required. This finding was supported by another calculation. Mullen et al. (2001, 1454) the results obtained in the meta-analysis continue to be permanent even though new researches are done in the future. He stated that the value to be obtained with the formula N / (5k + 10) can be determined by being greater than 1. In the calculation made in this direction, [16614 / (38 * 5 + 10) = 83.07] has been found to be greater than 1. Continuing to examine the data in the table, it is seen that Kendall's Tau coefficient in the Begg and Mazumdar Rank Correlations analysis is not statistically significant (0.206 and p = 0.078). This is another sign that there is no publication bias. In addition, by looking at the results of Egger's Linear Regression method (p = 0.074> 0.05), it can be expressed with 95% confidence that there is no publication bias.

After determining that there was no publication bias in the study, heterogeneity examination was started. The funnel graph obtained for this purpose is given in Figure 2.

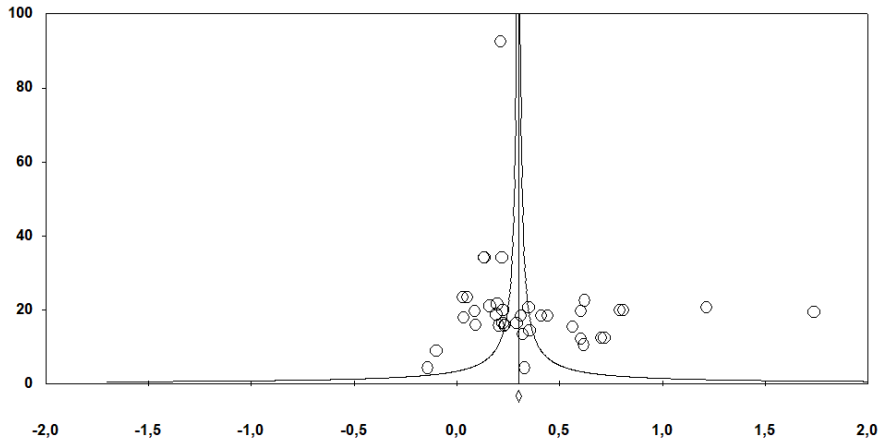

Figure 2. *Heterogeneity Funnel Plot*

When the graphic in Figure 2 is examined, it is seen that some studies are not included in the slope lines. This situation can be interpreted as the research may be heterogeneous. For this reason, heterogeneity analysis was made and the result of the analysis supported this finding. All the values obtained as a result of the heterogeneity test (Q = 1811,605, p <0.05, I^2 = 97.958) showed that the distribution of the effect sizes of the studies within the scope of the study is heterogeneous. Therefore, it was decided that the use of random effects model is more appropriate in the interpretation of the effect sizes. In the analysis, the studies included in the meta-analysis are given according to the first author surname and the year of publication. Findings regarding variables related to teachers and administrators affecting the technological leadership of school administrators are given in Figure 3, Table 2 and Table 3. While making the groups in Table 3, studies with administrators were coded as “Y”, those with teachers as “O”, and research with both groups as “OY”.

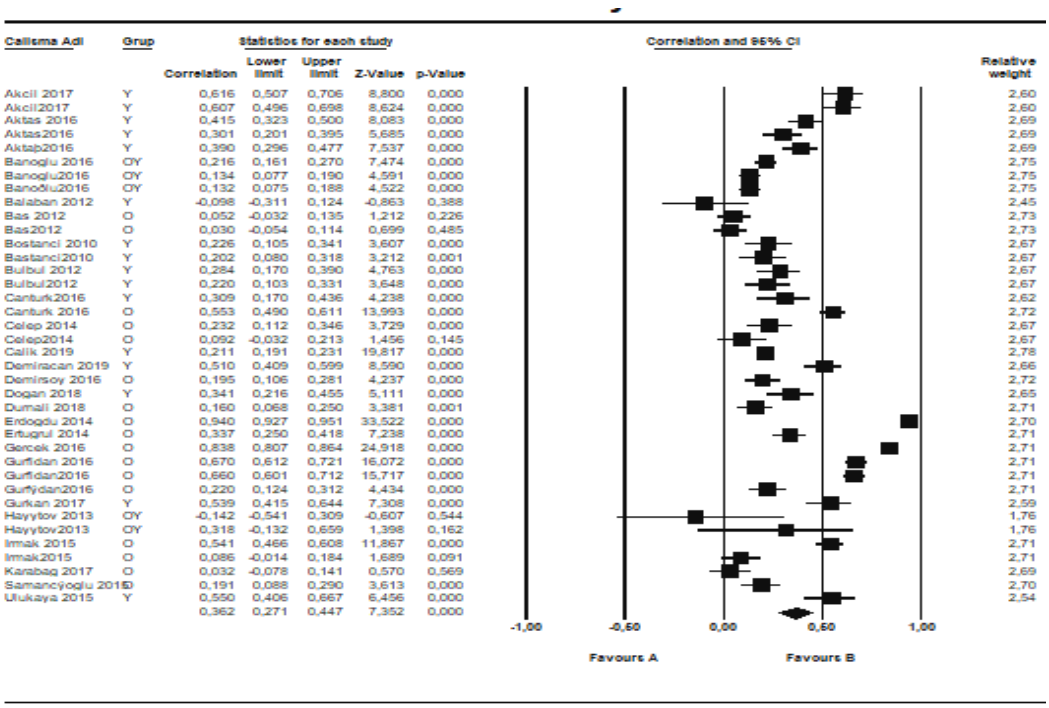

Figure 3. *Correlation Based Forest Graph of the Variables Regarding Teachers and Administrators Affecting the Technological Leadership of School Administrators*

Figure 3 shows the correlation distribution of 38 studies based on the relationship between the school administrators' technological leadership and the research group (teacher-administrators) related variables. When the distribution is examined, it is seen that the weights of the studies (between 1.76-2.78) are close to each other. In addition, it is understood that 2 studies are very strong, 9 studies show strong correlation, only two studies show negative correlation, others show positive correlation, and correlation values vary between -0,142 and 0,940. For these studies, the correlation value calculated according to the random effects model was 0.362, and the Fisher's Z effect size was 0.379. These data indicate that there is a positive, moderate and significant (p <.05) effect between the technological leadership and the variables related to the research group (teacher-manager).

Table 3. Meta-Analysis of Technological Leadership of School Administrators

				95% Confidence Interval		Heterogeneity Test		
Basic Factor	f	df	Average Effect Size	Lower limit	Upper limit	QB	X2	P
Teachers	17	16	0.438	0.213	0.662	1427.569	26.296	0.00
Managers	16	15	0.381	0.293	0.468	165.285	24.996	0.00
General	38	37	0.379	0.278	0.480	1811.605	55.758	0.00

When the data in Table 3 are examined, it is seen that the average effect size of the variables examined in the technological leadership of school administrators with 37 degrees of freedom in 38 studies is 0.3379 (confidence interval lower limit: 0.278, upper limit: 0.480). In addition, it was calculated that the impact of the factors perceived by teachers (ES: 0.438) on the technological leadership of school administrators was higher than the factors perceived by administrators (ES: 0.381). It was understood that the analyzed studies were heterogeneous (p <0.05) since it was seen that the heterogeneity value between the groups calculated as 1811,605 according to the random effects model was higher than the chi-square table value (55.578).

Secondly, the data collected from teachers and administrators were analyzed according to the level of influence of school administrators on the technological leadership, the publication year determined as the moderator variable, the type of publication, and the region variables. In the analyzes pursued, the studies that do not specify the region and cover all of them and the studies with single data in each class were excluded due to the need for at least two studies (Dinçer, 2014; Kalkan, 2020).

Table 4. Moderator Analysis Results of Factors Affecting Technological Leadership of School Administrators

				95% Confidence Interval		Heterogeneity Test		
Main Factor	f	df	Average Effect Size	Lower Limit	Upper Limit	QB	X2	P
2010	2	1	0.214	0.128	0.297			
2012	5	4	0.111	-0.005	0.223			
2013	2	1	0.093	-0.354	0.505			
2014	4	3	0.540	-0.170	0,881	15.347	15.507	0.053
2015	4	3	0.355	0.097	0.568			
2016	13	12	0.420	0.267	0.553			
2017	4	3	0.471	0.139	0.708			
2018	2	1	0.247	0.062	0.415			
2019	2	1	0.365	0.041	0.619			
Doctoral	3	2	0.353	0,061	0,590			
Master	18	17	0.330	0.184	0.462	0.423	5.991	0.809
Article	17	16	0.394	0.253	0.519			
Mediterranean	6	5	0.582	0.363	0.740			
Aegean	5	4	0.288	0.113	0.446			
Central Anatolia	4	3	0.099	-0.015	0.211	18.021	9.488	0.001 *
Marmara	17	16	0.318	0.151	0.466			
Unspecified	3	2	0.489	0.157	0,722			

When Table 4 is analyzed, it was found that the effect size calculated by the various factors perceived by teachers and administrators regarding the level of influencing the technological leadership of school administrators did not differ statistically (p> .05) according to the publication year and type of moderator variables (p> .05), but statistically differentiated according to the region variable (p <.05). For this reason, it can be said that the region where the studies are carried out has changed the effect size of the school administrators regarding the technological leadership, and the publication year and publication type of the studies did not change the effect size of the school administrators regarding their technological leadership. In 2013, the lowest effect size value (0.093) for the year in which the studies were conducted; the highest (0.540) is seen to be calculated in 2014. The lowest impact size value (0.330) for study types is master's degree; the highest (0.394) was calculated in the article publication type. The lowest effect size value for the region where the studies are carried out (0.099) Central Anatolia; the highest (0.582) was obtained in the Mediterranean region.

4 | Discussion & Conclusion

In this study, it was aimed to study the findings obtained from the research conducted on factors associated technological leadership of school administrators in Turkey by using meta-analysis method. As

a result of the literature review, it was seen that the variables examined with the technological leadership of school administrators were in a wide range (technology use in education, school climate, information communication technology, executive effectiveness, lifelong learning, etc.), and the number of researches examining similar variables was not sufficient for analysis. However, it was determined that the data about the technological leadership of school administrators were collected from two different groups, namely the administrator or the teacher. Accordingly, it was aimed to reveal the differences between the research conducted with teachers and administrators regarding the technological leadership of school administrators. In the research, 24 studies were reached in the form of 12 master's theses, 2 doctoral theses, 10 articles. However, 14 studies were also used since opinions of both teachers and administrators were taken, they were taken into consideration separately. So, totally 38 studies were analyzed with the help of meta-analysis method. The sample numbers of the analyzed studies differed significantly from each other. It was determined that the sample consisted of a total of 9867 people; 4021 women and 5846 men. It was observed that the researches were mostly in the type of master thesis, and were carried out intensively in 2016, mostly in public schools and all types of schools.

It was found that some studies were carried out from the point of view the school administrators. The school administrators' self-efficacy perceptions of technology leadership, their acceptance towards information and communication technologies (Bülbül & Çuhadar, 2012), their level of education and training (Ulukaya, 2017), their attitudes towards the use of technology in education (Aktaş, 2016), their use in management processes (Cantürk, 2016), their technology leadership strategies and innovation management competence beliefs (Demiraçan, 2019), information technologies self-efficacy perception (Doğan, 2018), lifelong learning competence with their technological leadership (Gürkan, 2017), technology leadership competence perceptions, teachers' positive and negative attitudes towards technology (Hayytov, 2013), the place of open and technology leadership in management practices in the education system (Akçil et al., 2017), the technology leadership profiles of the principals (Banoğlu et al. 20 16), the relationship between school administrators' technology leadership roles and computer anxiety levels (Uysal-Balaban, 2012) were analyzed. In addition to these studies, Bostancı (2010) examined the technological leadership of school administrators. In these studies, it is seen that there is a positive and moderate relationship with a positive effect level (Aktaş, 2016; Demiraçan, 2019; Gürkan, 2017; Ulukaya, 2017). As a result of the studies, it was reached that the school administrators' acceptance level for information and communication technologies is used in the academic process and administrative structure of technology. Moreover, it was found that integration will be provided in educational institutions with the increase in acceptance levels of technology leadership self-efficacy perceptions and technology use (Bülbül & Çuhadar, 2012; Cantürk, 2016); The development of these competencies of school administrators as a requirement of the rapid changes brought by the digital age (Gürkan, 2017) and the necessity for education managers and leaders to have digital citizenship and open leadership in order to be effective (Akçil et al., 2017). In the context of Fatih Project Schools and other schools, it was emphasized that technological leadership meetings, workshops, sharing experiences, giving importance to “digital citizenship” practices for principals, teachers to adopt “team learning” school culture more (Banoğlu et al., 2016).

When all the studies analyzed in the research were evaluated together, it was determined that the average effect size value of the variables examined in the technological leadership of school administrators was medium. In addition, in the studies conducted on the technological leadership of school administrators, it has been determined that the impact coefficient of the studies conducted with teachers is higher than the impact coefficient of the research conducted with administrators. In most studies, teachers' views about administrator's technological leaderships were taken, because it would be more objective for teachers to evaluate managers rather than school administratos' own perspectives. Similarly, Hayytov (2013) stated that it may be an exaggeration to assume that managers' perceptions of their "technology leadership competence levels" are realistic. In his own study, he attributed the reason for the perception of competence of private school administrators to be lower than that of official school administrators. Even

if the managers see themselves as sufficient about their leadership, it can be said that the teachers whose leader is the audience are not affected by the leadership behavior of their managers.

The level of data collected from teachers and administrators to affect the technological leadership of school administrators were analyzed according to the publication year, publication type and region variables, which were determined as moderator variables. While the effect size calculated by the various factors perceived by teachers and administrators on the level of school administrators to influence their technological leadership does not differ according to the publication year and publication type variables, it is concluded that it differs according to the region variable. Consequently, it can be said that the region where the studies are conducted, the various factors perceived by teachers and administrators change the effect size of the school administrators regarding their technological leadership. It is concluded that the value of the lowest effect size for the year in which the studies were carried out is 2013, the highest one was in 2014, lowest degree of impact size is in master's study types, the highest one is in article publication, Central Anatolia has the lowest effect size for the region where the studies are conducted, highest effect size is in Mediterranean region.

As a result of the research findings, it can be suggested that the studies to be carried out regarding technological leadership should be carried out by applying different methods and techniques, and the causes of regional differences should be investigated in different studies. In addition, it can be suggested that studies on the development of technological leadership be carried out in other regions and schools, and in addition to the variables in these studies, it is recommended to enrich the literature with the studies dealing with the variables related to technological leadership, and the level of relationship between these variables and technological leadership.

Statements of publication ethics

Since this research was carried out with the method of meta-analysis, no ethics committee approval was required.

Researchers' contribution rate

First author collected data and contributed to manuscript revisions. Second author contributed with data analysis and reported the results. All authors read and approved the final manuscript.

Conflict of interest

The authors of this article declare that there is not conflict of interest.

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Perceived Organizational Barriers of Female Education Administrators About Their Career Progression in Turkish Republic of Northern Cyprus

Gülyüz Debeş[a*], Ali Tatar[b], & Mehmet Abacılar[c]

a* Asst. Prof. Dr., University of Mediterranean Karpsia, Nothern Cyprus, (https://orcid.org/0000-0001-7894-8174) *gulyuzd5@gmail.com
b* Asst. Prof. Dr., University of Mediterranean Karpsia, Nothern Cyprus, (https://orcid.org/0000-0002-6695-1437)
c* Asst. Prof. Dr., University of Mediterranean Karpsia, Nothern Cyprus, (https://orcid.org/0000-0002-7267-0797)

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Abstract

This study investigates the perceived organizational barriers on women career progression in the Turkish Republic of Northern Cyprus (TRNC). A descriptive survey was carried out to examine the barriers that females face in educational organizations when trying to empower their careers. The sample of the study was composed of 21 women who were selected randomly. The data were collected using quantitative research methodology. Descriptive statistics and analysis of variance were used to explain the results. The results revealed that the female education administrator's career advancement was not affected by biological make up of female in family life % 57.14 (N=12) and female education administrators perceived their career progression to be not affected by male dominated hierarchies in the workplace %71.43 (N=15). In addition, the biological make up of women was not a block from any promotions when they moved up to senior positions in the workplace %76.19 (N= 16). However, the results revealed that female education administrators faced career barriers during their career advancement % 76.19 (N=16). The results revealed that female education administrators overcame challenges in their career progression while they persisted in gender equality, empathy, patience, responsible decision making, collaboration and corporation with men and seeking legal right in the workplace. In addition, the participants stated that there was no prejudice about female biological make up against female career progressions in the educational organizational settings of TRNC %66.67 (N=14). However, female education administrators are in need of organizational support in the same context. They should confront the challenge and responsibility of identifying work-life balance requirements, which should provide equal opportunities with male education administrators.

Keywords: Gender equality, career barriers, female, education administrator

Kuzey Kıbrıs Türk Cumhuriyeti'nde Kadın Eğitim Yöneticilerinin Kariyer İlerlemeleri Konusunda Örgütsel Engel Algıları

Öz

Yapılan araştırmanın amacı, Kuzey Kıbrıs Türk Cumhuriyeti (KKTC) eğitim kurumlarında görev yapmakta olan kadın yöneticilerin toplumsal cinsiyet eşitliğine göre kadın rollerinin kariyerlerini etkileyip etkilemediğine ilişkin görüşlerinin belirlenmesi ve olası kariyer engelleri ile baş edebilme stratejilerine ilişkin algılarının incelenmesini amaçlamaktadır. Nitel araştırma deseni kullanılan bu çalışmada katılımcılar ile yarı yapılandırılmış odak grup görüşmesi yapılmıştır. Bu çalışmada seçilen örneklem rastgele örnekleme modeli ile seçilmiştir. Çalışma kapsamında, Lefkoşa ilçe sınırı içerisindeki toplam 21 kadın eğitimci ile görüşülmüştür. Bu çalışmada, katılımcıların % 57.14 'ü (N=12) aile içindeki kadın rolünün kariyerini etkilemediğini belirtmiştir. Bununla birlikte, katılımcılar kariyer gelişimlerinin makam sıralaması üzerindeki erkek egemen yapılanmanın kariyer gelişimi üzerinde bir etkisi olmadığını %71.43 (N=15) ve üst makamlara atanmalarında bir engel teşkil etmediğini %76.19 (N= 16) belirtmişleridir. Buna karşın, katılımcılar, kariyer gelişimleri sürecinde karşılaştıkları kariyer engelleri ile cinsiyet eşitliği yaklaşımı, empati, sabır, akılcı kararlar, karşı cinsleri ile birlik ve beraberlik, haklarının farkında tavır ile baş edebilmişlerdir. Sonuç olarak katılımcılar, genel olarak kadın rolüne karşı bir ön yargı olduğundan fakat Kuzey Kıbrıs Türk Cumhuriyetinde kadına karşı bir ön yargı olmadığını belirtmişlerdir %66.67 (N=14).

Anahtar kelimeler: Birinci kelime, ikinci kelime, üçüncü kelime.

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1 | INTRODUCTION

Over the twenty years, gender equality has started to become part of mainstream non-government organizations and academia therefore many researchers into gender equality continue to draw from the knowledge of career barriers of female and in the processes of its power within the organization level. Due to the strong presence of gender equality, it has been given attention at research level. General hypothesis about gender equality has been quoted that female face multiple barriers and gender-based discrimination in the work-life balance.

However, in the manifesto of United Nations (UN) women and men must share equal rights, responsibilities, and opportunities across all development areas (UN, 2019). In doing so, the structural causes of gender equality are crucial to accelerate the 2030 Agenda for Sustainable Development Goals (SDGs). The Goal of SDG 5 (five) aims to build on these achievements to ensure that there is an end to discrimination and inequality against women and girls everywhere. It builds on the important work of eight distinct parts of UN system, which focused exclusively on gender equality and women's empowerment (See table 1).

Table 1. Sustainable Development Goals of Gender Equality

5.1 End all forms of discrimination against all women and girls everywhere
5.2 Eliminate all forms of violence against all women and girls in the public and private spheres, including tracking and sexual and other types of exploitation
5.3 Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation
5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate
5.5 Ensure women's full and e active participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life
5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programmed of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences
5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, services, inheritance and natural resources, in accordance with national laws

Source: UNDP, 2030 Sustainable Development Goals

The United Nations has made significant progress in advancing gender equality, through landmark agreements such as the Beijing Declaration and Platform for Action and the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW). Over many decades, the United Nations (UN) has focused a universal roadmap to address the gender equality, including by legal, social, and economic barriers to women's empowerment. Ending all forms of gender inequality against women and girls is not only a basic human right, but it also has a multiple effect across all other development areas such as education, economic decision-making and political power, and women's economic independence and equal earning potential against to men. It is not only education that the remaining gender gap in employment but also gender inequalities are socially constructed.

We have already known that women empowerment has been always limited by the barriers that usually involving the gender gaps however work is the best way to empower women economically and socially. Women are faced challenges to participate in labor market less likely than men as well as their access to quality employment opportunities which remains restricts towards to labor force participation rate by gender gap.

According to International Labor Organization (ILO), the reality of the situation is in stark contrast to women's and men's wishes regarding women's employment. In 2018, only 45.3 per cent of women had a job, resulting in a gap of almost 25 percentage points between the desired and the actual employment rate for women (See Figure 1).

Figure 1. Preference of women to work at paid jobs and employment-to population ratio

In 2018, 1.3 billion women were in employment compared to 2.0 billion men, which means that there were still over 700 million fewer women in employment than men. In other words, women were still 26.0 percentage points less likely to be employed than men. Over the past 27 years, the gender employment gap has shrunk by less than 2 percentage points (See figures 2a and 2b).

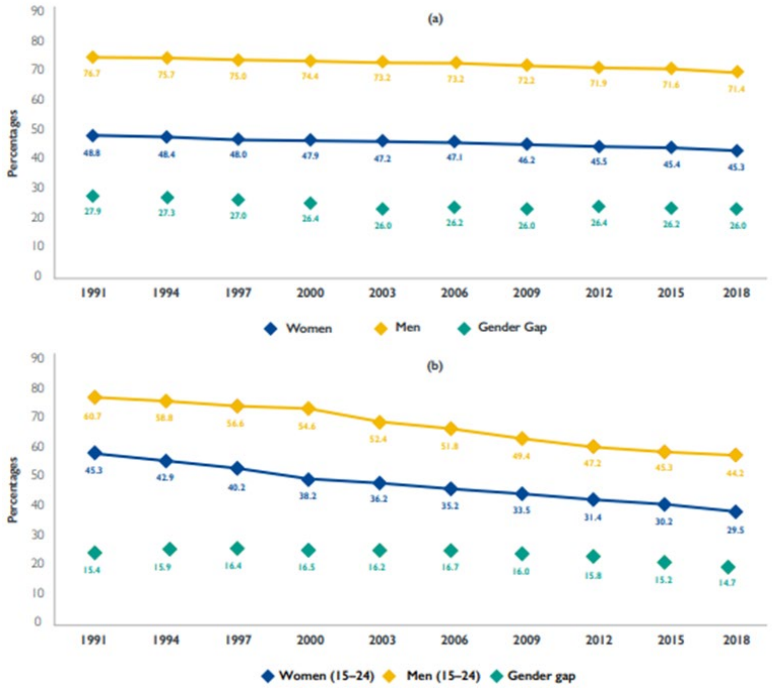

Figure 2. Gender employment rates according to the years

Over the current years, European Commission (EU) has made sustained efforts to put in place measures that equality between female and men in EU stated that employment rates in the EU. To deal with 2019 the report of EU, women remain at about 11.5 pp. lower than that of men. Women's average is about 16 % lower than that of men. Women rarely reach the highest management positions, with only 6.3 % of CEO positions in major publicly listed companies in the EU being held by women. The Annual Employment Performance Report is accessible at https://www.consilium.europa.eu/register/en/content/int?lang=EN&typ=ADV.

To establish clear life roles for both men and women to engage equally in work-life balance, caring responsibilities for promoting gender equality in work-life balance which should be adequately share with equally. In addressing women's underrepresentation in the labor market, working women faced the work-life balance challenges lead to them sharing of domestic and caregiving work more than men. Gender equality remains restricts how gender gap may be translated into practice in assessing women's perceived career barriers. It describes social and economic perspective that is useful in considering the construct of perceived barriers, in particular for in the workplace, and summarizes factors, such as gender, have a great influence on a female's career construction because female face multiple barriers and gender-based discrimination in the work place (Jackson,2001; Wentling,2006).

Research indicates that gender diversity leads to men being promoted faster than women even in organizations in which gender inequality and culture and dissatisfaction with promotions negatively influence women's overall career advancement (Linehan & Schein,2006). The ILO's statistics (2019) revealed that women are promoted more slowly and less often than their male counterparts (See Figure 3).

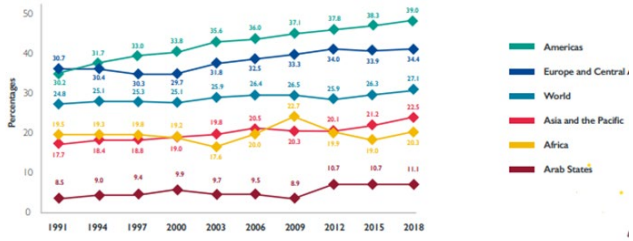

Figure 3. Women in managerial positions by region (ILO, 2019)

The limited advancement of female serves as a reminder that women are less committed and less competent than their male counterparts due to the biological make up of women. Thus, the study established that women in middle and senior positions in the schools were in support of the presidential affirmative policy to appoint more women in the educational settings through affirmative action would expose more female managers to leadership roles and thus provide models and mentors for the young career women.

The 2030 Declaration of UN has committed to ensure Sustainable Development Goal 5 - gender equality and empowerment of women, by adequate policies and programs, to ensure that women equally participate in development over the world. Thus, it is important to examine perceived organizational barriers on women career progression in TRNC. Therefore, a descriptive survey was carried out to examine the barriers that female face in educational organizations when trying to empower their careers.

The study quotes on hypothesis on career barriers of female educational chairs due to female biological make up are the most significant impediment of their career advancement. The main research question of the study is "What are the perceived organizational barriers of female education administrators about their career progression in Turkish Republic of Northern Cyprus?". Based on this main research question the study explored the following sub-research questions:

Does the female biological make up in family life;

influence female career progression?

influence female's work-life balance?

have set backs from any promotions while moving up the senior position in the workplace?

Do female education administrators;

face with obstacles during their career advancement due to the biological make up of women in the workplace?

have difficulties in the context from unfair situation due to the biological make up of women in the workplace?

Do female education administrators;

face with a carrier barrier in the context from their female fellow's bullying?

share equal opportunities with male education administrators to rise to senior level positions?

perceive their career progression to be negatively affected by male dominated hierarchies in the workplace?

4. Does the male dominated hierarchy affect female's career progression in the workplace?

5. How do education administrators overcome challenges in their career progression?

6. Is there any prejudice about whether the biological make up of women has an influence on female career progression in the workplace?

2 | METHOD

DATA COLLECTION

A descriptive survey was carried out to examine the barriers that females face in educational organizations when trying to empower their careers. The sample of the study was composed of 21 females in middle and senior level. The participants were randomly selected. The data were collected using a quantitative research design. Through the in-depth interviews, with the participants, female education administrators, following major reasons were uncovered as the barriers for their career progression.

The sample of the study were composed 21 females in middle and senior level. The participants were selected randomly. The data were collected using quantitative research model. Descriptive statistics and analysis of variance were used to explain the results. The participants of the study comprised 21 female school principals at primary and middle school in TRNC in 2020-2021 school year. In terms of work experience, 7 participants had less than 24 years and 14 participants were more than 24 years of work experience. In terms of educational status, the participants were composed of % 14.3 (N=3) school principals, % 4.8 (N=1) vice school principals %71.4 (N=15) teachers, % 4.8 (N=1) and section chairs % 4.8 (N=1).

3 | FINDINGS

The research question 1.a was concerned with whether the biological make up of women in family life has an influence on female career progression? According to the results, 57.14% (N=12) of participants stated that their career advancement was not affected by their biological make up of them in family life; however, 42.86% (N=9) of the participants stated that their career advancement was affected by the biological make up of them in family life (See table 1).

Table 1. Does the Biological Make Up Of Women in Family Life Have an Influence on Female Career Progression?

Participant	Answer	F	%
p1, p2,p3, p4, p5, p6, p9, p11, p12, p13, p14, p18	Does	12	%57.14
p7,p8, p10,p15, p16, p17, p19,p20, p21	Does not	9	%42.86

The research question 1.b was concerned with whether the biological make up of women had an influence on female's work-life balance? The results revealed that the biological make up of women did not have an influence on the work-life balance of 66.66% (N= 16) of the female educational chairs. However, 23.80% (N= 5) of the participants claimed that the biological make up of women had an influence on their work-life balance (See table 2).

Table 2. Does the biological make up of women have an influence on female's work-life balance?

Participant	Answer	F	%
P1, P4, P6, P8, P10	Does not	5	%23.80
P2, P3, P5, P7, P9, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20,21	Does	16	%66.66

Research question 1.c was concerned with whether the biological make up of women were blocked from any promotions while moving up the senior position in the workplace? The results revealed that the biological make up of 76.19% (N= 16) of the participants was not blocked from any promotions while females moved up to senior positions in the workplace. However, 23.81% (N= 5) of the participants stated that the biological make up of women was blocked from any promotions while female moved up to senior positions in the workplace (See table 3).

Table 3. Is the biological make up of women blocked from any promotions while moving up the senior position in the workplace?

Participants	Answer	F	%
P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P15, P16, P17, P18, P21	No	16	76.19
P12, P13, P14, P19, P20	Yes	5	23.81

Research question 2.a was about whether female education administrators faced with obstacles during their career advancement due to the biological make up of women in the workplace. The results revealed that 61.90% (N=13) of female education administrators did not face with obstacles during their career advancement due to the biological make up of women in the workplace. However, 38.10% (N=38.10) of the participants claimed that they were faced with obstacles during their career advancement due to the biological make up in the workplace (See table 4).

Table 4. Do female education administrators face with obstacles during their career advancement due to the biological make up women in the workplace?

Participants	Answer	F	%
P1, P2, P3, P4, P5, P9, P10, P11, P13, P15, P17, P18, P19	Do not	13	61.90
P6, P7, P8, P12, P14, P16, P20, P21	Do	8	38.10

The research question 2.b was concerned about whether female education administrators faced with obstacles in the context from unfair situation due to the biological make up of women in the workplace. According to results, 47.62% (N=10) of the female education administrators did not face with obstacles in the context from unfair situation due to the biological make up of female in the workplace. However, 42.86% (N=9) of female education administrators were faced with challenges and obstacles in the context from unfair situation due to the biological make up in the workplace (See table 5).

Table 5. Do female education administrators face with obstacles in the context from unfair situation due the biological make up of women in the workplace?

Participants	Answer	F	%
P1, P2, P3, P5, P6, P10, P11, P13, P15, P17	Do not	10	47.62
P8, P9, P12, P14, P16, P18, P19, P20, P21	Do	9	42.86
P4, P7	Non answered	2	9.53

On the other hand, research question 3.a was concerned with whether female education administrators face with a carrier barrier in the context from their female fellow's bullying. The results revealed that 61.90% (N=13) of female education administrators did not face with a carrier barrier in the context from their female fellow bullying. However, 38.10% (N=8) of female education administrators stated that they were faced with a carrier barrier in the context from their female fellow's bullying (See table 6).

Table 6. Do female education administrators face with a carrier barrier in the context from their female fellow's bullying?

Participants	Answer	F	%
P1, P2, P3, P4,P5, P6,9, P10,P11,P13,P17,P18, P19	Do not	13	61.90
P7, P8,P12,P14,P15,P16,P20,P21	Do	8	38.10

The research question 3.b was concerned with whether female education administrators share equal opportunities with men, who are university fellows of that female, to be promoted to a senior level positions in educational settings. Accordingly, %48.15 of female education chairs stated that they shared

equal opportunities with men who are university fellows of that female to rise senior level positions in educational settings (See table 7).

Table 7. Do female education administrators share equal opportunities with men who are university fellows of that female to rise senior level positions in educational settings?

Participants	Answer	F	%
P1, P6, P7, P8, P9, P10, P12, P14, P15, P16, P17, P18, P20	Teacher	13	46.43
P3, P12	Vice Manager	2	7.14
P8, P12, P17	Manager	3	10.71
P17	Controller	1	3.57
P11	Supervisor	1	3.57
P2, P4, P5, P8, P19	Other	5	17.86
P14	No job	1	3.57
P13, P21	No answer	2	7.14

The research question 3.c was concerned about whether female education administrators perceive their career progression to be affected by male dominated hierarchies in the workplace. The results stated that %71.43 (N=15) of female education administrators perceived that their career progression was not affected by male dominated hierarchies in the workplace. However, %28.57 (N=6) of the participants perceived their career progression was affected by male dominated hierarchies in the workplace (See table 8).

Table 8. Do female education administrators perceive their career progression to be affected by male dominated hierarchies in the workplace?

Participants	Answer	F	%
P1, P2, P3, P4, P5, P6, P9, P10, P13, P14, P15, P17, P19	Do not	15	71.43
P7, P8, P12, P16, P18, P20	Do	6	28.57

Research question 4 was concerned about whether the male dominated hierarchy affected female's career progression in the workplace. According to results, %76.19 (N=16) of the participants stated that the male dominated hierarchy to was not affected female's' career progression in the workplace. However, % 14.28 (N=3) of the participants claimed that that the male dominated hierarchy to was affected female's' career progression in the workplace (See table 9).

Table 9. Does the male dominated hierarchy affect female's career progression in the workplace?

Participants	Answer	F	%
P1, P2, P3, P4, P5, P9, P10, P11, P12, P13, P14, P16, P17, P18, P19	Does not	16	76.19
P6	Have not male supervisor	1	4.76
P8, P9, P20	Does	3	14.28
P7	No answer	1	4.76

Research Question 4 was concerned with whether female education administrators face with career barriers during their career advancement. The results revealed that %76.19 (N=16) of female education administrators face with career barriers during their career advancement. According to the relative statistic, female education administrators claimed that in male work environment, female education administrators often do not get the diversity of experience compared to male chairs, women are blocked from gender inequality with promotions negatively influence women's overall career advancement.

They also stated that the organizational structure impeded female executive's entry to advancement in the workplace. The structure includes gender inequality and cultural barriers working within organizations led to under representation of women at organizational level (See table 10).

Table 10. Do female education administrators face with career barriers during their career advancement?

Participants	Answer	F	%
P1, P11, P18	No	3	14.29
P3, P4, P6, P7, P8, P9, P10, P12, P13, P14, P15, P16, P17, P19, P20, P21	Yes	16	76.19
P2, P5	No Answer	2	9.52

Research question 5 was concerned about how female education administrators overcome challenges in their career progression. According to results, female education administrators overcame challenges in their career progression while they persisted in gender equality, empathy, patience, responsible decision making, collaboration and cooperation with men, sharing responsibilities with men, flexible working conditions, create common understanding, no effort being alone, time management and seeking legal right in the workplace (See table 11).

Table 11. How do female education administrators overcome challenges in their career progression?

Participants	Answer	F	%
P1	Persistence and effort	1	4.76
P3	Empathy	1	4.76
P4	Patience	1	4.76
P5	Responsible decision making	1	4.76
P6	Flexible working time	1	4.76
P7, P20	Gender equality	1	4.76
P8	Caring responsibilities	1	4.76
P9	Sharing responsibilities with men	1	4.76
P10, P13, P16, P21	Legal rights in the workplace	4	19.05
P12	Collaboration with men	1	4.76
P14	Cooperation with men	1	4.76
P17	Create common understanding	1	4.76
P18	No effort be alone	1	4.76
P19	Time management	1	4.76
P2, P11, P15	Non answered	3	14.28

The research question 6 concerns about whether there is any prejudice about female biological make up against of female career progression in the educational organizational settings of TRNC. According to results, 66.67% (N=14) of the participants stated that there was no prejudice about female biological make up against female career progression in the educational organizational settings of TRNC. However, 33.33% (N=7) of the participants claimed that there was prejudice about the biological make up against of female's career progression in the educational organizational settings of TRNC (See table 12).

Table 12. Is there any prejudice about the biological make up of female against of female career progression in the educational organizational settings of TRNC?

Participants	Answers	F	%
P1, P2, P3, P4, P5, P6, P9, P10, P11, P15, P16, P17, P18, P21	No	14	66.67
P7, P8, P12, P13, P14, P19, P20	Yes	7	33.33

4 | Discussion & Conclusion

Within the educational organization, there are certain factors which serve to hamper female career progression. In 2018, 1.3 billion women were in employment compared to 2.0 billion men, which means that there were still over 700 million fewer women in employment than men. In other words, women were still 26.0 percent less likely to be employed than men. Thus, the limited advancement of female serves as a reminder that women are less committed and less competent than their male counterparts due to the

biological make up of women. In addressing women's underrepresentation in the labor market, women are promoted more slowly and less often than their male counterparts (ILO,2019), therefore, it can be claimed that gender equality remains restricts how gender gap may be translated into practice in assessing women's perceived career barriers. The study described educational executive perspectives that is useful in considering the construct of perceived barriers, particularly in the workplace, and summarizes the factors that negatively influence women's overall career advancement.

The 2030 Declaration of UN has committed to ensure Sustainable Development Goal 5 – 'gender equality' and empowerment of women, by adequate policies and programs, to ensure that women equally participate in development over the world. Thus, it is important to examine perceived organizational barriers of female education administrators on their career progression in TRNC to being referred to the agenda of 2030 Declaration of UN.

Through the in-dept. interviews, with the participants, female education administrators, following major reasons were uncovered as the barriers for their career progression. According to the study results, the female education administrators' career advancement was not affected by biological make up of female in family and female education administrators perceived their career progression to be not affected by male dominated hierarchies in the workplace. In addition, the biological make up of women did not block from any promotions while female moving up the senior positions in the workplace. However, the results revealed that female education administrators face with career barriers during their career advancement. According to results, female education administrators overcame challenges in their career progression while they persisted in gender equality, empathy, patience, responsible decision making, collaboration and corporation with men and seeking legal right in the workplace. In addition, the participants stated that there was no prejudice about female biological make up against of female career progressions in the educational organizational settings of TRNC.

However, female education administrators need organizational support in TRNC. They should confront the challenges and responsibilities of identifying work-life balance requirements which should provide adequate opportunities with male education administrators.

Statements of publication ethics

The study was approved by University of Mediterranean Karpsia, Northern Cyprus.

Researchers' contribution rate

The corresponding author contributed to the %85 of the study.

Conflict of interest

There was no conflict of interest in the study.

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Adaptation Study of Mathematical Ability Test (TOMAGS) to Turkish

Duygu Özdemir [a*], Mine Işıksal Bostan [b*]

a* Asst. Prof. Dr., İstanbul Aydın University, Faculty of Education, (https://orcid.org/0000-0001-5841-3404) *duyguozdemir5@aydin.edu.tr
b* Prof. Dr., Middle East Technical University, Faculty of Education, (https://orcid.org/0000-0001-7619-1390)

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Abstract

Today, it is an important issue to diagnose and provide educational support to mathematically gifted students who are seen as the potential to develop societies. Literature review and existed practices reveal that there is no common and clear way to diagnose mathematically gifted students. In this study, it was aimed to explain the adaptation studies of Test of Mathematical Abilities for Gifted Students (TOMAGS) into Turkish Language. TOMAGS was a norm referenced, standardized test and in this study, steps for adaptation of an achievement test were followed. In this regard, first of all, language and cultural adaptations were conducted and then, psychometric analysis was carried out based on the results obtained from implementation of the test with the sample consisting of 563 students whom aged ranged between 9 and 12 in different cities of Turkey. Results show validity and reliability evidences from the implementation and it was concluded that the test can also be used in Turkish Language for identifying mathematical abilities of gifted students.

Keywords: Mathematics, gifted students, test adaptation, diagnose

Üstün Yetenekli Çocuklar için Matematiksel Yetenek Testi'nin (TOMAGS) Türkçe'ye Uyarlama Çalışması

Öz

Günümüzde, toplumları ileriye taşıyabilecek potansiyeller olarak görülen matematikte üstün yetenekli çocukların tanılanmaları ve ihtiyaç duydukları eğitimsel desteğin sağlanabilmesi oldukça önemli bir konu olarak görülmeye başlanmıştır. Ancak var olan uygulamalar ve erişilebilen alan yazın taramaları bu çocukları tanılamak için çok yaygın ve net bir yöntem bulunmadığını ortaya koymaktadır. Bu sebeple, bu çalışmada matematikte üstün yetenekli çocukları belirlemek amacıyla geliştirilmiş olan TOMAGS (Test of Mathematical Abilities for Gifted Students)'ın Türkçe uyarlama çalışmaları süreci ve bulguları hakkında bilgi vermek amaçlanmıştır. Standardize edilmiş, norm referanslı bir test olan TOMAGS'ın Türkçe uyarlama sürecinde başarı testinin uyarlama sürecine ilişkin önerilen adımlar izlenmiştir. Bu süreçte önce dil ve kültür uyarlamaları yapılmış, ardından testin 9-12 yaş aralığındaki 563 kişiden oluşan örneklemde uygulanmasından elde edilen veriler ile psikometrik analizleri yapılmıştır. Güvenilirlik ve geçerlik kanıtları sunulan uygulama sonuçlarında ise testin Türkçe dilinde de üstün yetenekli çocukların matematiksel yeteneğin seviyelerini belirlemede kullanılabileceği sonucuna varılmıştır.

Anahtar kelimeler: Matematik, üstün yetenekli çocuklar, test uyarlama, tanılama

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1 | INTRODUCTION

Gifted children in mathematics who can see the world mathematically (Krutetski, 1976) have a special potential that can contribute to the development and future of societies (Davaslıgil, 2004; Hannah, James, Montelle, & Nokes, 2011). In order to reach the desired level economically and socially, countries have initiated various studies to diagnose their gifted children in mathematics (Fıçıcı & Siegle, 2008). In order to reveal and use their existing potential, identification of gifted students is an important step. In this context, when the studies in the literature are examined, they (Basister & Norimune, 2018; Fıçıcı & Siegle, 2008; Gadanidis, Hughes, & Cordy, 2011; Glavche, Anevska, & Malcheski, 2019; Johnson, 2000; Singer, Sheffield, Freiman, & Brandl, 2016) focus on the characteristics of gifted students in mathematics, their cognitive, affective and social needs, need for differentiated or enriched education in classrooms, and teachers' knowledge, attitudes and beliefs towards these students.

How to identify mathematically gifted students is seen as one of the important questions to answer for providing appropriate educational opportunities to them (Greenes, 1981). In this context, in line with the theory of Vygotsky's (1978) Zone of Proximal Development (ZPD), theoretical framework of this study, this study focuses on the recognition of gifted students in mathematics in order to respond to their differentiated needs in classroom. Although many approaches have been developed to identify gifted students in mathematics, there is no common and clear definition of giftedness in mathematics (Özdemir 2016; Pitta-Pantazi, Christou, Kontoyianni, & Kattou, 2011). Krutetski (1976) stated that there is a mathematical thinking style in mathematically gifted children and therefore they can see the world from a mathematical perspective and many researchers have developed arguments on it. Thus, it has been mentioned that gifted students in mathematics have some important and common features even if a clear definition cannot be made. For example; having a relational understanding between numbers and symbols, associating and interpreting them in real life, solving mathematical concepts and problems in different ways in an unusual speed and accuracy, are some of these features (Fıçıcı & Siegle, 2008; Sriraman, Haavold & Lee, 2013). In addition, being able to make different and creative interpretations about mathematical concepts and abilities of solving complex problems and related interest compared to their peers are the characteristics of gifted students in mathematics (Ashley, 1973; Greenes, 1981; House, 1987). In addition, mathematical creativity is seen by many researchers (Leikin, 2009; Pitta-Pantazi et al., 2011; Sheffield, 1994; Sriraman, 2005; Sriraman et al., 2013) as an important factor in determining mathematical giftedness.

In general framework, giftedness in mathematics has been a remarkable subject since the 1900s. In addition to the common characteristics of gifted students in mathematics, various studies are carried out to determine this ability. Since the questions in the tests organized according to the students' own age and class levels are insufficient in determining gifted students, testing above the level has been one of the most used methods. As one of the first studies carried out in this context (Stanley, 1991), a criterion to get 500-800 points from the Scholastic Abilities Test - Mathematics (SAT-M)) was set for children who will attend special mathematics-related programs such as Study of Mathematically Precocious Youth (SMPY) at Johns Hopkins University. Later on, this limit score was changed in order to force the students more and to choose higher level children, and the students who could score between 700-800 as a result of the evaluation were selected for the program. Similarly, students were selected with this kind of above-level test exams in the study conducted by Lupkowski-Shoplik and Kuhnel (1995) at Carnegie Mellon University. However, since measuring the students' mathematical ability with methods appropriate for their developmental levels are more meaningful, it was thought that these above-level tests can be problematic (Ryser & Johnsen, 1998). Thus, some additional methods like open-ended questions or student interviews have been seen as one of the effective methods that can be used to evaluate giftedness in mathematics (Sheffield, 1994). Nonetheless, in spite of the advantages of student interviews, due to its difficulties in standardizing and application-evaluation process, it has not found much use. In this context, in determining

the superior ability in mathematics; the use of standardized tests including open-ended questions, was considered one of the most appropriate methods.

Test of Mathematical Abilities for Gifted Students (TOMAGS) is a measurement tool with validity and reliability values that can meet the needs of researchers who need standardized measurement tools to determine giftedness in mathematics (Ryser & Johnsen, 1998). The test consists of items that will require students to use their mathematical thinking skills, mathematical reasoning and problem-solving skills, and the test has been developed taking the principles of the curriculum and characteristics of gifted children into account (Sriraman, 2008). Mathematical problem solving, mathematical communication/language and mathematical reasoning skills, which are the three basic principles that exist in the National Council of Teachers of Mathematics (NCTM) as well as the mathematics education programs of the Ministry of National Education (MoNE) in Turkey, are the principles and basic skills that have been taken into consideration in the formation of TOMAGS (MoNE, 2013).

When the national literature is examined, in addition to the test adaptation process of general intelligence, the adaptation studies of the scales developed for determining the sub-dimensions of the intelligence can be seen. For instance, the Schutte Emotional Intelligence Scale (Austin, Saklofske, Huang, and McKenney, 2004) by Tatar, Tok and Saltukoğlu (2011), BarOn Emotional Intelligence Test (BarOn & Parker, 2000) by Karabulut (2012); Perception of Gifted Education Scale (Jeong, 2010) by Tortop and Sarar (2018); Multiple Intelligence Scale (McClellan and Conti, 2008) by Babacan & Dilci (2012); Scale of Cultural Intelligence (Ang et al. 2007) by İlhan and Çetin (2014) were achieved reliable and valid results during their adaptation process into Turkish. Regarding giftedness in mathematics, which is one of the important sub-dimensions of giftedness, no similar study has been found that aims to introduce test studies that can determine giftedness in mathematics with the help of standardized scales. Additionally, as it is stated before, gifted students in mathematics are really important values for countries because these children have the potential to lead the developments in the country. Therefore, in terms of Turkey context, to be able to support the gifted students in classrooms, the first step for their progress is to recognize, identify and reveal their giftedness . For this reason, as can be seen in the relevant international and national literature, it is necessary to identify gifted students in mathematics, thus it is needed to develop measurement tools that allow us to identify them. In this connection, in the present study, it was aimed to analyze and present a measurement tool that allows the identification of gifted students in mathematics in Turkey. Hence, the validity and reliability evidences with the analysis conducted for the adaptation study of TOMAGS were presented to make contribution to the related national literature. That is, based on the need in mathematics education field, in this study, adaptation studies for the TOMAGS (intermediate level) developed for children between the ages 9-12, and the methods and its findings will be conveyed.

2 | Method

The adaptation process of TOMAGS, a standardized, norm-referenced test developed to identify mathematically gifted children, will be described in this study, (Callahan, 2006; Ryser & Johnsen, 1998). There are two different parts, as elementary and intermediate level, in the test. The first level of the test was developed for children aged 6 to 9, while the intermediate level was developed for children between the ages of 9-12. TOMAGS-intermediate test, which will be adapted in the scope of the study, was developed as a measurement tool that can measure the limits of gifted students, consisting of 47 open-ended questions with the required difficulty level in problem solving format. In addition, this test measures students' ability to transfer their mathematical knowledge to new and different situations or to produce new solution strategies for existing problem situations (Ryser & Johnsen, 1998).

In the study carried out by Ryser and Johnsen (1998), within the scope of the reliability studies of the original TOMAGS test, the analysis values for 3 types of error conditions were obtained as shown in Table 1 and since these values were greater than .80, it was stated that the test results can be used safely, that is, the TOMAGS test results can be used safely.

Table 1. Reliability studies of TOMAGS (Ryser & Johnsen, 1998, p. 28).

	Test Errors				
	Sample		Time Sampling	Scorer	Average
	Regular Students	Gifted Studets			
TOMAGS - Intermediate	.88	.86	.94	.99	.93

In addition, content, criterion and construct validity studies were carried out regarding the validity studies of the TOMAGS original test. During the content validity period, the content was determined by considering NCTM standards and literature reviews. Besides, the content validity of the measurement tool was strengthened by pilot study and the classical item analysis studies which enabled the reconstruction and keeping the most suitable items in the content. In addition, TOMAGS original study was examined in terms of criterion validity by making correlation study with two separate tests. That is, the Cognitive Abilities Test (CogAT) (Thorndike & Hagen, 1986) with 55 students and Iowa Tests of Basic Skills: ITBS, applied to 38 students who were diagnosed as gifted in mathematics (Hambleton, Hieronymous, & Hoover, 1987) showed that TOMAGS provides statistically significant criterion validity on the total math scores (see Table 2).

For the evidence of construct validity of the original test, group differentiation, factor analysis, item bias and item validity studies were conducted. In this context, a statistically significant difference was found on the assumption that the TOMAGS test could distinguish gifted students in mathematics and other students. While factor analysis studies concluded that the test was parallel to NCTM standards, it was also concluded that there was a scarcely any significant bias between the groups in the sample. Thus, the item validity studies reflected that the test could be used safely (see Ryser & Johnsen, 1998).

Table 2. Correlation Between TOMAGS Intermediate and Selected Tests (Ryser & Johnsen, 1998, p. 35).

Criterion Measures	TOMAGS-Intermediate
CogAT Quantitative Battery	.67
ITBS Mathematics Total	.44

TEST ADAPTATION PROCESS OF TOMAGS TO TURKISH LANGUAGE

In this section, it is aimed to present the psychometric properties of this ability test adapted to Turkish as the main purpose of the study and to give information about the road map followed in the adaptation study in general. In the adaptation process of the success tests, there are steps that contain a great deal of similarity to the scale adaptation process. Hambleton (2002) stated that there are different stages that make the adaptation process of a success test successful. In the context of these steps, the steps followed during this adaptation study are summarized and explained below.

Step 1. Expert opinion on the structure to be measured is similar in both the original language and the target language.

In this study, the suitability of the adaptation process was accepted because the psychological structure of the test has similar behavioral indicators in both cultures.

Step 2. Make sure that the adaptation is the best option

As an alternative to adaptation of a test, development process of this instrument is an option. However, if there is a measurement tool that provides up-to-date, sufficient psychometric evidence in a different language, adaptation will be meaningful if other conditions are met. In addition to its psychometric strength,

adaptation of the measurement tool is also useful for comparing the feature to be measured between the target language and the original language. In the adaptation phase of this test, it has been found that it is more convenient and effective to adapt a reliable and valid test that has been developed before by considering the appropriate criteria regarding giftedness.

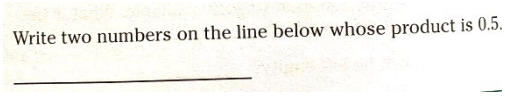
Step 3. Working with translators who know both languages well

In terms of the adaptation process, because it is vital to maintain the structural equivalence of the measuring tool, the translators who carry out the translation and adaptation process should know both the original and target language well and, if possible, should be knowledgeable in terms of the measured psychological characteristics. In the study, we have worked with translators who know both target languages and support has been received from relevant experts in terms of field knowledge.

Step 4. Translation and adaptation of the measurement tool

After the first three steps, the content of the measurement tool needs to be translated and adapted to ensure equivalence in terms of two languages. In the adaptation process of the study, the content was first translated from the original language to the target language (forward-translation,) then the translated content was translated back to the original language (back-translation) (Figure 1). In this way, the original content and the translated content were compared in terms of equivalence, and the forward and reverse translation stages were completed in this way.

Original Form of the Question:



Forward Translation: Aşağıdaki satıra, çarpımları 0,5 olan iki sayı yazınız.

Back Translation: In the following line, write two numbers whose product is 0.5.

Figure 1. An example of the original form, forward and back translation for the test.

Step 5. Examining the Adapted Content

It is not enough to translate the content one to one in the adaptation process, and some changes may be required to ensure cultural equivalence. Accordingly, the original version of the measurement tool content was compared with the version after the translation, and the final version of the form was created by discussing the differences found about cultural equivalence. For example, some terms and units such as inch and yard have been converted.

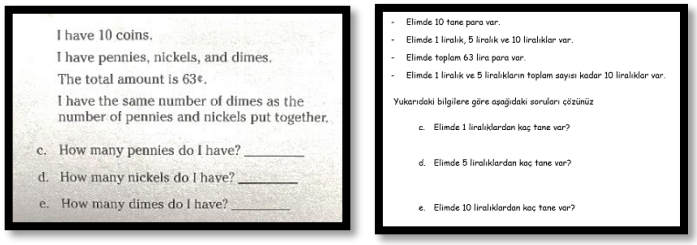


Figure 2. An example for the adaptation of the item to Turkish culture

Step 6. Application of Adapted Measurement Tool

Evidence of validity and reliability of the measuring tool, which has gone through many steps up to this point, should be made not only through expert opinion but also empirically. In this regard, it is expected

that the adapted measurement tool will be implemented in the target language, in a sample that reflects the psychological structure to be measured. Thus, adapted form was applied to a similar sample to the original sample and; validity and reliability evidences obtained in Turkey sample are presented in detail in the following sections of the study.

SAMPLE

This study was carried out with 563 students in 9-12 age group and they were selected conveniently from the private and public schools in four different cities of Turkey. There were 563 students from Ankara (391 students), Karaman (147 students), Kastamonu (17 students) and Marmaris (8 students) and 308 of them were boys (54.9%) while 253 (45.1%) of them are girls. 46.4% of the participant are students attending to public schools, 38.4% to private schools and 15.3% to educational institutions where gifted students attend. Information about the students' ages and genders was collected from each of the participants included in the study, and 146 (25.9%) of the students were aged between 12 years and 12 months; 260 (46.2%) of then were aged 11 years and 12 months;130 (23.1%) of them were between the age of 10 years and 12 months, and 22 (4%) of them were between the age of 9 years and 12 months. The average age of boys and girls is approximately 11. Considering the risk of the test results being affected by age in line with the development period, it can be stated that the groups have a balanced distribution in this respect. Detailed information about the participants is presented in Table 3 and Table 4.

Table 3. Number of participants and information about their cities

City	Number of Students	Percentage
Ankara	391 students	69.4%
Karaman	147 students	26.1%
Kastamonu	17 students	3.1%
Marmaris	8 students	1.4%

Table 4. Information and percentages about participants

School Type	City	Number of Students	Percentage
Public School	Ankara	177 students	%46.4
Public School	Ankara	84 students	
Private School	Ankara	61 students	
Private School	Karaman	147 students	%38.4
Private School	Marmaris	8 students	
Science and Art Center for Gifted Students (BİLSEM)	Ankara	10 students	
Science and Art Center for Gifted Students (BİLSEM)	Kastamonu	17 students	%15.3
School for Gifted Students	Ankara	59 students	

As mentioned above, for this study, all the adaptation process phases proposed by Hambleton (2002) have been completed and the test has been applied with the sample. After this application, the reliability and validity studies of the test were conducted and the psychometric results obtained from these studies are presented below. Moreover, for this study, approval from the research ethics committee of a university was taken and the participants, whose names used as pseudonymously for their confidentiality, participated to the study voluntarily and was informed about the aims and details before the study.

3 | Findings

Using the data of the respondents who completed the test consisting of 47 items in total, the characteristics of the distribution obtained from the results of measurement tool, analysis of the test on many items, reliability and validity evidences (psychometric evidences) are presented below.

Distribution and Properties of Items

The distribution of the results obtained from the participants in the context of the total score is given in Figure 3.

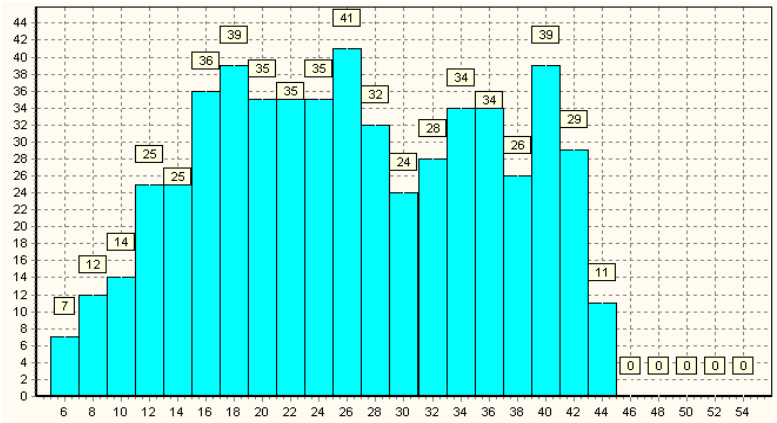


Figure 3. *Total Scores Obtained from the Participants in Tests*

When the distribution in the figure is examined, it is seen that it is slightly flattened compared to the standard normal distribution, but it shows a normal distribution pattern in accordance with its general characteristics. Other features related to the distribution are given in Table 5 below. In accordance with the results obtained, in the test consisting of 47 items, the respondents with the least number of correct answers answered 5 items and the respondents with the highest number of correct answers answered 44 items correctly. The median of the scores is 25.00 and the average is 25.75, so the distribution is very similar to the standard normal distribution. Another indicator confirming this situation is the calculation of the skewness coefficient as -0.008. Therefore, the level of skew is quite low and in contrast, since the coefficient of kurtosis is -1.006, it can be stated that the distribution is more flattened than the standard normal distribution (Pallant, 2015). In addition, it can be said that the distribution provides normal distribution properties because of the kurtosis and skewness values who are between -2 and +2 (George & Mallery, 2010).

Table 5. Variables and values related to the distribution of test items

Variable	Value
Number of Respondents	563
Highest Score Possible	47
Lowest Score	5
Highest Score	44
Median	25,00
Average	25,75
Standard Deviation	10,01
Variance	100,25
Skewness	-0,008
Kurtosis	-1,066

Properties of the items in the test; the difficulty and discrimination of the items are given in Table 6. While the test analysis examines how the test items perform in a group, item analysis examines the relationship of the items in the test with some external factors or other items in the test (Thompson & Levitov, 1985). Item analysis is a process that examines student answers with individual test items in order to evaluate the quality of these items and the entire test, and it is very important to develop and rearrange the items that will be used in the next tests (Quaigrain & Arhin, 2017). It can also be used to eliminate ambiguous, suspicious or misleading items and obtain evidence of validity for a single application test. The results obtained in the item analysis process for these purposes are presented in Table 6 as item difficulty and item discrimination index values regarding the properties of the items in the test.

Table 6. TOMAGS Item Difficulty and Item Discrimination Index Values

Item	Correct Answers	Item Difficulty	Item Discrimination Index
Q1	504	0.90	0.28
Q2	481	0.86	0.30
Q3	264	0.47	0.92
Q4	253	0.45	0.91
Q5	435	0.78	0.51
Q6	308	0.55	0.82
Q7	321	0.57	0.82
Q8	326	0.58	0.79
Q9	341	0.61	0.84
Q10	314	0.56	0.75
Q11	285	0.51	0.89
Q12	224	0.40	0.74
Q13	216	0.39	0.57
Q14	234	0.42	0.74
Q15	247	0.44	0.78
Q16	481	0.86	0.37
Q17	218	0.39	-0.61
Q18	351	0.63	0.58
Q19	105	0.19	0.42
Q20	454	0.81	0.47
Q21	309	0.55	0.81
Q22	470	0.84	-0.43
Q23	337	0.60	0.47
Q24	376	0.67	0.44
Q25	512	0.91	-0.28
Q26	512	0.91	-0.27
Q27	166	0.30	0.55
Q28	189	0.34	0.46
Q29	355	0.63	0.75
Q30	391	0.70	0.63
Q31	353	0.63	0.80
Q32	153	0.27	0.63
Q33	158	0.28	0.74
Q34	192	0.34	0.70
Q35	194	0.35	0.74
Q36	517	0.92	0.16
Q37	130	0.23	0.52
Q38	218	0.39	0.72
Q39	81	0.14	0.47
Q40	221	0.39	0.79
Q41	506	0.90	0.21
Q42	461	0.82	0.42
Q43	299	0.53	0.65
Q44	374	0.67	0.51
Q45	241	0.43	0.59
Q46	216	0.39	0.56
Q47	151	0.27	0.46

When the values in Table 6 are analyzed, it is seen that especially the discrimination of 17th, 22nd, 25th and 26th items are negative. In this regard, the correct response rate of the items in the high-performance group in terms of total score was lower than the correct response rate in the low performance group. In this respect, it can be said that 4 out of 47 items have an undesired quality in terms of discrimination.

When the items are considered as a group, the psychometric properties obtained are given in Table 7. As seen in this table, the average item difficulty was calculated as 0.548 and it is very close to 0.50. In line with the fact that the item variance gets the highest value when the item difficulty is 0.50, it is a positive feature that the average item difficulty takes a value close to 0.50 (Quaigrain & Arhin, 2017).

Table 7. General Psychometric Properties of TOMAGS Turkish Adaptation Study

Variable	Value
Number of Items Examined	47
Average of Item Difficulty	0.548
Average of Item Discrimination	0.525
Average of Double Series Correlation Coefficient	0.457
Mean Point-Double Series Correlation Coefficient	0.425
Average Number of Correct Performers of High Performs	34
Average Number of Correct Performers of Low Performers	18

In the study, three different calculations were made for item discrimination: differentiation level of correct response rate in lower and upper 27% groups, double series and point-double series correlation coefficient. The endpoint groups method can be applied to measure the discrimination power of a test item in an easy way. If the test has been applied to a large sample, the discriminative power of an item can be measured by comparing the number of high-score respondents who answered that item correctly and the number of low-score respondents who answered that item correctly. If a particular item can make a good distinction between high and low score participants, more participants in the group with the highest score will have answered that item correctly (Matlock-Hetzel, 1997). In all three methods, average item discrimination was calculated as 0.40 and above. Since the item was found to be very successful if it had a discrimination value of 0.40 and above (Crocker & Algina, 1986, p.315), it can be stated that the test can significantly differentiate the high and low performing groups in spite of the existence of four items with negative discrimination that can be shown as an exception as previously stated.

Reliability

The reliability of the achievement test, which was adapted to Turkish within the scope of this research, was tested by two different methods; Kuder-Richardson 20 Coefficient (KR-20) and Test-Halfway method. In terms of the internal consistency, these methods are KR-20 (such as true-false) which is based on correlation between results obtained from divalent measured test items (such as true-false) and Test-Halfway method that examines the results obtained from the two halves created by randomly splitting the test items (Crocker & Algina, 1986). As mentioned before, these two methods are thought to be useful and necessary in order to determine the internal consistency of the achievement test.

The KR-20 coefficient is a coefficient ranging from 0.00 to 1.00, which is used as an indicator of reliability in binary scoring (scoring as true or false) and other measurement tools (Crocker & Algina, 1986). The KR-20 coefficient, interpreted in terms of consistency between the items that make up the test, is

interpreted as increasing reliability as it approaches to 1.00. In this study, the KR-20 value which was calculated according to the data obtained from 563 students was found as 0.926. According to Cortina (1993), KR-20 values of 0.90 and above indicate that the items that make up the test consistently measure the same psychological feature and there is a statistically significant relationship between them.

The Test-Halfway method is the correlation between the total scores from the two half tests created by dividing the test in one way (Crocker & Algina, 1986). Since it is a correlation coefficient, it takes values between -1.00 and 1.00. The correlation obtained belongs to one of the halves created, and the Spearman-Brown correction formula is used to calculate the reliability coefficient of the entire test, which provides evidence for internal reliability (Drost, 2011). While commenting on the reliability of the measuring tool with the test half-split method, there are different techniques regarding how to split the test, in this research, the items in the test were randomly distributed in two halves; and in this way, it was tried to prevent bias in choosing.

Correlation coefficient (r) = 0.774 between the total scores obtained from two halves which was randomly split in two groups as 24 items and 23 items. When this correlation coefficient was corrected with the Spearman-Brown formula (Spearman Brown = (2 * r) / (1 + r)), the correlation coefficient for the whole test was calculated as 0.872. In his study, Peter (1979) stated that in measurement tools developed and used in social sciences, values of 0.70 and above obtained by halfway test can be seen as satisfactory. Therefore, it can be argued that the reliability coefficients obtained by Kuder-Richardson 20 and test splitting method are satisfactory (Crocker & Algina, 1986).

Validity

The validity of a measurement tool can be defined as the degree to which the tool serves the purpose of development and in this context, the validity evidence of the TOMAGS measurement tool examined in this study was obtained as follows.

Item-Total Correlation test is applied to check the inconsistency of other behaviors measured with any item in the test and, if this is the case, to remove the item from the test. In other words, this analysis aims to eliminate unnecessary items by sieving before deciding on the factors that represent the structure (Churchill, 1979). Within the scope of this research, item-total test analysis of 47 items in the measurement tool adapted to Turkish was done and the correlation coefficients obtained are shown in Table 8 below.

Table 8. Item-Total Test Analysis Correlation Coefficients

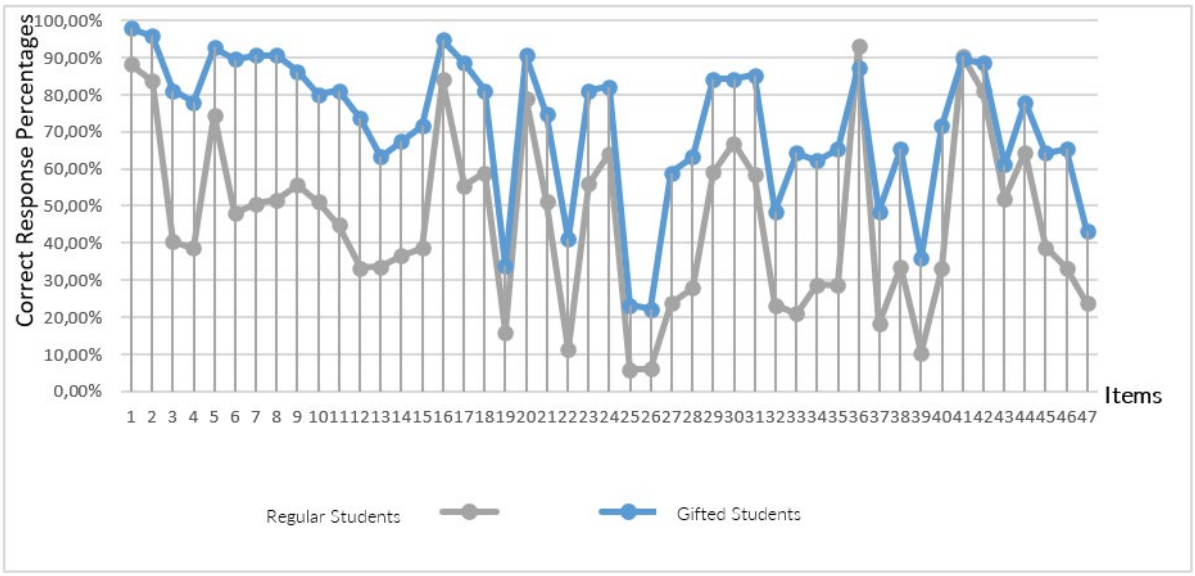
Item	Correlation Coefficient	Sig. (2-tailed)	Item	Correlation Coefficient	Sig. (2-tailed)	Item	Correlation Coefficient	Sig. (2-tailed)	Item	Correlation Coefficient	Sig. (2-tailed)
Q1	.375**	,001	Q13	.519**	,001	Q25	.486**	,001	Q37	.514**	,001
Q2	.364**	,001	Q14	.606**	,001	Q26	.465**	,001	Q38	.569**	,001
Q3	.741**	,001	Q15	.610**	,001	Q27	.502**	,001	Q39	.557**	,001
Q4	.738**	,001	Q16	.437**	,001	Q28	.442**	,001	Q40	.662**	,001
Q5	.507**	,001	Q17	.588**	,001	Q29	.606**	,001	Q41	.318**	,001
Q6	.683**	,001	Q18	.447**	,001	Q30	.524**	,001	Q42	.470**	,001
Q7	.651**	,001	Q19	.484**	,001	Q31	.650**	,001	Q43	.517**	,001
Q8	.629**	,001	Q20	.501**	,001	Q32	.605**	,001	Q44	.429**	,001
Q9	.673**	,001	Q21	.641**	,001	Q33	.691**	,001	Q45	.481**	,001
Q10	.605**	,001	Q22	.535**	,001	Q34	.599**	,001	Q46	.476**	,001
Q11	.704**	,001	Q23	.385**	,001	Q35	.642**	,001	Q47	.446**	,001
Q12	.635**	,001	Q24	.394**	,001	Q36	.260**	,001			,001

** The correlation coefficient is statistically significant. (p <.05).

As can be seen in Table 8, all 47 items are in a significant and positive relationship with the test total score variable; correlation coefficients ranged from 0.260 to 0.741. In this case, 47 items had a statistically significant relationship with the total test score; it can be said that all items measure the same psychological feature (see Churchill, 1979).

Correct Response Percentages of Students Studying at the Gifted School/BILSEM and Regular Students

The items that make up a measuring instrument are expected to differentiate those who have higher level of measured property from others, and this is considered as an indication of validity (Pierson, Kilmer, Rothlisberg & McIntosh, 2012). In this regard, the items in the TOMAGS measurement tool are expected to be answered more accurately by students diagnosed as gifted. Correct response percentages of 95 students, studying in the gifted school and in the Science and Art Centers (BİLSEM) which are institutions affiliated to the Ministry of National Education and gifted students can continue outside their school hours,



and 467 regular students are compared and analysis results are presented in Figure 4.

Figure 4. Correct Response Percentages Graph of TOMAGS Turkish Adaptation

Test Total Score and Standard Deviation Values of Gifted and Regular Students

In a test developed to distinguish gifted students, the scores of gifted and regular students were compared since the average scores of the gifted students studying at gifted school and BİLSEM are expected to be higher than other students. In this respect, the score means and standard deviations of these two groups of students from the 47-questioned measurement tool are shown in the graph in Figure 5.

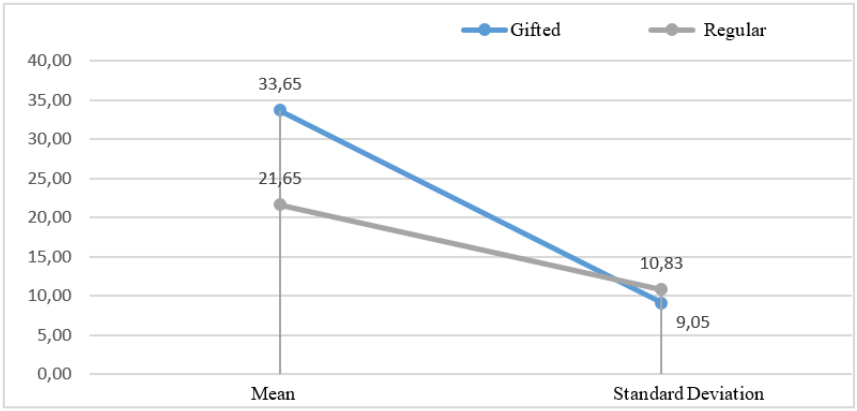


Figure 5. Total Score Mean and Standard Deviation Values of Regular and Gifted Students

As seen in the graphic above, gifted students have been more successful in terms of total score obtained from the measurement tool compared to other regular students. In addition, these students with a lower standard deviation value exhibit a more homogeneous distribution than other students.

In line with the findings, it can be stated that the measurement tool adapted to Turkish is sufficient in terms of the correlation between the items and the total score, and thus it can be concluded that it has the ability to distinguish the group that has the feature it wants to measure from the others on the basis of item and total score averages.

4 | Discussion & Conclusion

The aim of the present study is to adapt the TOMAGS to Turkish language and for this aim, adaptation stages to Turkish and Turkish culture as well as necessary validity and reliability analysis were conducted. As stated before, TOMAGS original content, which was prepared to test the limits of gifted children, can be used as a tool to identify giftedness in mathematics due to its strong validity and reliability values.

Therefore, first of all, item difficulty and item discrimination index values were calculated in accordance with the values obtained in Turkey sample of TOMAGS. The fact that the average item difficulty was found as 0.548 and it was very close to 0.50 which is the desired value, this was seen as a positive feature. In addition, the item discrimination indexes of which the assessment was made in three different ways, the correlation values of 0.40 and above and the average item discrimination as 0.525 showed that the test was at the desired level in order to distinguish the high and low performing groups significantly (Crocker & Algina, 1986, p. 315). In addition, three different evaluations were made for the item discrimination index correlation values, and these values were found to be 0.40 and above and the mean item discrimination value was 0.525. All these results showed that the test was at the desired level in order to significantly distinguish the high and low performing groups (Crocker & Algina, 1986, p. 315). However, when the individual discrimination values were examined, undesired values for the 4 items (17th, 22nd, 25th and 26th) were obtained. However, it was concluded that due to the desired result obtained at the average value, these items and values did not disrupt the general structure of the test (Crocker & Algina, 1986) and so it was decided that the results for these 4 items could be neglected. In addition, KR-20 coefficient which was calculated within the scope of reliability was found as 0.926 and this also provided a desired result as being 0.90 and above in terms of consistency of the items and reliability of the test (see Cortina, 1993). The coefficients obtained by the test halfway method (r = 0.774) and the coefficient obtained by the Spearman-Brown correction (r = 0.872) are considered as satisfactory due to being above of 0.70 (Peter, 1979) and these were provided as evidences for reliability. Within the scope of validity, the data obtained from the Item-Test Total Score Correlation showed that coefficients for the correlation change from 0.260 to 0.741 and all 47 items had a significant and positive relationship with the test total score variable. In

this case, 47 items had a statistically significant relationship with the total test score; thus, it can be said that all items measure the same psychological feature. In addition, in line with the data obtained, it can be said that almost all of the items in the test provide validity by separating those who have a higher level of measured property from others.

As Dang, Weiss, and Nguyen (2013) stated, the use of intelligence or ability testing is related with the aims of diagnosing children and providing them proper educational opportunities. These children can both low and high ability students who have cognitive strengths or weakness and such kind of tests serve as a tool to aware of these students in educational environments and adapt educational content and methods to better suit the needs of these students (Kaufman, 1994). Within the scope of this adaptation study, the adaptation to Turkish language and culture, reliability and validity studies of TOMAGS which was developed for students between the ages 9-12 were carried out. By this way, a diagnosing tool that enable to find out the students who have high probability in mathematically giftedness can be obtained for Turkish language. The results of the analysis were found to be in line with the reliability and validity findings of the original TOMAGS study (Ryser & Johnsen, 1998). In other words, as with the reliability and validity values of the original study of TOMAGS, the TOMAGS–Turkish measurement tool has been found to have reliable and valid values, too. For this reason, it can be said that the TOMAGS-Turkish test can be used safely in determining the mathematical ability levels of gifted children.

In addition, findings also coincide with the findings obtained in the Turkish adaptation process of various intelligence test scales. For instance, in studies conducted by some researchers (İlhan & Çetin, 2014; Karabulut, 2012; Tatar, Tok & Saltukoğlu, 2011; Tortop & Sarar, 2018), analysis for the adaptation of the emotional intelligence, cultural intelligence and multiple intelligence scales to Turkish were reflected similar reliability and validity evidences. In addition to these, in Alma' s (2015) study, by using similar adaptation process and analysis, Gifted Rating Scale for Preschool/Kindergarten Form (GRS-P) was adapted to Turkish and so, a Turkish version of the test could be provided to the related literature and field.

In this study, adaptation study of TOMAGS- intermediate, which was mentioned in the international literature by many researchers (Crowley, 2015; Ficici & Siegle, 2008; Leader, 2008; Meehan, 2007; Ryser & Johnsen, 1998) as a reliable test developed to identify gifted students in mathematics, was carried out and it was concluded that the Turkish version of the test is reliable and valid. It is very important to determine the gifted students in mathematics and carry out studies to support their existing potential (Özdemir, 2016). Thus, it is thought that this study which aims to adopt the test that can be reliably used as a first step to identify gifted students in mathematics, might make significant contributions to the field of mathematics education and giftedness. This measurement tool can be used in achieving the goals such as identifying gifted students in potential mathematics, examining student and teacher opinions, presenting differentiated educational practices for them and evaluating their effectiveness. In addition, it is recommended that similar studies are carried out within the scope of the Turkish adaptation study of the TOMAGS 6-12 age test and the adapted test might be used in the field.

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The study is part of the first researcher's dissertation study.

Statements of publication ethics

We declare that the study has no unethical problems and ethics committee approval was obtained from Middle East Technical University, Ankara (Place: ODTÜ, Date:16.06.20 Number: 286208)

Researchers' contribution rate

The authors involved in the research contributed equally.

CONFLICT OF INTEREST

This study has not any conflict of interest.

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Objectives of Recognition in the European Higher Education Area

Canan Ünvan[a*]

a* Dr., Hacettepe University (https://orcid.org/0000-0001-9665-5914) * canan.unvan@gmail.com

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Abstract

The aim of the research is to determine objectives of recognition in the EHEA between 1998-2020 and to reveal aspects open to development. Data of the study was obtained through document analysis of communiques adopted in EHEA Ministerial Conferences. Results of the research: adoption of three cycle system; comparable and readable degrees; the use of EAR Manual; mutual recognition are important. Implementation of LRC helps to facilitate recognition of qualifications in higher education. Recently, a Global Convention for recognition of qualifications in HE was adopted. Use of Diploma Supplement; a close cooperation between quality assurance and recognition networks are encouraged. ENIC-NARIC Networks are necessary for fair and efficient recognition. ECTS boosts external recognition. Quality assurance and accreditation are closely associated with recognition. Recognition in higher education and its tools are substantial in terms of increasing mobility, providing transparency, enhancing employability. Automatic recognition; recognition of prior non-formal and informal learning need to be improved in HE systems through revised national legislations.

Keywords: Higher education, bologna process, european higher education area, recognition

Avrupa Yükseköğretim Alanında Tanıma'ya İlişkin Hedefler

Öz

Bu araştırmanın amacı, Avrupa Yükseköğretim Alanı'nda 1998-2020 yıllarında, tanıma ile ilgili hedefleri tespit etmek ve gelişmeye açık yönleri ortaya koymaktır. Avrupa Yükseköğretim Alanı Bakanlar Konferanslarında kabul edilen bildirgelerin analizi, dolayısıyla doküman analizi ile veri elde edilmiştir. Araştırmanın sonuçları şu şekildedir: üç aşamalı derece sistemi ile karşılaştırılabilir ve anlaşılabilir derecelerin kabul edilmesi; Lizbon Tanıma Sözleşmesi'nin uygulanması; Avrupa Tanıma Alanı Kılavuzu kullanılması; karşılıklı tanıma ilkesi önemlidir. Son dönemlerde, yükseköğretimde yeterliliklerin tanınması için küresel bir sözleşme kabul edilmiştir. Diploma Eki kullanılması; kalite güvence ve tanıma ağları arasında yakın işbirliği teşvik edilmektedir. Adil ve verimli tanıma süreçleri için ENIC-NARIC iletişim ağları gereklidir. Avrupa Kredi Transfer ve Biriktirme Sistemi kullanımı öğrencilerin hareketliliğini artırmada önemli bir etkendir. Kalite güvencesi ve akreditasyon, tanıma ile yakından ilişkilidir. Yükseköğretimde tanıma ve araçları; hareketliliği, istihdamı artırmada, şeffaflığı sağlamada önemli bir role sahiptir. Uluslararasılaşmaya katkıda bulunmaktadır. Otomatik tanıma ile önceki non-formal ve informal öğrenmelerin tanınması konusunda ülkelerin ulusal mevzuatlarını iyileştirmesine ihtiyaç bulunmaktadır.

Anahtar kelimeler: Yükseköğretim, bologna süreci, avrupa yükseköğretim alanı, tanıma

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1 | INTRODUCTION

On May 25, 1998, a meeting was held in Sorbonne with the participation of Education Ministers from Italy, Germany, France and United Kingdom. The Ministers who are responsible for higher education called on the other European countries to join them. The objective was to enhance external recognition and to facilitate employability as well as student mobility. In order to achieve this objective, a common reference frame was encouraged by the Ministers. The ultimate goal was to create a European Higher Education Area (EHEA), where common benefits and national identities affect and reinforce each other for the advantage of Europe (Sorbonne Joint Declaration, 1998).

Following Sorbonne, considering that Europe of knowledge is crucial and widely recognized, 29 European Education Ministers signed the Bologna Declaration on June 19, 1999. Ministers acknowledged that establishment of the European Higher Education Area needs persistent support, governance and adjustment to the continuously progressing demands. Therefore, they planned to meet within two years again to evaluate progress achieved and for new steps. In the Bologna Declaration, Ministers report that they have to look at specifically the purpose of growing international competitiveness of European higher education system. Furthermore, some objectives were set to promote European higher education system worldwide and to establish European Higher Education Area. These objectives are to adopt a system of comparable and readable degrees, in addition by way of Diploma Supplement; to adopt a system basically build on two main cycles; to establish a credits system (e.g. ECTS); to promote mobility by preventing obstacles; to encourage European cooperation in quality assurance; and to promote essential European dimensions in higher education. Ministers particularly point out that they will show respect to the variety of cultures, national education systems, languages and to university autonomy by trying to achieve these objectives (Bologna Declaration, 1999).

Bologna Process started with the aim of creating a European Higher Education Area. The aim of the member countries was to establish a comparable, competitive and transparent higher education area. Depending on the implementations of the countries, objectives were developed within the framework of requirements. In this context, Bologna Process is not a static system, it is a process which continuously improving (YÖK, 2010).

Two years after Bologna Declaration, European Ministers met in Prague to assess progress achieved and to set priorities and directions about the process for the years ahead. Ministers committed that they will continue cooperation on the basis of objectives starting in Bologna Declaration. On the other hand, Turkey, with Prague Communique and Prague Conference in 2001, became a member of Bologna Process (Prague Communique, 2001). Bologna Process created an area for cooperation and dialogue that reaches far beyond Europe (European Commission/ EACEA/ Eurydice, 2015).

Nowadays, there are 49 member countries of the Bologna Process. San Marino has become the member of the Process with 2020 EHEA Ministerial Conference. Every two or three years Ministerial Conferences are organized to evaluate improvement throughout EHEA and to determine new steps. Ministers decide at these conferences on EHEA's central aspects. At each Conference, a communique outlining decisions taken by Ministers is adopted (EHEA and BP, 2020). With each new declaration and communiques, new objectives such as quality assurance, qualifications frameworks, mobility, internationalization, recognition, etc. regarding higher education were included to the agenda of the Bologna Process member countries. Accordingly, Education Ministers of Bologna Process Member Countries commit to implement these objectives in their national higher education systems. Among these objectives, recognition has an inclusive role and recognition is connected to other objectives.

The issue of recognition is at the core of Bologna Process since its beginning. Recognition is regarded as both a nucleus, operational target by itself and an instrument to provide full implementation of EHEA

(European Commission/ EACEA/ Eurydice, 2012). Recognition is a crucial policy tool to consolidate EHEA (EHEA Working group on recognition, 2012).

The term "Recognition" has several definitions depending on the purpose. Firstly, recognition of a higher education institution is a prerequisite for international recognition, an institution should primarily recognized at the national level. Secondly, recognition of an institution nationally does not mean that all its programmes and qualifications are automatically recognized nationally. In some of European countries, some higher education programmes provided by recognized institutions may not lead to nationally recognized higher education qualifications. Thirdly, if both higher education institution and programme are nationally recognized, the awarded qualification is recognized nationally as well. Lastly, the explanation for an individual qualification's recognition abroad is as follows. Ensuring that qualifications acquired in one region of the EHEA are valid for employment and further studies in other region of the Area is important for cooperation and objectives of the Bologna Process. Considering broad European diversity and intention of cross-border mobility for both employment and study motivations, a foreign credential's formal acknowledgement is not adequate. In addition, credential assessors must evaluate foreign qualification in order to find correct path for employment or further studies in the host country (Rauhvargers, 2004). As can be understood from definitions, recognition of a higher education institution, a study programme, a course and a qualification is crucial both at national and international level. At the same time, the concept of fair recognition is underlined by Bologna Process member countries.

On the other hand, fair recognition of qualifications is a technical aim of Bologna Process. It is a piece of set of basic values underpinning the European Higher Education Area. Recognition practice needs to be fair, predictable and safe so that EHEA can be an inclusive, open, and attractive area for students. It is necessary that qualifications and credits gained will be recognized in home as well as in other countries, for any mobile learner or a potentially mobile learner. That's why, if exchange and mobility are to underpin the European Higher Education Area, recognition is a principle that has to be made fully effective and operational (European Commission/EACEA/Eurydice, 2018). Fair academic and professional recognition together with recognition of informal and non-formal learning is at the center of EHEA. It contributes directly to the academic mobility of students and it increases graduates' probability of professional mobility (Bucharest Communique, 2012). As explained above comprehensively, recognition plays an outstanding role in the European Higher Education Area in terms of promoting mobility, internationalization and transparency. Furthermore, recognition facilitates employability.

Recognition has effect and is effected by other policy developments such as internationalization, mobility, qualifications framework, etc. It is at the core of consolidation and development of EHEA. Moreover, it is necessary for continuing implementation of Bologna Process. For this reason, recognition is in high priority of European political agenda (Stakeholders' Conference on Recognition, 2011). There are also some studies at the national level regarding recognition. According to Aydemir (2019), even though there is not a legal obstacle on the implementation of recognition of prior learning (RPL) for Turkish higher education institutions, practices about RPL is not widespread. If essential arrangements such as policy and implementation are made, then, RPL practices is going to improve. Dölek (2017) states that it is necessary to make a new regulation comprehensively on the process of equivalency of foreign qualifications by considering international agreements and implementations in the other countries. Toprak and Erdoğan (2012) states that Europe's lifelong learning policy and its implementation should be taken into consideration as a benchmark. Aksoy (2013) states that challenge in lifelong learning is to identify different learning paths and to develop appropriate solutions. Because lifelong learning is relatively a new concept, this field is open to study for researchers.

Since recognition is an important field in higher education, it is necessary to make more research on the subject and to improve implementations in all dimensions of recognition. Additionally, higher education insitutions need to develop their recognition practices and procedures by considering new and current conditions.

In order to develop recognition processes and implementations in higher education systems within the European Higher Education Area, it is required to follow objectives regarding recognition. In this framework, the aim of the research is to determine objectives on recognition in the European Higher Education Area (EHEA) between 1998-2020 and to reveal aspects open to development.

2 | METHOD

The aim of the research was to determine objectives on recognition in the EHEA between 1998 and 2020. In addition, the aim was to find aspects open to development in recognition. Therefore, the research is a descriptive study. Document analysis method was used in order to achieve findings.

Creswell (2015) states that qualitative researchers collect data by analyzing documents, observing behaviours and interviewing with participants. Furthermore, document analysis is a systematic procedure of assessing and reviewing documents (Corbin and Strauss, 2008; see also Rapley, 2007). According to Yıldırım and Şimşek (2013), document analysis includes analyzing the written materials that contains information about facts subject to research.

DATA COLLECTION AND ANALYSIS

In this context, there are 12 declarations or communiques of Education Ministers between 1998 and 2020 in the European Higher Education Area. These documents are adopted for implementation by Education Ministers of Bologna Process Member Countries and also published after each EHEA Ministerial Conference. In other words, the declarations or communiques consist of Education Ministers' commitments including recognition in higher education. Ministers declare that they are going to improve their recognition practices in their higher education systems. Thus, the declarations or communiques starting from 1998 to 2020 are in Table 1.

Table 1. Declarations and Communiques in the European Higher Education Area

Declarations and Communiques	Date Adopted and Place
Sorbonne Joint Declaration	25 May 1998, Sorbonne (Paris)
Bologna Declaration	19 June 1999, Bologna (Italy)
Prague Communique	19 May 2001, Prague (Czech Republic)
Berlin Communique	19 September 2003, Berlin (Germany)
Bergen Communique	19-20 May 2005, Bergen (Norway)
London Communique	18 May 2007, London (England)
Leuven and Louvain-la-Neuve Communique	28-29 April 2009, Leuven (Belgium)
Budapest-Vienna Declaration	12 March 2010, Budapest (Hungary) and Vienna (Austria)
Bucharest Communique	26-27 April 2012, Bucharest (Romania)
Yerevan Communique	14-15 May 2015, Yerevan (Armenia)
Paris Communique	25 May 2018, Paris (France)
Rome Communique	19 November 2020, Italy (Rome)

Each documents in Table 1 were analyzed separately and items on recognition were determined. That is to say, data of the study was obtained through the analysis of declarations or communiques adopted in the EHEA Ministerial Conferences. As a result, objectives regarding recognition in higher education was obtained through analysis of each declarations or communiques.

3 | Findings

After analyzing these documents comprehensively, main findings regarding recognition in higher education were obtained. It was clearly understood from findings that with each new declaration and communique, a new objective regarding recognition were included. According to findings, commitments of Education Ministers through declarations or communiques regarding recognition in higher education, in other words objectives about recognition in higher education are specified below.

Adoption of three-cycle system; recognition of degrees and study periods

According to Sorbonne Joint Declaration, higher education systems' international recognition and appealing potential are directly associated to their readability both internally and externally. It is perceived that recognition of undergraduate and graduate degrees is crucial in international equivalence and comparison. The Declaration emphasizes that Lisbon Recognition Convention on the recognition of higher education qualifications within European Region was accepted in 1997. The purpose of convention is to facilitate higher education qualifications' recognition among countries.

Bologna Declaration states that a system based on first cycle (undergraduate) and second cycle (graduate) should be adopted with a view to constitute European Higher Education Area and to encourage European higher education system globally. Prague Communique reexpressed the adoption of a system build on two main cycles. It is stated that some countries adopts this system whereas the other countries approaches to this structure with great attention. Berlin Communique states that efforts will be strengthen in speed up effective use of two cycles system. With this communique, doctoral level was included as the third cycle. The communique also expresses that in terms of Lisbon Recognition Convention, first cycle degree programmes should give access to second cycle degree programmes. In addition to this, second cycle degree programmes should give access to doctoral studies. The communique explains that efforts will be strengthen in improving recognition system of periods of studies and degrees.

Bergen Communique urges countries to ratify Lisbon Recognition Convention without delay. The Communique states that principles of the convention will be fully implemented and those principals will be incorporated properly to the national legislation. Participating countries are invited to deal with problems in recognition defined by ENIC/NARIC networks. Ministers mentions that they arrange national action plans to enhance the quality of process related with recognition of foreign qualifications. In addition, the communique indicates that recognition of degrees and periods of study is one of key characteristics of EHEA's structure. In London Communique, Ministers reminds that Lisbon Recognition Convention should be ratified as a matter of priority. In the communique, Ministers agreed to concentrate on completing primarily recognition of degrees and study periods together with some other action lines. In Bucharest Communique, among the goals of EHEA for the next years, there are European Area of Recognition (EAR) Manual and Lisbon Recognition Convention (LRC). Countries are invited to review their domestic legislation to absolutely comply with LRC. The use of EAR Manual need to be promoted so as to improve recognition practices.

In Paris Communique, Ministers express that they will work to implement LRC and its recommendations. Compliance of national legislation with Lisbon Recognition Convention is important to support quality and cooperation within the EHEA. Apart from this, Both in the Paris and Rome Communique, Ministers welcome the efforts on the UNESCO Global Convention for the recognition of

qualifications in higher education. In addition, In Rome Communique, Ministers underline that they will reinforce the LRC's implementation.

Briefly, communiques emphasize the importance of adoption of three cycles system (undergraduate as first cycle; graduate as second cycle; doctoral studies as third cycle), a convention on recognition of higher education qualifications, and EAR Manual.

Convention about Recognition of Qualifications regarding Higher Education in the European Region (namely Lisbon Recognition Convention) was adopted in 1997. The aim of the convention is to facilitate recognition of qualifications allowed in one party in another party. The convention ensures that requests should be evaluated within a reasonable time and in a fair manner. Additionally, ENIC Network is going to facilitate, promote and oversee the implementation of the Convention (Lisbon Recognition Convention, 1997).

European Area of Recognition Manual makes recognition procedures transparent to all stakeholders such as students, credential evaluators, higher education institutions and policy officers directly or indirectly involved in recognition. The Manual aims to contribute to a joint higher education recognition area. All European countries, in the recognition of qualifications, practice a similar methodology on the basis of commonly agreed guidelines and standards. A more transparent and harmonized recognition practice is necessary for quality of student mobility in Europe, thus plays a key role in the EHEA. This is also important for Bologna Process' global dimension because recognition of qualifications is identified as a key field of cooperation (EAR Manual, 2012).

According to the 2015 Bologna Process Implementation Report, first cycle and second cycle are fully implemented in most of the Bologna Process member states. Furthermore, in 33 systems in the EHEA, all first cycle programmes (bachelor degree programmes) give access to the second cycle (master degree programmes (European Commission/EACEA/Eurydice, 2015).

ADOPTION OF COMPARABLE AND READABLE DEGREES; COOPERATION BETWEEN QUALITY ASSURANCE AND RECOGNITION NETWORKS; MUTUAL RECOGNITION

Sorbonne Declaration notes that there is a common ground for mutual recognition of higher education degrees for professional purposes via European Union's respective directives. In the Bologna Declaration, there are some objectives about recognition. One of these is to adopt a system, which compose of easily comparable and readable degrees. The diploma supplement is important to achieve this goal. With the adoption of such a system, employability of European citizens and European higher education system's international competitiveness will be promoted.

Prague Communique mentions that because European tools contributes to facilitating of professional and academic recognition of courses, degrees and etc., higher education institutions was motivated to benefit completely from existing national legislation and tools at European level. Therefore, individuals can productively use their competencies, skills and qualifications within the European Higher Education Area. Besides, with Prague Communique, the concept of fair recognition was emphasized. Organizations and ENIC-NARIC Networks were invited to promote fair and efficient recognition of qualifications at institutional, national and international level. The Communique also notes that a closer cooperation between quality assurance and recognition networks is promoted. Quality assurance systems have a crucial role in securing high quality standards and in making easier comparability of qualifications within Europe.

According to the Berlin Communique, Bologna Process member countries should ratify Lisbon Recognition Convention and so ENIC-NARIC Networks as well as national authorities should practice the convention. Another objective in the communique is about Diploma Supplement (DS). When students graduate, as of 2005, they should receive Diploma Supplement both automatically and free of charge. It should be issued in a commonly spoken European language. Because Diploma Supplement improves higher

education degree systems' transparency and flexibility; it promotes employability and facilitates academic recognition, institutions and employers were invited to use Diploma Supplement. Bergen Communique emphasizes the significance of collaboration between nationally recognized agencies to increase mutual recognition of accreditation or quality assurance decisions.

London Communique emphasizes the importance of fair recognition. It is stated that EHEA's fundamental components are recognition of periods of study, higher education qualifications and prior learning as well as non-formal and informal learning, at national and international level. The Communique also states that there is improvement related to mutual recognition of accreditation and quality assurance decisions. Furthermore, continued international cooperation among quality assurance agencies are promoted. The communique expresses that a register of European Higher Education Quality Assurance Agencies was established. The register is going to increase trust in higher education in the EHEA and beyond and also it is going to facilitate mutual recognition of quality assurance and accreditation decisions.

Budapest-Vienna Declaration remarks that students should benefit from mobility smoothly and they need fair recognition of their qualifications. Paris Communique states that quality assurance is a key to enhance mobility and fair recognition of study periods and qualifications within the EHEA. In this Communique, Ministers, approved the revised Diploma Supplement. Briefly, communiques emphasizes the importance of comparable and readable degrees, ENIC-NARIC Networks, Diploma Supplement and mutual recognition of accreditation decisions.

Diploma Supplement is an important document for the EHEA. It is also a significant tool for graduates to make sure that their degrees are recognized by employers, public authorities and HEIs in a foreign country as well as in their home countries. Since inception of Bologna Process in 1999, Diploma Supplement was adopted in national legislations of member countries. It was committed to issuing Diploma Supplement to all graduates free of charge, in a widely spoken language, and automatically by 2005 (Diploma Supplement Template, 2019). According to the 2015 Bologna Process Implementation Report, all countries within the EHEA issue DS in a widely spoken European language (mostly English as non-national language) (European Commission/EACEA/Eurydice, 2015).

ENIC (European Network of National Information Centers) Network was established in 1994 whereas NARIC (National Academic Recognition Information Centers) Network was established in 1984. The network contributes to creation of EHEA by facilitating recognition of qualifications and curricula (ENIC-NARIC, 2020). According to the 2015 Bologna Process Implementation Report, in 20 countries within the EHEA, higher education institutions make decisions autonomously, but they use the knowledge and experience of national ENIC/NARIC Centre at the same time (European Commission/EACEA/Eurydice, 2015).

Frederiks and Heusser (2005) states that mutual recognition of accreditation decisions is formal acknowledgement of accreditation decisions in one country by competent authorities in another country. One of the striking reasons to making effort for mutual accreditation decisions is to promote international mobility of students as well as staff, which is underlying motive of Bologna Process. In order to facilitate mobility, it is essential that both bachelor degree (first cycle) and master degree (second cycle) are recognized in all Bologna member countries. Furthermore, accreditation plays an important role in this process since the recognition of degrees is mostly associated with accreditation of these degrees.

Using Credits

According to Sorbonne Joint Declaration, the use of credits like ECTS (European Credit Transfer and Accumulation System) is going to facilitate the process for those who want to study in a different country and to acquire a degree. The aim is to create apparent higher education systems for all and to improve external recognition. Bologna Declaration remarks that establishment of a credits system (e.g. ECTS) is an appropriate tool to promote students' mobility extensively. In addition, credits could be obtained in non-higher education circumstances, including lifelong learning, if they are recognized by related universities.

In Prague Communique, the necessity of ECTS was underlined. The communique states that these arrangements as well as mutually recognized quality assurance systems will improve competitiveness, attractiveness and compatibility of European higher education and also will make easier access of students to the European labour market. If use of this credit system and Diploma Supplement is generalized, the progress will foster in this direction. With Berlin Communique, substantial role of ECTS was emphasized. ECTS facilitates student mobility and curriculum development internationally. In addition, the communique states that ECTS is progressively becoming a generalized basis for credit systems at the national level. A goal for further progress was encouraged in the communique that ECTS is not only a transfer system but also it is an accumulation system. In other words, ECTS is also used for credit accumulation. London Communique states that efforts should be made regarding appropriate implementation of ECTS build on student workload and learning outcomes. With the Yerevan Communique, revised ECTS Users' Guide was adopted as an official document of EHEA. Briefly, communiques emphasizes the importance of ECTS and ECTS Users' Guide.

ECTS is a tool of the EHEA for making courses and studies more transparent. Thus, it helps to improve quality of higher education. ECTS Users' Guide includes guidelines to implement ECTS. In the guide, there are also links to useful supporting documents (ECTS Users' Guide, 2015). According to the 2015 Bologna Process Implementation Report, the vast majority of Bologna Process member countries use ECTS for all higher education programmes (European Commission/EACEA/Eurydice, 2015).

Recognition of Prior Learning

According to Berlin Communique, in realizing lifelong learning, higher education plays an important role. Therefore, necessary measures are taken to align national policies. HEIs and all related stakeholders are encouraged to improve prospects for lifelong learning in the level of higher education including recognition of prior learning. It is stated in the communique that such an action need to be an integral piece of higher education activity. With the Bergen Communique, Ministers express that they are going to work with HEIs and related other stakeholders in order to improve recognition of prior learning. London Communique states that recognition of prior learning for credits and access well developed in only a few EHEA countries. That's why, the communique stresses to improve RPL.

In Leuven Louvain la Neuve Communique, among priorities for the next decade, there is lifelong learning. Accomplished policies in the lifelong learning is going to involve fundamental procedures and principles for recognition of prior learning based on learning outcomes irrespective of if skills, competences and knowledge were obtained through formal, informal or non-formal learning paths. In Yerevan Communique, one of the commitments of Ministers is to eliminate barriers for recognition of prior learning. This will provide access to higher education programmes and facilitate award of qualifications based on prior learning. In addition, HEIs will be encouraged to enhance their capacity to recognize prior learning. Briefly, communiques emphasizes the importance of recognition of prior learning. Recognition of Prior Learning plays a crucial role in succeeding lifelong learning.

A formation of system for recognition of each forms of prior learning is one of the main themes in both higher education sector and all other education and training sectors. There is a need to increase recognition of knowledge and skills acquired through informal and non-formal learning. The objective for recognition of prior learning from the learner's point of view is to gain admission to a higher education programme or to continue in higher education studies (European Commission/ EACEA/ Eurydice, 2012). According to 2020 Bologna Process Implementation Report, only six higher education sytems (Denmark, France, Finland, Belgium-Flemish Community, Romania and the Netherlands) in the EHEA achieve recognition of prior non-formal and informal learning (European Commission/EACEA/Eurydice, 2020).

Automatic Recognition

According to Bucharest Communique, ways for achieving comparable degrees' automatic academic recognition will be explored. In Yerevan Communique, automatic recognition of qualifications are stated among the priorities of Bologna Process member countries. If this is achieved, students and graduates move in a comfortable way internationally. In the Communique, automatic recognition is among the commitments of the Ministers. Ministers commit that they will ensure automatic recognition of qualifications from other EHEA countries at the same level as relevant national qualifications.

Paris Communique states that Ministers will work to ensure automatic recognition so as to further improve mobility and recognition within the EHEA. Rome Communique underlines that Ministers will make sure automatic recognition of periods of study and academic qualifications within the EHEA. Thus, students, graduates and staff are able to move to teach, study and do research without restriction. Briefly, if automatic recognition is achieved within EHEA, mobility of students and graduates will be in a more comfortable manner.

The definition of Automatic Recognition Pathfinder Group is as follows: "Automatic recognition of a degree leads to automatic right of an applicant holding a qualification of a certain level to be considered for entry to a programme of further study in the next level in any other EHEA-country (access)". It is also stated that automatic recognition is an essential precondition for extensive academic mobility (EHEA Pathfinder Group on Automatic Recognition, 2014). Automatic recognition does not suggest automatic admission to any specific programme. It means that holders of a qualification giving access to a study programme at the next level have the right to be noticed for entry (European Commission/EACEA/Eurydice, 2018). 2020 Bologna Process Implementation Report shows that most of the countries in the European Higher Education Area have to improve their practices on automatic recognition. According to this report, only 10 countries (Turkey, Denmark, Finland, France, Germany, Italy, Malta, Norway, Poland and Sweden) practices automatic recognition in their systems.

Consequently, according to the findings of the research, main themes related to recognition in the declarations and communiques are use of credits, a convention to recognize higher education qualifications, mutual recognition, ENIC-NARIC networks, fair recognition, recognition tools, ECTS, Diploma Supplement, transparency, recognition of prior learning, recognition of periods of studies and degrees, automatic recognition, and European Area of Recognition Manual. By taking into account these themes, objectives of recognition were offered. Accordingly, objectives on recognition in declarations and communiques between 1998-2020 are adoption of undergraduate and graduate degrees; recognition of degrees and study periods; adoption of comparable and readable degrees; cooperation between quality assurance and recognition networks; mutual recognition; using credits; recognition of prior non-formal and informal learning and automatic recognition.

When these objectives are evaluated, recognition tools such as Diploma Supplement and ECTS are also encouraged in the documents in order to improve recognition procedures in higher education systems. Recognition is important because it facilitates mobility, enhances transparency and contributes to internationalization. For this reason, From Sorbonne Joint Declaration to Rome Communique, for 22 years, Bologna Process Member States identified new targets regarding recognition in higher education. They committed to implement these objectives in their national higher education systems through declarations and communiques. It was obviously understood from findings that with each new declaration or communiques, the scope of the target about recognition in higher education was extended. These objectives are briefly as follows: Adoption of three-cycle system is on the agenda of countries in the EHEA. In addition, it is emphasized that implementation of Lisbon Recognition Convention by countries helps to facilitate recognition of qualifications in higher education. Recently, a Global Convention for recognition of higher education qualifications was adopted on November 2019. The use of European Area of Recognition (EAR) Manual is also encouraged. Another objective is to adopt comparable and readable degrees. Use of Diploma Supplement is promoted. The necessity of ENIC-NARIC Networks is underlined

for fair and efficient recognition. Furthermore, a close cooperation between quality assurance and recognition networks is encouraged. Mutual recognition in some fields is also on the agenda of the EHEA. Use of credits is also the other objective. Using credits like ECTS boosts external recognition and ECTS promotes mobility of students. The other objective is to develop recognition of prior learning (RPL). RPL is also closely connected to lifelong learning. Another objective is to enable automatic recognition of qualifications. According to 2018 Bologna Process Implementation Report, there are differences in implementation levels of recognition between countries. There are also aspects open to development in recognition such as automatic recognition, recognition of prior non-formal and informal learning (European Commission/EACEA/Eurydice, 2018).

A crucial issue is that objectives in recognition should not be evaluated separately, because they are all connected to each other. On the other hand, countries in the EHEA need to improve some of recognition procedures in their higher education systems.

4 | Discussion and Conclusion

Since the beginning of the Bologna Process, objectives regarding recognition were set through declarations and communiques in order to improve mobility, exchange, transparency, employability, etc. Because recognition is at the center of the EHEA, countries are making efforts to achieve objectives regarding recognition in their higher education systems. Communiques and declarations are significant documents in order to absorb targets in the EHEA. From Sorbonne Joint Declaration (1998) to Rome Communique (2020), for 20 years, there are essential goals for both recognition and also in the other fields of higher education to consolidate EHEA. Bologna Process member countries are responsible to fulfill those objectives.

International prerequisites for improving recognition throughout the EHEA was created on a large scale. The next step is to make the big attempt and bring it all “down to institutional actuality” or to fail (Rauhvargers, 2004). In communiques and declarations, importance and necessity of recognition is clearly expressed. Furthermore, there are objectives for countries in order to achieve better recognition. For instance, London Communique emphasized that institutional and national approaches to the recognition must be more coherent. In other words, coherent use of tools as well as recognition practices is necessary to improve the process. Leuven Louvain la Neuve Communique states that European Credit Transfer and Accumulation System and Diploma Supplement are promoted by the Bologna Process in order to further enhance transparency and recognition. According to the Communique, tools of multidimensional transparency must be related closely to the Bologna Process principles (e.g. specifically recognition) and recognition is going to remain among priorities. According to Bucharest Communique, in order to strengthen EHEA, meaningful practice of learning outcomes is required. Understanding, development and realistic use of learning outcomes is important for the success of Diploma Supplement, ECTS, recognition etc. All of these are interdependent. Bologna tools such as ECTS and Diploma Supplement need to be ensured based on learning outcomes.

As it is seen, if recognition processes continue in a productive manner, reflections to the other fields of higher education will be major. Nowadays, there are still differences in the level of implementation among Bologna Process Member Countries. Rauhvargers (2004) states that for the recognition of qualifications in the EHEA, it is necessary that LRC is ratified in all Bologna member states. Two-tier degree structure throughout Europe is beneficial in terms of comparability and transparency.

According to the European Higher Education Institutions Convention, European universities are willing to use available instruments such as ECTS, Diploma Supplement, ENIC-NARIC Network and Lisbon Convention for recognition and mobility in a constructive and flexible way (Convention of European Higher Education Institutions, 2001). Countries in the European Higher Education Area are all aware of the

importance of the subject. They are realizing dimension and tools of recognition such as ECTS, Diploma Supplement, ENIC-NARIC Networks, Lisbon Recognition Convention, European Area of Recognition Manual, etc. in their national higher education systems.

Besides, due to fast growth in internationalization of higher education, it was decided to create a global regulatory framework for recognition of higher education qualifications. The Convention was adopted on November 2019 and it is called "Global Convention on the Recognition of Qualifications concerning Higher Education". The convention is going to facilitate academic mobility, widen access to higher education in the world. It will increase the possibility of cross-border education for researchers, teachers, job seekers as well as students. It will contribute that higher education qualifications will be evaluated through non-discriminatory, transparent and fair mechanisms. Accordingly, it will reinforce international cooperation in higher education and it will be beneficial to enhance quality of higher education globally (UNESCO Global Convention, 2020). Apart from these, fair recognition of qualifications, automatic recognition, recognition of prior learning and mutual recognition are crucial issues to consider by countries.

The significance of recognition of skills and knowledge acquired through informal and non-formal learning was emphasized by communiques of Ministerial Conferences for years. Recognition of prior informal and non-formal learning facilitates alternative access paths to higher education and enables informal and non-formal learning to be credited and recognized during studies (European Commission/EACEA/Eurydice, 2018). Yerevan Communique notes that automatic recognition of qualifications should be a reality by 2020 (Yerevan Communique, 2015).

Another outstanding matter in the recognition is that quality assurance, accreditation, quality assurance agencies are very closely associated with recognition. Frederiks and Heusser (2005) states that in several countries of the world, mutual recognition of accreditation or other quality assurance systems is being debated. This process, in Europe, is very much associated with Bologna Process leading to introduction of first cycle (bachelor) and second cycle (master) degree programmes and revitalizing accreditation in many European regions. It is believed that mutual recognition of accreditation decisions is going to contribute to recognition of higher education qualifications and students' mobility in Europe. It is also going to be advantageous for study programmes and institutions operating cross borders. Accreditation decisions are important in terms of facilitating international recognition of degrees. That's why, in the future, it can be anticipated that accreditation will become even more outstanding.

Furthermore, quality assurance and recognition are important in developing transparency and trust in higher education systems throughout the European Higher Education Area (European Commission/EACEA/Eurydice, 2018). As a conclusion, recognition and its tools are substantial in terms of increasing mobility, providing transparency and enhancing employability. They contribute to internationalization of higher education systems. That's why, countries, higher education institutions and related stakeholders need to consider all dimensions of recognition in their implementations. Furthermore, automatic recognition as well as recognition of prior non-formal and informal learning need to be improved in higher education systems through revised national legislations.

Statement of Publication Ethics

I declare that the research has no unethical problem and I observe research and publication ethics.

Conflict of Interest

The study has no conflict of interest.

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Sociological Inferences Deduced from Creative Writing Activities: Analyzing Gender Perceptions and Stereotypes of Children in terms of Child Development

Senem Gürkan [a*]

[a*] Dr. Res. Asst., Ondokuz Mayıs University, (https://orcid.org/0000-0002-2061-6385) * senem.gurkan@omu.edu.tr

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Abstract

Being a sample for the field of sociology of education, this research aims at analyzing the gender perceptions and gender stereotypes of students through their creative writing activities. The participants of the study chosen by purposeful sampling technique are 97 3rd grade students who study at a primary state school in Samsun, Turkey. A child of 9 years has knowledge of a person's behavior that is equal to his/her gender stereotypes in terms of child development. So, the participants were chosen intentionally of this age group. As the 82 writings of the students were valid for this research, the sample of the study is 82 writings, 43 of which were collected from girls and 39 of which are from boys. Carried out through qualitative and quantitative, that is, mixed type research paradigms, the design of this study is content analysis. As the data collection technique, document analysis is employed to the free topic creative writing activities of children. During data collection period and procedures, the students were free to choose the topic and the setting was their own classroom to create a natural accommodation. The parents of the students were asked to receive their consents before the activity. As for the data analysis, content analysis was also used as the data analysis technique. The children's writings were examined for five categories evaluated from the previous studies in literature. These categories were choice of the topic, frequency of male and female characters, attributes, occupational roles and domestic roles. The findings of the study, in short, show that stereotypical differences and gender perception differences occur in the creative writings of children.

Keywords: Sociology of education, child development, gender, creative writing, content analysis

Yaratıcı Yazma Çalışmalarından Elde Edilen Sosyolojik Çıkarımlar: Çocukların Toplumsal Cinsiyet Algılarının ve Kalıp Yargılarının Çocuk Gelişimi Açısından İncelenmesi

Öz

Eğitim sosyolojisi alanındaki çalışmalara örnek teşkil eden bu araştırma, öğrencilerin toplumsal cinsiyet algılarını ve kalıp yargılarını yaratıcı yazma çalışmaları yoluyla incelemeyi amaçlamaktadır. Amaçlı örneklemeyle seçilen katılımcılar, Türkiye'de Samsun ilinde bir devlet ilkokulunun 3. sınıfında eğitim görmekte olan 97 adet ilkokul öğrencisidir. 9 yaşındaki bir çocuk, bir kişinin davranışları hakkında çocuk gelişimi açısından cinsiyet klişelerine ilişkin bilgiye sahip olduğundan, bu yaş grubu özellikle seçilmiştir. Toplanan çalışmaların 82 adeti geçerli olduğu için, çalışmanın örneklemini, 43'ü kız, 39'u erkek olan 82 öğrenci oluşturmuştur. Hem nitel hem nicel araştırma paradigmaları (karma) doğrultusunda yürütülen çalışmanın deseni içerik analizidir. Öğrencilerin serbest bir konuyla ilgili yazdıkları çalışmalardan elde edilen veriler, doküman analizi tekniğiyle incelenmiştir. Veri toplama sürecinde ve prosedürlerinde, öğrenciler, diledikleri bir konuda yazı çalışması yapabilmeleri üzerine serbest kılınmıştır ve bu çalışmalar, öğrencilerin doğal sınıf ortamında uygulanmıştır. Öğrencilerin ailelerinden, uygulamadan önce onay alınmıştır. İçerik analizi, aynı zamanda bu çalışmanın veri analiz tekniği olarak da kullanılmıştır. Öğrencilerden toplanan veriler -yaratıcı yazma çalışmaları-, daha önce alanyazında yapılmış çalışmalardan derlenen beş kategori çerçevesinde incelenmiştir. Bu kategoriler konu seçimi, kadın ve erkek karakterlerin sıklığı, kişilik özellikleri, mesleki roller ve ev içi rollerdir. Çalışmanın bulguları, çok öz olarak, öğrencilerin yaratıcı yazma çalışmalarında toplumsal cinsiyet algılarına ve kalıp yargılarına yönelik farklılıklar olduğunu ortaya koymuştur

Anahtar kelimeler: Eğitim sosyolojisi, çocuk gelişimi, toplumsal cinsiyet, yaratıcı yazma, içerik analizi

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1 | Introduction

Gender is a term referring to the responsibilities, traits and some other social interactions attributed to women and men in society. Children learn these different roles and traits called gender stereotypes within their socialization process. The term "gender" is generally used instead of "sex", that is, the biological sex of a person. Formerly and firstly underlined by Money (1955), these terms are different. However, gender is a social phenomenon and it a culture-based sex (Bhasin, 2003; Dökmen, 2004; Butler, 1999).

Regarding the usage of the term, until 1970s, "gender" was used to indicate grammatical structures. When Oakley (1972) used the term in a sociological area, the term came into the field of sociology as today.

Once the children get these gender cognitions as gender stereotypes, they recreate these differences as their behavior when they develop into adults (Eagly & Steffen, 1984). These unequal assumptions for gender can be commented as social discrimination gathered by children after they learn how to sort men and women according to their roles and activities and then entrench in their long-term memories (Davies et al. 2005).

It is a very well-known theory of Kohlberg (1966) that the cognitive development stage of a child includes the child's gathering her/his gender identity as the child made a cognitive judgment of the sex he or she belongs to. This means that a child who is 8 or 9 years old knows how a person behaves in parallel with the gender stereotypes and is aware of sex-typing. Based on this theory, the children of 9 years were selected as the participants of this study.

Language generally, use of language specifically, is a way of revealing the social and cultural approvals of children. Therefore, some social issues such as gender (Davies, 1989), culture, religion, etc. (Sumida, 2000) can be gathered from the products of children. Creative writing activities, for example, can be used as these kinds of materials to identify and describe children's social views. With creative writing activities, as the writers of these genres are also the good observers of the society, they can observe and write the lives, actions and the attitudes of the human beings (Harper, 2013: 3).

Another reason for choosing a creative writing activity is that "creative writing is a rich, personal, value-laden language activity and can provide a record of thought which represents the writer's ordering of reality." (Trepanier-Street & Romatowski, 1991). In addition to this, allowing children to write what they want, that is, free choice of topic would have a positive effect on reproducing the gender stereotypes of the children that can be observed in their writing activities (Maryland, 1983). This is because the children are actually are not free, their gender would be in the practices they apply (Clark, 1989).

From this point of view, the aim of this study is to analyze the gender perceptions and gender stereotypes of children through their free topic creative writing activities.

The questions that are sought to be replied are:

1- Are there any differences in the choices of topic of male and female students?

2- Are there any differences in the frequency of male and female characters of male and female students?

3- Are there any differences in the attributes of male and female characters of male and female students?

4- Are there any differences in the occupational roles of male and female characters of male and female students?

5- Are there any differences in the domestic roles of male and female characters of male and female students?

6- Do the creative writing activities of children provide us with a sociological aspect as determining gender bias perceptions?

Literature Review for Creative Writing and Gender Studies

Gender and creative writing are the two issues discussed together with in order to put forth the importance of creative writing to reveal the gender-biased or lack of gender-biased uses of the young authors.

Sometimes gender is taken as one of the variables or factors to reveal the difference in creative writing performance; whereas sometimes creative writing activities are used as a means of data collection technique to discuss some sociological issues such as gender stereotyping, economic, cultural, political and religious structures, etc.

One of the studies which took gender as a variable to show the difference in creative writing performance is done by Baer & Kaufman (2008). Using divergent thinking tests as a means of data collection, the researchers founded that there is not a concrete evidence to suggest a difference, but there is a fact that females are superior to males at creative tests.

Tsai (2013), for instance, aimed to evaluate creativity performance by using collage making activity as a CAT (Consensual Assessment Technique) to evaluate the gender differences in the students' writing performances. The participants of the study were 18 graduate or doctoral students from a university, 7 of which are males and 11 are females. As the results of the study, some gender differences were found. The males showed a tendency to use more abstract and original Picture structures then those of females. Moreover, there seems to show a negative correlation between the students' academic performance and their creativity.

There are many other studies suggesting that there are differences between the sexes of the students when the aim is evaluating the creativity. Including 122 children and 200 adults showing some markers of dyslexia in their genetics of families as the participants of their study, Berninger et al. (2008) found some gender differences in their writing. Vlachos & Bonoti (2006) found the same kind of differences between genders in creative writing. Ulu (2019), also revealed the gender differences in creativity of the 4th grade students in terms of gender and some other variables.

Another study done with 20 kindergarten students aimed at examining gender-based differences in the writing of young children. The findings of the study show that the students' choice of topics show gender differences, as boys chose gender specific topics such as dinosaurs, aliens, Mario Brothers, Star Wars, and sports whereas Girls chose the topics with baby, dolls, Hannah Montana, family, pets, and school (Buxton, 2011).

On the other hand, some other studies were carried out not to take gender as a factor or a variable for scaling the creativity performance; but to use creative writing activity as a means of data collection technique to reveal a child's social opinions from their own writings.

One of these, Sumida (2000), revealed the thoughts of the students about gender, society and economy by examining the writings of her students.

In his comprehensive study, Dobson (2017) used language-context discourse analysis in order to analyze the secondary school male students' gender identities and view of hegemonic masculinity. The study proposes some suggestions to review the curriculum and pedagogies.

Trepanier & Romanowski (1985) are the other researchers using creative writing activities as an evidence for revealing the gender differences and gender role perceptions of 180 elementary school children. The students wrote these activities in their own classrooms and they were free to choose the topic for their writings. Their stories were examined for the frequency of the male and female characters,

attributes and roles of the characters. The findings of the study suggested both similarities and differences between male and female students.

Another study close to our one examined the written completing of the students' writings to story starters. The characters were both stereotypical and non-stereotypical regarding their occupations. The results of the study suggested both gender differences and gender stereotyping between children (Trepanier-Street et al. 1990).

In their study to develop an instrument to determine whether the gender roles can be apparent from the characters written by the writing activities of children, Tuck, Andree and Bell (1985) created "ACTS-The Analysis of Character Traits-. As the results of the study, it was found that both male and female authors use gender stereotypic traits and the characters of both male and female students include these traits.

2 | Method

This study, the purpose of which is to examine the gender perceptions and gender stereotypes of the primary school students through their creative writing activities, is a mixed type of research in which both qualitative and quantitative research models were conducted. Regarding the qualitative research, to reveal the gender perceptions, qualitative method was used. Moreover, to remark the percentage and frequency of these perceptions, quantitative method was used to support the qualitative findings.

Research Design

As for the design of the study, in order to reveal these perceptions, content analysis was employed, as it describes 'the core consistencies and meanings' (Patton, 2002: 453) and/or "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (Krippendorff, 2004: 18). In other words, to set forth what the participants intend to say and mean, content analysis was conducted to the data that were collected.

Participants

In order to strengthen the study, the samplings were not chosen randomly, but purposefully via purposeful sampling, involving selecting the participants who are the right people to have knowledge and experience about the phenomenon that is being studied (Cresswell & Plano Clark, 2011). As stated in the introduction part of the study, a child of 9 years has knowledge of a person's behavior that is equal to his/her gender stereotypes. So, the participants were chosen intentionally of this age group.

The participants of the study are the 97 3rd grade students who were from a primary state school in Samsun, Turkey. As the replies of the 82 students were valid (as some students used some gender unspecified characters, only the writings with gender specified female and male characters were valid), the participants would be considered as 82 students, 52% of whom were female (43 girls) and 48% of whom were male (39 boys). Their ages were all 9.

Data Collection and Procedure

As the data collection technique, document analysis, "in which documents are interpreted by the researcher to give voice and meaning around an assessment topic" (Bowen, 2009), was used. These documents consist of the creative writing studies of the students who were free to choose the topic.

This writing activity was fulfilled in students' own classroom settings to create an unstructured and natural atmosphere.

All the students were free to choose a topic to write during the activity. They also had the freedom to choose the plot and the number of the characters in their stories. They were given two course time (80 minutes) to complete the activity.

The researcher gave these instructions to the students:

"Dear students. I want you to write a story about any topic, on any plot you wish and use as many characters as you wish to create a story. I will give you a paper, and if it is not enough, I can give you more. Please use your imagination and creativity and write a story. You have two course times, that is, 80 minutes. Before you start, please do not forget to write your age, class and sex on the paper. I hope you will enjoy this activity. Good luck and thank you in advance!"

As for the rating procedure, three experts (one from Department of Gender Studies and two from the Faculty of Education) were asked to control the results that the researcher gathered from the writings of the students. After these judges arrived at a consensus, the rating procedure of this research was over.

Limitations

In order to make the methodology and the possible findings of the study clearer, the limitations of this study should be considered:

The first limitation is about the valid writings of the study. At the beginning of the study, there were 97 students to participate to the activity. However, as 15 of them used gender unspecified characters, only the rest 82 writings were taken into account. Lastly, the participants, that is, samples of the study were not chosen randomly as it was easy to reach them. Of course, with a bigger number of participants, the study could be more forceful.

Data Analysis

Regarding the data analyses, content analysis was also used as the data analysis technique, just as the researchers confirmed this situation and regard content analysis both as a design and as a data analysis technique (Taylan, 2011:64; Merriam, 1998). The collected data were examined in order to come to the findings and get responses to the categories given below. These categories that were used during content analyses were gathered from the researches done before such as Trepanier & Romatowski (1985) and Tuck, Andree & Bell (1985).

These five categories are:

- Choice of the topic
- Frequency of male and female characters
- Attributes
- Occupational roles
- Domestic roles

Research Ethics

The ethical approval report of this research was taken from Ondokuz Mayıs University Ethical Committee on 2020, 26th August with the number of 220-494. The parental consent of the participants was received before the activity.

3 | Findings

Findings for the Choice of the Topic

When the titles of the writing of the students were analyzed, as stated in Figure 1, it was found out that the 82 different topics could be classified into 11 categories: friendship, the life of a friend or a person, legendary characters, nature, animals, their own life or their dream world, space, extraordinary things, virus, a member of the family, school.

The students mostly preferred to write on the theme of "The Life of a Friend or a Person", 35,4 %, and "Their Own Life or Their Dream World", 18,3 %. The other topics that the students choose to write were Animals, Extraordinary Things, Legendary Characters, Space, Nature, Friendship, School, Virus and A Member of the Family.

Table 1. The Categories for Topics

Topic	Frequency	Percent (%)
The Life of a Friend or a Person	29	35,4
Their Own Life or Their Dream World	15	18,3
Animals	9	11
Extraordinary Things	8	9,8
Legendary Characters	5	6,1
Space	5	6,1
Nature	4	4,9
Friendship	3	3,7
School	2	2,4
Virus	1	1,2
A Member of the Family	1	1,2
TOTAL	82	100,0

Table 2. The Choices of Topic of Male and Female Students

Topic	Female Students	Male Students
The Life of a Friend or a Person	15	14
Their Own Life or Their Dream World	10	5
Animals	5	4
Extraordinary Things	4	4
Legendary Characters	3	2
Space	3	2
Nature	1	3
Friendship	2	1
School	0	2
Virus	1	0
A Member of the Family	0	1
TOTAL	43	39

These findings regarding the distribution of topic according to sex show that sex makes difference according to the choice of topic, but the rate is not the same with each topic. The most significant difference between the choice of female and male students' use of topic is on the topic "Their Own Life or Their Dream World Friendship and Virus", as Figure 2 indicates. While the 10 of the female students

preferred to write on the "Their Own Life or Their Dream World", only 5 of the male students preferred the same. 2 of the girls wrote on the theme "Friendship" whereas only one of the boys wrote on the same issue. Lastly, one of the girls wrote on "Virus" while no male student wrote.

The boys wrote more than girls on the themes such as "Nature"; the 3 of the boys wrote on this theme while only one of the girls chose to write. Two of the boys wrote on school while no girl wrote on this theme. Lastly, one of the boys wrote on "A Member of the Family" while no girls wrote.

There seems to be no big differences between girls and boys regarding the choice of the topic. When the results of the former studies are compared to the findings of this study, there is no parallelism with former studies. In the study of Graves (1973), girls had a tendency to write about primary territory (about family, friends, class, animals, school, etc.) while boys did not have. But in our study, there is no clear-cut distinction between girls and boys.

Findings for the Frequency of Male and Female Characters

Table 3. Findings for the Frequency of Male and Female Characters

	Frequency of Female Characters	Percent %	Frequency of Male Characters	Percent %	
The Use of Female Students	93	72	56	46	149
The Use of Male Students	36	28	67	54	103
TOTAL	129	100,0	123	100,0	252

Each writing of the students was examined for the frequency of male and female characters that were created and/or used by the participants. The results gained from the frequency of male and female characters indicated that the students tend to create and/or use the characters of their own sex as Figure 3 demonstrates.

The findings demonstrate that the students totally used 252 characters, 129 (51%) were female and 123 (49%) were male characters, which shows no significant difference.

As a result of the analyses it was found out that the female students used 149 characters, 93 of which were female characters and 36 of which were male characters. Moreover, it was found out that the male students used 103 characters, 36 of which were female characters and 67 of which were male characters. The important point that must be underlined here is that the students used the characters of their own sexes mostly; female students used more female characters and male students used more male characters.

Findings for the Attributes

The children's writings were also analyzed for the attributes of female and male characters created by the participants.

When the writings of the students were observed, it was found out that between the 82 writings, the 57 of the writings included attributes regarding gender. When the roles, attributions and responsibilities of women and men in the society are considered, both male and female students attributes domestic roles in the private sphere (child and elderly care, doing the washing up, cooking, helping children with their homework, taking children to school or zoo) for women and the outer work in the public sphere (earning the livelihood, buying presents for children, taking his family to picnic, hunting, fighting or struggling for something, directing) for men.

Findings for the Occupational Roles

Another category analyzed within this study was the occupational roles of the characters created by the participants. The data shows that there are 20 different occupations used by the students, 16 (80 %) of which are the occupations for men and 4 (20 %) are for the women.

These occupations for men are hunter, pilot, director (manager or king), teacher, officer, woodsman, astronaut, scientist, doctor, basket maker, soldier, athlete, grocer, policeman, farmer, toy seller. The occupations of women are teacher, doctor, photographer and musician. The students created the characters with the occupations in parallel with the attributions of the society, that is, the men would be clever, powerful and strong, while the women are responsible for caring and teaching.

The occupations mostly used by the students are astronaut and female teacher (used 5 times by the students, 6,1 %) and director (manager or king; used 4 times by the students, 4,9 %). Following these, the students used hunter (used 3 times by the students, 3,7 %) and athlete, male teacher and officer (each was used 2 times by the students, 2,4 %). The other thirteen occupations were used for 1 time (1,2 %), equaling to 15,6 % in total.

Table 4. Findings for the Domestic Roles

	Frequency	Percent %
mother	35	19
children	34	18,3
daughter	25	13,5
father	21	11,4
son	17	9,2
sister	10	5,4
brother	9	4,8
grandfather	7	3,8
cousins	5	2,7
grandmother	5	2,7
aunt	4	2,2
wife	4	2,2
uncle	4	2,2
husband	3	1,6
twins	2	1
TOTAL	185	100

The last category to be applied for the data collected from the participants of this study is the domestic roles of the characters created by the participants.

When the frequencies of the domestic roles were considered, it was found out that the children used mother (19%), children (18,3%) and daughter (13,5 %) mostly. The other domestic or family roles that were used in the stories were father, son, sister, brother, grandfather, cousins, grandmother, aunt, wife, uncle, husband and twins. When the domestic roles created by the female and male authors are considered, there seems to be no significant difference in the use of these roles.

4 | Discussion, Conclusion and Suggestions

The findings of the study indicate that stereotypical differences and gender differences occur in the stories created by children which constitute a solid demonstration for a child's sexual development. The evidence for this situation can be seen in the choice of the topic, frequency of male and female characters, attributes, occupational roles and domestic roles, just as the other studies revealed before (Trepanier & Romatowski, 1985; Tuck, Andree & Bell, 1985).

As for the choice of topic, there seems to be difference between girls and boys, but not so big. The most important difference is on the topic of "Their Own Life or Their Dream World Friendship and Virus" on which the girls write mostly. On the other hand, the boys chose to write on the themes "Nature" and "Member of the Family" more than those of the girls. Unlike the other studies, in this study the choice to write about the primary territory and the other territories did not show differences between sexes. When the results of the former studies are compared to the findings of this study, there is no parallelism with former studies. In the study of Graves (1973), girls had a tendency to write about primary territory (about family, friends, class, animals, school, etc.) while boys did not have. But in our study, there is no clear-cut distinction between girls and boys.

The findings of the study also showed that the frequency of male and female characters differs according to sex. In other words, the girls have a tendency to create and/or use the characters of their own sex such as boys. This category was also used by Trepanier & Romanowski (1985) who found the same difference between male and female students.

The analyses of the study on the attributes of the characters suggested that both male and female students created and used the characters in parallel with the gender stereotypes; private sphere for female characters and public sphere for male characters. This is an indication that there is no difference in the use of attributions of female and male characters according to the sexes of the authors, just as Tuck, Andree & Bell (1985) put forth in their studies.

The study also reveals that it is possible to see 20 different occupational roles created both male and female characters. However, 80% of these occupations are for men whereas only 20% of these are for women. Moreover, the occupations referred to women are teacher and doctor, about teaching and caring, in parallel with the gendered attributions of the society. Moreover, the analyses of the occupational roles do not show differences according to the sexes of the students.

In short, the findings of the study suggested that the stories created by students show gender related differences between sexes on the categories such as choice of topic, frequency of male and female characters and occupational roles; whereas there seems to be gender related differences between sexes on the categories of attributes and domestic roles. These findings demonstrate that as many studies ascertain the gender differences between female and male students found as a result of creative writing activities (Berninger et al., 2008; Vlachos & Bonoti, 2006; Ulu, 2019); there are still gender inequality regarding the gender perceptions of the students. In order to struggle with this unequal condition and achieve a non-gendered education, these suggestions can be made:

- All the materials and curriculum related to students should be observed by the experts of gender studies in order to gain non gendered materials.
- A compulsory or optional course on gender studies should be included in the curriculum of all the grades of the educational system.
- The writers and preparators of the books and curriculums and teachers should take teacher training program on gender.
- The parents of the students should take a training program on gender.
- The legislations on gender equality should be thought and promoted to the public.
- More writing activities, whether free of topic or not, should be applied to the students.

Statement of Publication Ethics

I declare that this research has no unethical problems that will limit the publication of the article.

Researchers' Contribution Rate

Written by one writer, all the contribution rate of the study is of the author.

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