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Dr. Ertuğrul USTA

Necmettin Erbakan University

ertugrulusta@gmail.com

Journal Secreteria

Dr. Veysel Bilal ARSLANKARA

vbilalarslankara@gmail.com

Language Editor

Handan ATUN

handanatun@gmail.com

Editorial Assistant
Emine Demirci DÖLEK

Correspondence Address

Necmettin Erbakan Üniversitesi
Ahmet Keleşoğlu Eğitim Fakültesi A-Blok-127
Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü
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CONTENTS

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The Effect of Ideational Creativity Activities Applied Through face-to-face and Distance Education on the Ideational Behavior Skills of Pre-school Teacher Candidates

Neslihan Durmuşoğlu Saltalı[1]   **Gülay Asit[2]**

Mehmet Ali Ateş[3]   **Özgen Korkmaz[4]**

[1] Necmettin Erbakan University, Nezahat Keleşoğlu Health Sciences Faculty, Child Development Department, Konya, Türkiye
ndsaltali@gmail.com

[2] Dr. Independent Researher,
gulayasit@gmail.com

[3] Girne American University, Faculty of Education, Preschool Education Department, Kyrenia Turkish Republic of Noth Cyprus
mehmetaliates58@gmail.com

[4] Amasya University, Technology Faculty, Department of Computer Engineering, Amasya, Türkiye
ozgenkorkmaz@gmail.com

Article Info	ABSTRACT
	One of the basic skills among the 21st century skills is the ability to think creatively. Encouraging individuals to produce original ideas and supporting creative idea generation skills are important for the development of creativity. However, there are few studies in the literature on ideational creativity, especially on activities that support this type of creativity. The present study aimed to investigate the effect of the implementation of activities prepared to enhance the ideational behavior skills of university students through face-to-face and distance education on the development of students' ideational behavior skills. The study was carried out in two stages. The pre-test and post-test comparison results showed that the scores of the groups that were administered ideational creativity activities through face-to-face and distance education were significantly higher than the control group. In terms of being able to produce solutions and total ideational creativity, it was determined that the post-test scores of the experimental group that was administered ideational creativity activities through distance education were higher. These findings suggest that distance education method is a preferable method in supporting ideational creativity.

INTRODUCTION

The creativity of students is considered to be a basic competence in the education strategies of many countries. In recent years, in order to strengthen their competitiveness in the international arena, states attach great importance to the development of creativity of individuals, prepare content that supports creativity in educational curricula, and invest in the development of creativity in educational resources (Horng et al., 2005). One of the important points that societies should focus on in terms of creativity is to raise creative individuals in generating ideas. In order for individuals to produce creative ideas, they should be encouraged by their parents and teachers to look at events and problems from different perspectives, to produce different ideas, and to express the different ideas they produce. Starting from the family environment where children are raised and from pre-school education institutions in the first years of life, encouraging creativity is important. Positive attitudes toward creative thinking have a supportive role in terms of producing creative ideas (Kettler et al., 2018). At this point, it is important for parents and teachers to have high creativity and a correct and positive perspective on creativity in order to encourage the creativity of the child (Duffy, 2006; Yildiz-Cicekler, 2016). Limiting creativity to only producing a concrete aesthetic product, which is widely observed in society, is a wrong approach to creativity. In recent years, one of the ways to evaluate the creativity of individuals is to evaluate their ability to produce original ideas (ideational creativity) (Runco, Plucker, & Lim, 2001). Before each output that appears as a creative product, there is an idea generation stage in the mind of the individual in which that product is designed (Wallas, 1926). When the literature is reviewed, it is seen that most of the studies on the creativity of individuals deal with creativity in terms of the concrete product (painting, composition, music, dance, visual arts, etc.) that the individual reveals (Sen, 2021). However, the first condition of supporting creativity in all areas is to encourage individuals to produce original ideas and express the ideas they produce (Duffy, 2006). In educational curricula, the support given to students to enhance their intellectual creativity and the encouragement given to think differently and produce different ideas seem to be overshadowed by other educational goals. For example, in the study by Kettler et al. (2018), teachers reported that supporting intellectual creativity in the classroom environment is the least important goal. Csikszentmihalyi (2015) argues that according to the systems theory, every individual has a potential for creativity; however, the environment has a very important role in revealing this potential. It is important to encourage individuals by attaching importance to, supporting and rewarding their creative ideas, or by giving positive reactions to their behavior of revealing creative ideas (Yildiz Cicekler & Aral, 2021a). It is also important that families and teachers create environments for children to produce creative ideas from an early age on and accept and support different ideas (Yildiz Cicekler & Aral, 2021b; Yalcin & Yildiz Cicekler, 2021). In the literature, there are studies showing the importance of teachers' having a positive attitude towards creative thinking and developing their own creative thinking skills so that they can perform some practices that support and develop children's creative ideas (Kasiser & Shnitzer-Meirovich, 2021; Cag Adiguzel, 2016). The findings suggest that practices or activities on creativity designed and implemented by teachers and teacher candidates are important. In addition, there are studies in the literature emphasizing the need for content that can improve students' creativity in higher education and criticizing higher education institutions for practices where creativity remains in the background (Gibson, 2010; Haring-Smith, 2006). In fact, as stated above, in order to raise students thinking creatively, teachers themselves need to be highly creative, give importance to creativity, and have the necessary characteristics for creative education (Yalcin & Yildiz Cicekler, 2021). When the studies on creativity of teachers and teacher candidates are reviewed, it is seen that although there are some studies investigating creative pedagogy (Craft, Jeffrey & Leibling, 2001; Lin, 2011; Sawyer, 2004), relatively few studies (Cetingoz, 2002; Duman & Gocen, 2005; Malik, Setiawan, Suhandi, & Permanasari, 2017, Volynkina, 2019) discussed the creativity of teachers and teacher candidates. It is important to work on the creativity levels of teacher candidates starting from the university years when they receive the necessary education in terms of teaching. In addition, valid and reliable assessment tools are required to determine the creativity levels of teacher candidates and teachers. Currently, there are a limited number of measurement tools to determine the creativity levels of teachers and teacher candidates (Creativity in Teaching Scale by

Yalcin & Yildiz Cicekler, 2021; "How Creative Are You?" Scale by Aksoy, 2004). In particular, there is no valid and reliable tool to evaluate the ideational creativity of teacher candidates. For this reason, in the first part of the research, the Turkish validity and reliability study of the Ideational Creativity Scale developed by Runco et al. (2001) was conducted on teacher candidates. In the second part of the study, a series of activities that could enhance the ideational creativity of teacher candidates were applied through face-to-face and distance education, and the effectiveness of these activities was tested.

Study 1

Research Question

The first part of the study aims to address the following research question: Is the Turkish version of the Ideational Behavior Scale valid and reliable in Turkish culture?

METHOD

At this stage, the Turkish adaptation of the Ideational Behavior Scale was carried out and the validity and reliability studies were conducted in a sample consisting of teacher candidates.

Sample

The sample of the first phase of the research consisted of 314 freshman teacher candidates studying at the education faculties of different universities in Turkey (four state universities, two foundation universities) in the fall semester of the 2020-2021 academic year. The sample was determined using the convenience sampling method, and participation in the research was voluntary. Four-hundred participants were invited to participate in this study. Forty-nine students were not willing to respond and thirty-seven students' responses were removed as they were incomplete. Thus, the data collected from 314 Turkish university students were used in this study. In the study, the recruitment rate was calculated as 78.5%. 258 female and 56 male teacher candidates participated in the study. The participants were between the ages of 18 and 35 and the mean age was 20.7. The reason for conducting the research with freshman teacher candidates is that many universities have elective or compulsory creativity courses starting from the second year in the early childhood education undergraduate curriculum and we thought that having taken these courses may affect the results of the study.

Data Collection Tools

The Ideational Behavior Scale, which was developed by Runco, Plucker and Lim (2001) and which consists of two factors and 23 items, was adapted to Turkish and then used to assess the ideational behavior skill levels of the teacher candidates in our study.

Data Analysis

Explanatory factor analysis (EFA), item analysis, item-total correlation, reliability coefficient calculations (Correlation between two halves, Spearman Brown, Guttmann Split-Half, Cronbach's Alpha), confirmatory factor analysis (CFA) statistics were used within the scope of validity and reliability studies of the scale. The test-retest method was used to identify the stability level of the scale.

RESULTS

In the first phase of the study, the Turkish adaptation study of the Ideational Behavior Scale was conducted with teacher candidates. First of all, the original scale in English was translated into Turkish by three academicians who know both languages well. The scale, which was translated into Turkish, was then sent to an academician who is competent in his field and has a good command of English, and the back-translation process from Turkish to English was completed. The original version of the scale and the translated English version were compared and found appropriate by the researchers. The first Turkish version of the scale, translated from the original language, was first presented to a Turkish language expert, and then was administered to 30 teacher candidates to pilot the scale. The pilot study

showed that the items were clear for the participants. After the language equivalence was achieved, the validity and reliability studies of the Turkish scale were initiated. In this context, exploratory and confirmatory factor analyses were carried out to test the construct validity of the scale. Tatlidil (2002) states that the suitability of the collected data for factor analysis should be tested first. Thus, the KMO and Bartlett sphericity tests were performed, and it was determined whether the EFA could be performed on the data. A KMO value between 0.70-0.80 indicates that the data set is moderately suitable for factor analysis, while KMO values of 0.80-0.90 and above 0.90 indicate that the data set is very suitable and perfectly suitable for factor analysis, respectively. In addition, a KMO value below 0.50 indicates that the dataset cannot be factorized (Russell, 2002). The Bartlett test results revealed that the null hypothesis was rejected at the 0.05 significance level (Eroglu, 2008). The values obtained within the scope of this research are as follows: KMO= 0.917; Bartlett test value= $\chi 2$= 3119.070; and df=253 (p=0.000). Thus, it was understood that the data set was perfectly suitable for factor analysis.

After the fit values were obtained, the EFA was conducted; the factorization of the scale was performed using the principal components analysis; and factor loadings were investigated using the Varimax vertical rotation technique. Factor analysis is used to reveal whether items in a scale can be grouped under fewer factors (Balci, 2009; Carmines, 1982). The Principal Component Analysis, on the other hand, is a technique that is frequently used as a factorization technique (Carmines, 1982). As a result of the Principal Components Analysis used in factor analysis, items with factor loadings below 0.40 and items with at least 0.10 difference between their loadings in two factors, i.e., items whose load is distributed across both factors, should be removed from the scale (Balci, 2009). When the natural factor distributions of the items were examined according to the factor loads obtained in the first analysis, it was determined that there were four factors with an eigenvalue above 1. It was found that all the factor loads of the items were above 0.40. However, factor analysis was repeated for two factors, considering the fact that the original scale has a two-factor structure, that the eigenvalues of the first two factors were quite high compared to the other factors, and that the contribution of the first two factors to the explained variance was sufficient.

The varimax vertical rotation technique was used according to the principal components analysis of two factors, and five items with factor loads below 0.40 and one item that load on different factors simultaneously were gradually removed from the scale. It was decided to keep three items with factor loads very close to 0.4 in the scale. It was tested whether the removed items adversely affected the content validity, and it was decided that removing these items from the scale would not adversely affect the integrity and scope of the scale. As a result, it was observed that the remaining 17 items in the scale could be grouped under two factors. The main criterion in evaluating the results of factor analysis is factor loads (Balci, 2009; Eroglu, 2008). High factor loads indicate that the variable may be under the specified factor. The factor loads of the remaining 17 items in the scale were between .386 and .616 without being rotated; however, these loads were found to be between .545 and .818 when rotated using the varimax vertical rotation technique. The literature states that it is sufficient for items and factors to explain at least 40% of the total variance in behavioral sciences (Eroglu, 2008; Kline, 1994). In our study, the items and factors included in the scale explained 53.05% of the total variance. In the next step, the contents of the items in the factors were examined, and it was seen that the first factor included items related to generating more ideas, and the second factor included items related to producing more solutions. For this reason, the first factor was called being able to generate ideas, and the second factor was called being able to produce solutions.

The factor structure is also seen in the scree plot (Graph 1) drawn according to the eigenvalues. As seen in the graph, there is an accelerated decline in the first two factors, indicating that these two factors contribute significantly to the variance. On the other hand, the graph also shows that the decrease in other factors has started to become horizontal. In other words, they contribute almost equally to the variance (Eroglu, 2008).
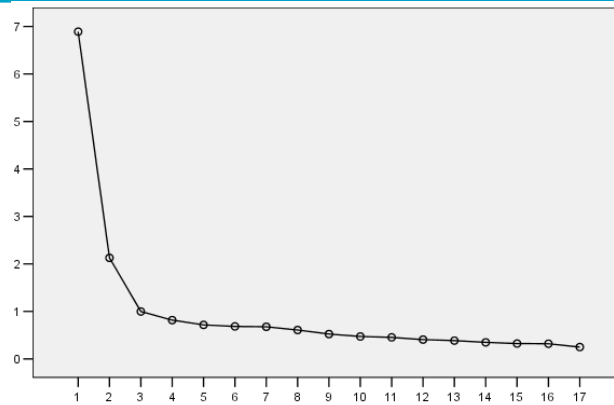
Graph 1. *Eigenvalues by factors*

The findings regarding the item loads of the remaining 17 items in the scale, the eigenvalues of the factors, and the variance explained by the factors are presented in Table 1.

Table 1. *Factor analysis results*

	Items	Var.	F1	F2
Being able to generate ideas	9. "I have always been an active thinker. I have lots of ideas."	.683	.818	
	8. "I would rate myself highly in being able to come up with ideas."	.659	.808	
	4. "I come up with a lot of ideas and solutions to problems."	.598	.774	
	5. "I come up with an idea or solution other people have never thought of."	.587	.760	
	1. "I have many wild ideas."	.524	.693	
	15. "I often have trouble sleeping at night because so many ideas keep popping into my head."	.556	.691	
	14. "Sometimes I get so interested in a new idea that I forget about other things that I should be doing."	.513	.690	
	13. "I am able to think about things intensely for many hours."	.514	.658	
	17. "I often find that one of my ideas has led me to other ideas that have led me to other ideas, and I end up with an idea and do not know where it came from."	.411	.639	
	2. "I think about ideas more often than most people."	.465	.588	
	3. "I often get excited by my own new ideas."	.386	.586	
	6. "I like to play around with ideas for the fun of it."	.388	.545	
Being able to produce	21. "I am good at combining ideas in ways that others have not tried."	.615		.774
	22. "My friends ask me to help them think of ideas and solutions."	.596		.757
	20. "I am able to think up answers to problems that haven't already been figured out."	.606		.750
	23. "I have ideas about new inventions or about how to improve things."	.525		.724
	19. "I try to exercise my mind by thinking things through."	.391		.582
	Eigenvalues		5.896	3.123
	Explained variance		34.685	18.368

As seen in Table 1, the first factor of the scale (being able to generate ideas) includes 12 items and factor loads vary between 0.545 and 0.818. The eigenvalue of this factor in the overall scale is 5.896, and the contribution it makes to the overall variance is 34.685%. The second factor of the scale (being able to produce solutions) includes five items. The factor loads of the items are between 0.582 and 0.774. The eigenvalue of the factor in the overall scale is 3.123, and the contribution it makes to the overall variance is 18.368%.

According to the item-total correlation method, the correlations between the scores obtained from each item in the factors and the scores obtained from the factors were calculated, and each item's level of serving the general purpose was tested. The item-factor correlation values obtained for each item are given in Table 2.

Table 2. *Item-factor correlations*

Being able to generate ideas		Being able to produce solutions	
Item	r	Item	R
9	.816**	21	.778**
8	.789**	22	.771**
4	.730**	20	.775**
5	.738**	23	.725**
1	.733**	19	.647**
15	.739**		
14	.711**		
13	.709**		
17	.638**		
2	.670**		
3	.632**		
6	.628**		

*Note: ** p<0.01, n=314*

As seen in Table 2, item test correlation coefficients varied between 0.628 and 0.816 for the factor of being able to generate ideas and between 0.647 and 0.778 for the factor of being able to produce solutions. Each item has a significant and positive relationship with the overall factor (p<0.000). Thus, it can be said that each factor serves the purpose of the factor it is under.

In addition, the discrimination power of the items in the scale was calculated. For this purpose, first of all, the raw scores obtained from the scale were ordered from largest to smallest, and then lower and upper groups of 84 individuals, which constituted the lower 27% and upper 27% groups, were identified. Independent groups t-test values were calculated based on the total scores in the groups. The t-values regarding the power of discrimination and the findings regarding significance levels are presented in Table 3.

Table 3. *Item discrimination strength*

Being able to generate ideas		Being able to produce solutions	
Item	t^p	Item	t^p
9	13.780***	21	9.787***
8	12.736***	22	10.741***
4	10.409***	20	11.765***
5	12.111***	23	7.869***
1	12.462***	19	8.483***
15	14.369***		
14	11.193***	**Being able to generate ideas**	22.063***
13	11.761***	**Being able to produce solutions**	14.868***
17	9.777***	**Ideational behavior**	28.820***
2	11.693***		
3	9.840***		
6	12.774***		

*Note: df: 168; ***=p<.001*

As seen in Table 3, the independent sample t-test values obtained as a result of the comparison of the scores in the lower and upper 27% groups regarding the 17 items, factors and total score of the scale vary between 7.869 and 13.780. The t value for the overall scale was found to be 28.820, and the t values for the teacher factors are 22.063 and 14.868. Each differentiation level is significant at the p<0.001 level. Thus, it can be stated that both the overall scale and each item in the scale have a high level of distinctiveness.

The reliability of the scale and the factors was calculated using the Cronbach's alpha reliability

coefficient, correlation value between two halves, the Spearman-Brown formula, and the Guttmann split-half reliability formula. Reliability analysis values for each factor and the overall scale are summarized in Table 4.

Table 4. *Internal consistency coefficients*

Factors	Number of Items	Correlation between two halves	Spearman Brown	Guttmann Split-Half	Cronbach's Alpha
Being able to generate ideas	12	.83	.91	.91	.91
Being able to produce solutions	5	.64	.78	.75	.79
Ideational behavior	17	.57	.73	.73	.90

As seen in Table 4, the correlation between two halves was determined as .58. The Spearman Brown reliability coefficient is .73; the Guttmann Split-Half value is .73; and the Cronbach's Alpha reliability coefficient was determined as .86. As for the internal consistency coefficients of the factors, the following values were obtained for being able to generate ideas and being able to produce solutions, respectively: the correlation between two halves .83 and .64; the Spearman Brown values .91 and .78; the Guttmann Split-Half values .91 and .75; and the Cronbach's Alpha values 0.91 and 0.79. Thus, it can be stated that each factor and the overall scale can make consistent measurements.

The stability level of the scale was determined using the test-retest method. The 17-item final version of the scale was re-administered to 38 teacher candidates three weeks later. The relationship between the scores obtained at the end of both applications was examined in terms of both each item and the overall scale. Thus, the ability of each item in the scale and the overall scale to make stable measurements was tested. The findings are summarized in Table 5.

Table 5. *Stability analysis results*

Being able to generate ideas		Being able to produce solutions		Factors and total score	
Item	r	Item	r		r
9	.89**	21	.34*	**Being able to generate ideas**	.41**
8	.36*	22	.53**	**Being able to produce solutions**	.40*
4	.46*	20	.39**	**Ideational behavior**	.57**
5	.32*	23	.40*		
1	.40*	19	.35*		
15	.55**				
14	.54**				
13	.39*				
17	.51**				
2	.48*				
3	.35*				
6	.64**				

*Note: n= 38; *=p<0.05 **=p<0.001*

Table 5 shows that the correlation coefficients for each item obtained using the test-retest method vary between 0.32-0.89 and each relationship is significant and positive. The correlation coefficients for the factors are 0.41 and 0.40, respectively. The correlation coefficient for the overall scale is .57. It is seen that each relationship calculated using the test-retest method is significant and positive. Thus, it can be concluded that the scale can make stable measurements.

DISCUSSION

The original 23 items in the Ideational Behavior Scale were adapted to Turkish language and the structure and psychometric properties of the scale were assessed. Overall, based on the evaluation results (see EFA results, CFA results, test stability analyses, item factor correlations, item discrimination analyses, Cronbach's alpha internal consistency coefficient analysis results), the Turkish version was found to be a valid and reliable measure. The original version of the scale consists of 23 items and a single factor. However, the factor analysis in the present study presented a two-factor

structure with 17 items. There are many studies in the literature, in which the scale was adapted to other languages (Chinese, Korean, Turkish, Spanish, German, Slovenian, Latvian, Arabic, Indonesian, and Greek). These studies confirmed either the single-factor structure of the scale (Runco et al. 2001; Kalis & Roke, 2011; Tsai, 2015) or, similar to our study, the two-factor structure of the scale (Tep, Maneewan & Chuathong, 2021; Lopez-Fernandez et al., 2019). These different results suggest that more studies are needed on the factor structure of the scale in different cultures and with different samples. This study was conducted with Turkish university students, which may limit the generalizability of the findings. The study may be replicated with students studying at different grade levels.

Study 2

Research Question

The second research question of the study is "Do the face-to-face and distance education activities aimed at developing ideational creativity of early childhood teacher candidates have an effect on their ideational behavior skills?". Answers to the following sub-questions were also sought.

Sub-Questions

a) Do the ideational creativity activities presented through face-to-face education have an effect on the ideational behavior skills of teacher candidates?

b) Do the ideational creativity activities presented through distance education have an effect on the ideational behavior skills of teacher candidates?

METHOD

Research Design

The second part of the study was carried out using the quasi-experimental method with pretest-posttest control group. In this design, it is recommended to have a control and at least one experimental group (Creswell & Creswell, 2017). Our study includes one control group and two experimental groups. In one of the experimental groups, the activities were administered face-to-face and in the other experimental group, the activities were administered via distance education. There are two main reasons why the activities developed to support ideational creativity were performed in two different experimental groups. The first reason is that the use of digital technologies in education is becoming more and more widespread in the world, and the effectiveness of distance education activities, especially after the global pandemic, has attracted the attention of the scientific world. The second reason is that, if there are individuals who have high levels of ideational creativity and have difficulties in expressing the idea even though they produce it for various reasons such as social anxiety, pressure, and not being able to express themselves by speaking, distance education methods offer a more comfortable environment for these individuals to express themselves via the expression of ideas in writing, the possibility of attending classes with cameras turned off, and the option of not seeing other individuals. In fact, it is stated in the literature that students need an environment in which they do not experience anxiety and they can express their ideas freely (Clapham, 1997). This can be shown as the theoretical basis of the desire of researchers to investigate the effectiveness of distance education.

Sample

The sample in the second phase of the research consisted of a total of 78 teacher candidates studying in a state university in the 2021-2022 academic year. The participants were grouped into one control group, one face-to-face education experimental group, and one distance education experimental group. The mean age of the sample in the experimental phase of the study was 20.15. The distribution of the groups by gender is summarized in Table 6.

Table 6. *Distribution of groups by gender*

Gender	Control Group	Face-to-face Education Group	Distance Education Group
	n	n	n
Female	24	21	21
Male	5	3	4
Total	29	24	25

The Intervention

Activities to enhance ideational creativity were prepared for both experimental groups. While developing the activities, fluency, flexibility and originality sub-dimensions of creativity were taken into consideration, and attention was paid to cover activities related to these sub-dimensions in a balanced way. The development of the activities was also based on the six-stage approach of the creative program developed and tested by Clapham and Schuster (1992). Finally, a comprehensive literature review was conducted; activity books related to creativity were examined (for example, Ideational Reading (Yilmaz, 2021) and Creative Mischief (Yilmaz, 2017); and activities that were thought to enable teacher candidates to think creatively and to produce creative ideas were developed. It is suggested in the literature that educational programs to be developed to support ideational creativity should include activities that enable divergent thinking, creative problem solving, and methods that support alternative idea generation such as guessing the problem and brainstorming (Clapham, 1997). These criteria were also taken into account while preparing the activities. Considering these suggestions and the sub-dimensions of creativity, a 14-hour training program was prepared to enhance the ideational creativity of teacher candidates. Each activity lasted 40 minutes and was applied to teacher candidates once a week, for a total of 14 weeks, following the Creativity in Early Childhood and Creative Children's Activities course given within the scope of the undergraduate curriculum. The teacher candidates were given the opportunity to express the ideas they came up with during the activities either orally or in writing.

Experimental Groups

The ideational creativity activities developed in the research were administered in the face-to-face and distance education experimental groups. It is stated in the literature that individuals need an environment in which they do not experience anxiety so that they can generate a large number of ideas and express them freely (Clapham, 1997). The researchers believed that the level of social anxiety that the teacher candidates experience in face-to-face and distance education conditions may change and this may lead to a difference in the evaluation of the effectiveness of the training program. For this reason, the activities were administered in two different experimental groups. The same activities were applied to both groups. They were implemented immediately after the theoretical content of the Creativity in Early Childhood and Creative Children's Activities course was covered. The course is offered as an elective course to early childhood teacher candidates in the second year.

Control Group

The participants who constituted the control group of the research took the Creativity in Early Childhood and Creative Children's Activities course.

Data Analysis

In the second stage of the study, first, normality analyses were performed on the data in order to determine the statistical methods to be used. Kolmogorov-Smirnov test was performed and it was found that some of the research data showed normal distribution, while some did not. Therefore, skewness and kurtosis values were examined for normality analysis. The normality values were found to be in the range of -1.50 to +1.50. For this reason, it was assumed that the analyzed data showed normal distribution (Tabachnick & Fidell, 2013). The findings regarding the normality analysis are presented in

Table 7.

Table 7. *Normal distribution analysis*

Group		Kolmogorov-Smirnov(a)			Skewness	Kurtosis
		Statistic	df	p		
F1 Pre-test	Control	.103	29	.200	-.964	1.083
	Face-to-face	.123	23	.200	.145	-.713
	Distance	.120	25	.200	-1,076	1.115
F2 Pre-test	Control	.130	29	.200	-.199	.089
	Face-to-face	.164	23	.109	.829	.146
	Distance	.168	25	.068	-.638	-.1013
FT Pre-test	Control	.103	29	.200	-.871	1.472
	Face-to-face	.097	23	.200	.450	-.335
	Distance	.126	25	.200	-1.308	1.066
F1 Post-test	Control	.124	29	.200	.400	.865
	Face-to-face	.132	23	.200	.224	-.714
	Distance	.204	25	.009	1.469	1.177
F2 Post-test	Control	.144	29	.126	.918	.473
	Face-to-face	.193	23	.026	-1.049	1.214
	Distance	.176	25	.044	1.103	1.130
FT Post-test	Control	.088	29	.200	.382	.755
	Face-to-face	.144	23	.200	-.105	.179
	Distance	.173	25	.052	1.066	.969

Note: F1= Being able to generate ideas, F2= being able to produce solutions FT= Ideational behavior

According to the results of the normality analysis, it was assumed that the data showed normal distribution and parametric statistical tests were performed to analyze the data (Ozdamar, 2013). In order to reveal the effectiveness of the experimental process, the similarity between the experimental and control groups was investigated before the training program was initiated. First, descriptive statistical values (arithmetic mean and standard deviation) of the pretest scores of the control group and the experimental groups were calculated. The calculations are summarized in Table 8.

Table 8. *Descriptive statistics on the pre-test scores of the groups before the intervention*

		n	Mean	Std. Deviation
F1 Pre-test	Control	29	42.48	8.24
	Face-to-face	24	40.71	6.64
	Distance	25	41.12	5.81
F2 Pre-test	Control	29	13.89	3.39
	Face-to-face	24	14.38	2.81
	Distance	25	14.80	3.21
FT Pre-test	Control	29	56.38	10.25
	Face-to-face	24	55.08	8.86
	Distance	25	55.92	8.45

Note: F1= Being able to generate ideas, F2= Being able to produce solutions FT= Ideational behavior

When the pre-test ideational behavior skill scores of the groups are examined (Table 8), it is seen that the mean scores are quite close to each other and there are small differences in the mean factor scores and mean total scores. The results of the One-way ANOVA test conducted to see if these differences are significant are summarized in Table 9.

Table 9. *Findings regarding the equivalence of the groups before the intervention*

		Sum of Squares	df	Mean Square	F	Sig.
F1 Pre-test	Between Groups	46.660	2	23.330	.470	.627
	Within Groups	3724.840	75	49.665		
	Total	3771.500	77			
F2 Pre-test	Between Groups	11.019	2	5.509	.549	.580
	Within Groups	752.315	75	10.031		
	Total	763.333	77			
FT Pre-test	Between Groups	22.332	2	11.166	.130	.879
	Within Groups	6466.501	75	86.220		
	Total	6488.833	77			

Note: F1= Being able to generate ideas, F2= Being able to produce solutions FT= Ideational behavior

As seen in Table 9, the ideational behavior pre-test factor scores of the groups (F1 [$f_{(2-77)}$=.470, p>0.05]; F2 [$f_{(2-77)}$=.549, p>0.05]) and the pre-test total score [$f_{(2-77)}$=.130, p>0.05] were similar.

RESULTS

The post-test scores of the distance education and face-to-face education groups were compared in order to reveal the effect of ideational creativity activities on the ideational behavior skills of the teacher candidates in these groups. First, descriptive statistical values (arithmetic mean and standard deviation values) of the post-test scores of the experimental and control groups were calculated. The results are presented in Table 10.

Table 10. *Descriptive statistics on the post-test results of the groups*

		N	Mean	Std. Deviation
F1 Post-test	Control	29	39.72	6.72
	Face-to-face	24	43.00	5.29
	Distance	25	44.76	4.73
F2 Post-test	Control	29	15.89	3.08
	Face-to-face	24	16.33	2.79
	Distance	25	17.72	2.54
FT Post-test	Control	29	55.62	8.19
	Face-to-face	24	59.13	6.86
	Distance	25	62.48	6.29

Note: F1= Being able to generate ideas, F2= Being able to produce solutions FT= Ideational behavior

When the post-intervention ideational behavior skill mean scores of the groups are examined, it is seen that the mean score of the control group is 39.72 on being able to generate ideas (F1), while the mean scores of the face-to-face education group and distance education group are 43.0 and 44.76, respectively. As for the factor of being able to produce solutions (F2), it is seen that the mean score of the control group is 15.89, the mean score of the face-to-face education group is 16.33, and the mean score of the distance education group is 17.72. When evaluated in terms of the total scores, it is seen that the mean total score of the control group is 55.62, the mean total score of the face-to-face education group is 59.13, and the mean total score of the distance education group is 62.48. Thus, it can be stated that while the distance education group has the highest mean score in terms of both factors and total score, the control group has the lowest mean score. The findings obtained from the one-way ANOVA test for the significance of these differences and the Scheffe test to determine the source of the arc in cases of difference are presented in Table 11.

Table 11. *Statistics on the comparison of the post-test scores of the groups*

		Sum of Squares	df	Mean Square	F	Sig.	ή²	Dif
F1 Post-test	Between Groups	354.868	2	177.434	5,425	,006	,127	Between the control group and the experimental groups
	Within Groups	2420.353	74	32.707				
	Total	2775.221	76					
F2 Post-test	Between Groups	47.399	2	23.699	2,957	,050	,070	Between the control group and the face-to-face education group
	Within Groups	601.063	75	8.014				
	Total	648.462	77					
FT Post-test	Between Groups	633.493	2	316.746	6,060	,004	,140	Between the control group and the distance education group
	Within Groups	3867.676	75	52.266				
	Total	4501.169	77					

Note: F1= Being able to generate ideas, F2= Being able to produce solutions FT= Ideational behavior

As seen in Table 11, the intervention led to a significant improvement in the ideational behavior skills of the teacher candidates in terms of both factors (F1 [f(2-77)=5.425, p<0.05]; F2 [f(2-77)=2.957, p<0.05]) and total score [f(2-77)=6.060, p<0.05]. The Scheffe test performed to determine the source of difference revealed that there was a difference between the control group and both the distance education and face-to-face education groups in the factor of being able to generate ideas. When the arithmetic mean scores in Table 10 are examined, it is seen that the difference is in favor of distance education and face-to-face groups. The calculation regarding this difference is ή2=0.127. Thus, it can be said that the activities developed to support the ideational behavior skills of teacher candidates and performed in both the distance education and face-to-face education groups contributed significantly to the teacher candidates' ability of generating ideas (factor 1), and this contribution was found to have a wide effect.

The Scheffe test results revealed that there was a difference between the control group and the distance education group in the factor of being able to produce solutions. When the arithmetic mean scores in Table 10 are examined, it is seen that the difference is in favor of the distance education group. The calculation was ή2=0.07 regarding this difference. Thus, it can be stated that the activities developed to support the ideational behavior skills of teacher candidates contributed significantly to their ability to produce solutions in the distance education group, and this contribution had a medium effect. In the face-to-face education group, an increase was observed in the mean score of the factor of being able to produce solutions; however, this increase was not found to be statistically significant.

The Scheffe test results further revealed that there was a difference between the control group and the distance education group in ideational behavior total score. When the mean scores in Table 10 are examined, it is seen that the difference is in favor of the distance education group. The calculation regarding this differentiation is ή2=0.14. Thus, it can be stated that the implementation of the activities through distance education contributed significantly to teacher candidates' ideational behavior skills, and this contribution was found to have a wide effect. However, it was revealed that although the activities also increased the ideational behavior scores of the teacher candidates in the face-to-face education, they did not create a statistically significant difference.

DISCUSSION

The study showed that the distance and face-to-face education activities developed to support the ideational behavior skills of early childhood teacher candidates contributed significantly to their ability to generate ideas and this contribution had a wide effect. Creative thinking is one of the characteristics that people should have in many areas of life. However, studies have shown that there is a decrease in the creativity scores of individuals in societies (Kim, 2011) and that there is a need for designs and contents that support creative thinking in education (Antonietti, Colombo, & Pizzingrilli, 2011; Griffiths, 2014; Shaheen, 2010; Brundrett, 2007; Richardson & Mishra, 2018). Many educational scientists argue that there is a need for activities that enable individuals to generate new ideas and think creatively at all levels of education (Scott, Leritz & Mumford, 2004). It is important to support the intellectual creativity of preschool teachers

and teacher candidates, who will be the first teachers of children in the education system. The findings of this study revealed that the skills of generating ideas can be improved through activities aimed at supporting the ideational creativity of teacher candidates. Similar to our research, Kaplan (2019) revealed that supporting teacher candidates with theoretical content and practical activities related to creativity contributed to their creativity. The same study recommends that the results obtained from experimental studies should be supported. Our study contributes to the literature as a study that supports the findings of Kaplan's study (2019).

Another important finding of our study is that when the activities developed to support the ideational behaviors of teacher candidates are implemented through face-to-face education, they contribute only to the factor of being able to generate ideas. However, when the same activities are applied through distance education, they make a significant contribution to both factors, that is, being able to generate ideas and being able to produce solutions. This finding suggests that distance education is a better option in terms of supporting ideational behavior skills. This finding may be attributed to the fact that in distance education, teacher candidates do not have to turn their cameras on, and they are not in the same environment with their classmates physically, which reduce group pressure and enable teacher candidates to express themselves more freely. The results of some studies in the literature support our interpretation. In Karakus et al. (2020) study, the students stated that they feel more comfortable expressing their ideas in distance education. Eskiyurt and Alaca (2019) reported that the students in their study evaluated online education as a safe environment to cope with the fear of negative evaluation. In addition, Pop et al. (2011) found that communicating with asynchronous audio tools reduced students' public speaking anxiety. These findings are also consistent with our findings.

Future studies that include activities with alternative contents to support creativity at different education levels may contribute to the field. Studies can be conducted to investigate how the creativity of teacher candidates contributes to their activity designs and classroom practices.

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Pre-service Teachers' Understanding of Graphs in Statistics in the Context of Lesson Study

Nadide Yılmaz[1] iD   **İffet Yetkin[2]** iD

[1] Karamanoğlu Mehmetbey University, Karaman, Türkiye
nadideylmz70@gmail.com

[2] Hacettepe University, Ankara, Türkiye
elif.yetkin.ozdemir@gmail.com

Article Info	ABSTRACT
	This study aims to examine pre-service teachers'(PTs') understandings of graphs and how their understandings about graphs have transformed into instructional practices as they participated in a lesson study. It was employed case study and three PTs participated. They initially viewed graphs as instruments for organizing and representing data. As the lesson study progressed, they began to view graphs as instruments to answer statistical questions. This fundamental transformation in their understanding resulted in a change in how they designed and implemented their lesson plans. They designed tasks around a statistical question and made connections with this question while deciding the type of graph and interpreting the graph. In addition, they anticipated students' possible conceptions. Hence, for these PTs, understanding the function graphs as instruments to answer statistical questions can be considered as a key development understanding (KDU), which was built on multiple experiences of designing, implementing and evaluating lessons.

INTRODUCTION

Graphs are important instruments in analysing statistical data. Representing data with graphs helps to make sense of the data and answer the statistical question. Different graphical displays allow answering different questions (Bright & Friel, 2011; Chick, 2004; Monk, 2003; Pfannkuch & Wild, 2004; Shah & Hoeffner, 2002; Wild & Pfannkuch, 1999).

Teaching graphs has been one of the major objectives in Turkish middle school mathematics curriculum since 1949. While the early curriculums paid greater attention to drawing and interpreting graphs mostly independent of their function in the statistical problemsolving process (SPSP) (Ministry of National Education [MoNE], 1968; 1983; 1990; 1998), recent curriculum documents put much emphasis on SPSP (MoNE, 2005; 2013; 2018). This process emphasizes that all components of doing statistics (i.e., formulating research question, collecting and analysing data and interpreting the results) should be addressed holistically and the function of graphs in answering statistical questions should be stressed (Franklin, et al., 2015; National Council of Mathematics [NCTM], 2000). Hence, teachers are expected to design activities so that students can decide which type of graph to draw as well as interpret the graph by taking into account the statistical question or the purpose being set at the beginning of the statistical inquiry. However, research shows that teachers and PTs generally ignore the SPSP and habitually focus on procedural aspects of teaching graphs (e.g., making calculations, drawing graphs) (Chick & Pierce, 2008; Heaton & Mickelson, 2002; İjeh, 2012; Lee, et al., 2014; Reston, et al., 2006). They mostly bring the function of graphs as instruments to display data set to the fore and ignore their function as instruments to answer statistical questions (Burgess, 2007; Mercimek, 2013; Sorto, 2004). Even though the current curriculum documents in Turkey emphasize the SPSP as a general goal, and emphasize that each component of SPSP is included in terms of specific objectives, how the links between these components could be established in classroom practices are implicit or left to the teachers (Ader, 2018; Ari, 2010). In order to teach graphs by taking into account SPSP, teachers need to develop an understanding that graphs are not only used to represent data but also used to answer statistical research questions. When instructional activities are based on this understanding, using graphs in statistics could be more meaningful for students (Bargagliotti, et al, 2020). In this study, we focused on three PTs' understandings of graphs in the context of a lesson study. We explored their initial understandings of graphs and the changes in their understandings as they engaged in planning, implementing, reflecting and revising lessons related to teaching graphs in the context of lesson study. We observed that PTs' limited understandings of graphs resulted in some difficulties during the planning and implementation of the lessons. Reflections on these difficulties as a part of the lesson study process, helped them to view the function of graphs in SPSP. Hence we came to realize that "viewing graphs as instruments to answer formulated statistical questions" could be considered as a KDU for learning and teaching graphs. Simon (2006) defined KDU as "conceptual advance that is important to the development of a concept" (p. 363). Two characteristics of a KDU are (1) it involves "a change in students' ability to think about and/or perceive particular mathematical relationships" and (2) "the transition requires a building up of the understanding through students' activity and reflection and usually comes about over multiple experiences." (p. 362). Hence developing KDUs require more than explanations or demonstrations (Simon, 2006). It can be said that the teacher, who has become aware of KDUs related to the field of statistics learning, can organize the teaching process in this direction (Groth, 2013). As students' KDUs develop, they can perceive the "big ideas" at the core of the focused mathematical concepts and progressive conceptual development takes place (Silverman & Thompson, 2008; Simon, 2006). When PTs learn cognitive landmarks that play a critical role in students' thinking, they can become aware of the importance of the elements involved in students' learning process (Llinares et al, 2016). Moreover, PTs can develop perspective on how students make sense of concepts (Simon, 2006). This may impact PTs' instructional decisions (Buforn & Fernández, 2014). All these show the importance of teachers having KDUs. When the literature is reviewed, it is seen that although key developmental understandings (KDUs) related to different concepts (e.g., Llinares et al., 2016, classification of quadrilaterals; Sánchez-Matamoros et al., 2015, derivative concept) have been researched, limited KDU research on statistical concepts shows why the current study is needed. In the study, we purposed

to examine how PTs understand the function of graphs in SPSP and the transformation of their understandings into instructional practices as they have participated in the lesson study. In this regard, an answer was sought for the following research question.

How PTs understand the function of graphs in SPSP and the transformation of their understandings into instructional practices as they have participated in the lesson study?

METHOD

A case study design was employed because in this study, it is aimed to reveal how PTs participating in the lesson study understand the function of graphs in the SPSP process and how they transform these understandings into instructional practices. This requires a long and detailed examination of PTs. Case study allows examining the focused situation in detail and making sense of it (Merriam, 2009; Yin, 2003) led us to prefer this method. In this study, the understandings of PTs were examined in detail in their natural process for approximately four months and an attempt was made to reveal what they meant.

Participants

The context of the study consisted of 12 senior PTs enrolled in a micro teaching course offered in the last semester of an undergraduate program aimed to certificate mathematics teachers for middle schools (5th-8th grade). The PTs were mainly required to take courses related to mathematics (e.g., calculus, analytic geometry, statistics and probability) and general pedagogy (e.g., educational psychology, measurement and evaluation) during the first two years of the four-year program. They were mainly required to take courses related to teaching mathematics (e.g., Teaching methods, School experience, Teaching practice) for the last two years of the program. The participants of the study were determined by using the criterion sampling method. First, attention was paid to the PTs' willingness to participate in the study. Secondly, care was taken to ensure that PTs successfully completed the courses that were considered necessary for teaching statistics (e.g., Statistics and Probability, Methods of Teaching Mathematics). Three PTs created the data for this study. There are several reasons why these PTs were chosen. The first is that a pilot study was conducted at the school where these PTs attended for teaching practice. The classroom teacher gained experience with lesson study during this pilot study. In addition, when the observations and discussion records were examined, it was revealed that these three selected PTs took a more active role in the process, and therefore it was thought that they would provide richer data. The grade point averages of these PTs ranged between 3.21 and 3.29. It was determined that two of the PTs received their high school education at an Anatolian Teacher Traning High School and and one of them at an Anatolian High School. It was observed that these PTs primarily aimed to become academicians and were interested in the lesson study process.

Context of the Study

The PTs carried out the lesson study process in the course of Micro Teaching in Mathematics Education, which was opened in the 2016-2017 spring term. In the first three weeks, the PTs read and discussed articles and book chapters about learning and teaching for data processing (Ben-Zvi, 2011; Cobb & McClain, 2004; Van de Walle, et al., 2010). They were then informed about the lesson study model and conducted one lesson study cycle as a group of three for the part of the pilot study. The PTs implemented the lesson study for the last seven weeks of the course duration. Data from one group (Gamze, Şirin and Beyza) were analysed for the current study. Groups were asked to design, conduct and revise three lesson plans for teaching seventh grade objectives related to graphs. Three types of graphs (bar, pie and line) are included in the middle school curriculum in Turkey (MoNE, 2018). Bar graphs are presented at the 6th grade whereas pie and line graphs are presented at the 7th grade. The PTs were asked to use a format with four components when planning their lessons: 1) learning activities and key questions, 2) expected student reactions, 3) teacher's responses to student reactions, and 4) goals and method(s) of evaluation (Mathews, et al., 2009). Immediately after they had completed their lesson plans, they initially implemented these plans in the university classroom to their classmates and then in the real

classroom. The lesson plans were carried out by Gamze, Şirin and Beyza respectively. After each implementation, evaluation of the lessons was made, and the lesson plan was revised. In the university classroom environment, an academician in the function of the expert (the second author) and the researcher (the first author) took part in the lesson as observers, and then evaluated the lesson. On the other hand, the classroom teacher and the researcher (the first author) participated in the lesson as observers, and afterwards evaluated the lesson in the real classroom environment. In addition, in the micro-teaching environment, the other PTs in the university class and the other group members in the real classroom environment evaluated the lesson plan and made suggestions about how to improve it. Each lesson study process lasted three weeks. This procedure is illustrated in Figure 1.
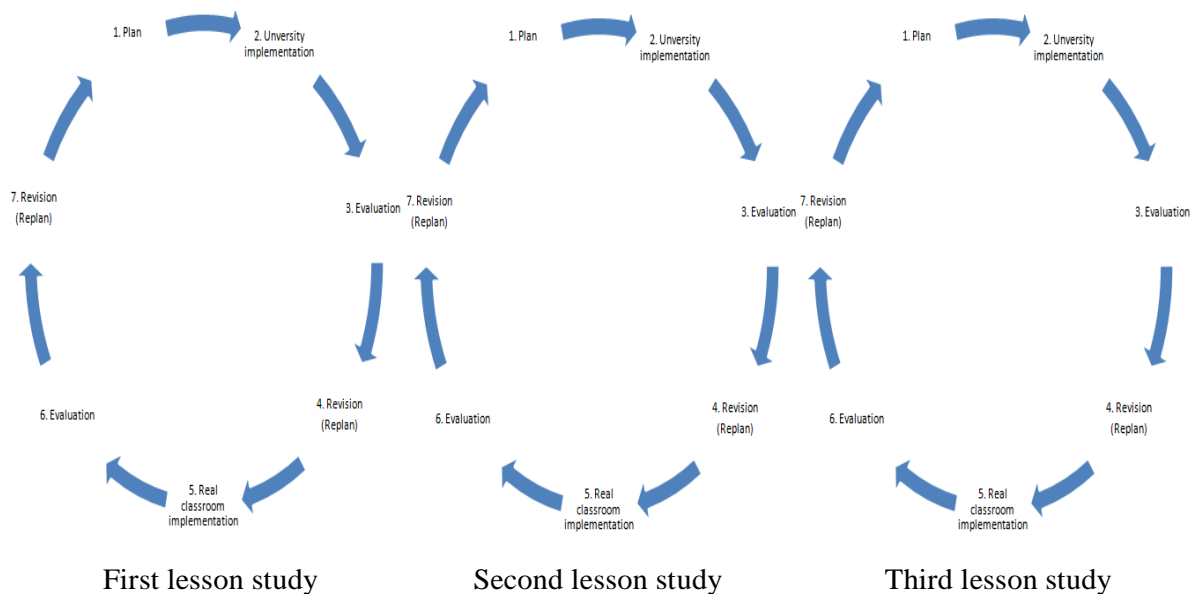
Figure 1. *Lesson study process (Adapted from Zhang & Cheng, 2011)*

Data Collection Tools and Data Analyses

The aforementioned implementations that took place at the university and real classroom as well as the meetings that were carried out for planning, evaluating and revising the lesson plans were video-recorded and transcribed into documents. The lesson plans organized by the PTs, video-recordings and transcribed lesson study meetings (for planning, implementation and evaluation) and classroom implementations at the university and real classroom environment, observation forms completed by the observers, field notes prepared by the first author and reflective papers written by the PTs were used to collect data. In order to data analysis, the descriptive analysis method was employed. By using the data obtained from the documents, video recordings, observation notes and reflective journals, a thorough analysis was conducted on the PTs' instructional decisions (recognized or disregard) and actions related to their teaching statistics. By analysing all the activities carried out during the lesson study process (planning the lessons, university and real classroom implementations, evaluation and revision meetings, reflections), researchers examined how the PTs made sense of the graphs, whether and to what extent they transformed their understandings about graphs into instructional practices as the lesson study implementations progressed. The findings are clustered around three themes that reflect changes in PTs' understandings of graphs as they worked for teaching graphs. These are namely establishing task requirements, deciding the appropriate type of graph, and interpreting graphs. In order to enhance the trustworthiness of the study, several strategies were adopted. The researchers spent a long time with the participants both in the university and the real classroom environments, collected data from many sources, used triangulation of data sources and data analysis (e.g., coded data in different time periods, consulted an expert review and examined intercoder reliability). In order to enhance the transferability of the study, the researcher provided detailed information about the participants and the context to be investigated and presented in-depth descriptions of the instructions and direct quotations of the participants. The intercoder

reliability of the study was found to be 85%. The research study that underpins this publication was approved by the ….. University Institutional Review Board for Human Subjects Research (Protocol Number 433-1358, 02.05.2016).

FINDINGS / RESULTS

The findings are presented in three sections (a) the PTs' initial understandings of graphs, (b) the PTs' struggles with teaching graphs as a result of the lack of understanding that graphs are instruments to answer statistical research questions, and (c) the PTs' development of an understanding about the function of graphs as instruments to answer statistical questions.

PTs' Initial Understandings of Graphs

The PTs initially viewed graphs as instruments for organizing and representing data. They overlooked the fact that graphs can also be used to answer a statistical question in a SPSP. This was observed while they were designing the tasks for their lesson plans, deciding the appropriate type of graph with their students and guiding their students for reading and interpreting graphs.

During the first phases of the study, the requirement of the tasks designed was mainly for the purpose of expressing a data set with a particular type of graph or transforming graphs into each other. For instance, they planned to collect data from the class about students' favourite football teams and then ask students to express the collected data with a graph: "Which graph would you use if we organized the answers you gave and showed them on a graph?" (1st University class plan). They planned to introduce pie graph after students draw a bar graph that they learned at the 6th grade as a new way to display data: "Let's convert the bar graph into a pie graph" (1st University class planning). Next, they planned to present a larger data set (n=360) with the same context (favourite football teams) and focused on procedural aspects of drawing pie graph (e.g., working with degrees and percentages). Likewise, in the 2nd lesson study, during the university classroom implementation, they presented a table showing average temperature of a city for 5 days and asked students: "I want to express this data [average temperature of a city for 5 days] in a graph. What kind of graph should I use?". These cases initially indicated that PTs mainly viewed graphs as instruments to represent data and ignored their function as instruments to answer statistical research questions.

Their view of graphs as instruments to represent was also observed while they were discussing the appropriate type of graph to be used with their students. For instance, during the 1st university implementation, when a student asked why they need to learn pie graphs as they already knew one way to represent data (i.e., line graph), Gamze explained that "each type of graph provides a different way of representing data" (1st university class implementation). Also, they usually chose prototypical examples and contexts for the tasks and made superficial connections between these examples and types of graphs (e.g., degrees of temperature by line graph, distribution of votes by pie graph, favourite sports teams by bar graph). While designing the tasks and deciding the appropriate type of graph, they also considered the type of the variable (categorical versus quantitative variables). To put it in a nutshell, the PTs focused on the connections between types of graphs and particular contexts or type of the variable rather than making connections with a statistical research question or a purpose for drawing the graph.

Furthermore, the PTs did not take the purpose that should have been set at the beginning while reading and interpreting graphs into account. For instance, when reading and interpreting pie graphs, the PTs asked students questions related to comparing groups rather than focusing on what makes a pie graph distinct as a instrument to represent data (i.e. observing the relative contribution of each category within the whole data set, comparing two different sized-data sets). A sample dialogue between Gamze and the students presents a class discussion about a pie graph showing the number of siblings in a class.

1st University Class Implementation

"Gamze: By looking at this graph, what can you tell me about the number of people? Let's see if there are any relations between them [slices of the graph] and then interpret.

Student: For example, half of 20 is 10. The number of people with one sibling is 9. The total number of people with no sibling and those with 2 siblings is 9. Thus, this gives us a total of 18 people.

…

Gamze: Ok, can you make comparisons among groups?

Student: The number of people with one sibling is the largest.

Gamze: Yes, the number of people with one sibling is the largest, isn't it? It has a largest slice. Which group has the smallest number of people?

Student: [people with] 3 and more [siblings]."

As can be seen, the PT did not include expressions regarding the purpose for drawing the graph while interpreting the pie chart. It was observed that the PT included the column chart, which is used more appropriately for the purpose of comparing data, in some of his/her questions regarding interpreting the pie chart (e.g., can you make comparisons among groups?).

It can be said that the PTs initially tended to see graphs as a tool used only to organize and represent data because the PTs did not make a connection between the purpose of drawing graphs and a statistical research question, both when preparing tasks for students and in discussions about deciding the appropriate type of graph and interpreting graphs.

PTs' Struggles with Teaching Graphs

The fact that the PTs view the graphs only as a means of representation posed difficulties in answering students' questions during their class implementations. These difficulties were observed especially in their first and second lesson study implementations. During the first lesson study implementation, Gamze transformed the bar graph into a pie graph without presenting a rationale or a clear explanation. As the task lacked a specific statistical research question, she struggled with a student's question asking whether they can also display degrees of temperatures by using a pie graph. Here Gamze focused on the variable type rather than the research question, which should be formulated at the beginning of the statistical investigation. The dialogue is presented below.

1st University class implementation

"Student: "Can we convert all bar graphs into pie graphs? (referring to the degrees of temperature)

Gamze: Since the variable (degrees of temperature) is quantitative, it is not appropriate to represent it by using a pie graph.

…

Gamze: Let's assume that it is a graph for degrees of temperatures. Tell me the values.

Student: It can be -2°C and 5°C.

Gamze: Hım, then there would be different temperatures in two different days? Do you think it would be meaningful to display these values [into a pie graph]? What does it mean here [referring to the slices of pie graph]? They represent the number of people. For example, the largest slice in the pie graph shows the highest frequency. Here, how do we show 25 degrees of temperature.

….

Student: So, this means we cannot use the pie graph in every situation, right?

Gamze: Yes. There are certain cases for which different graphs would be more suitable.

From this dialogue, it can be seen that the PT attempted to create a pie chart based on the data provided by the student, but realized that this would not be meaningful. Since she did not go through a problem situation

related to the example based on the intended use of the pie chart, she could not give a satisfactory answer to the student's question and could not structure the lesson effectively. In this example, different problem situations related to the context could be created and which representation would be more appropriate for each problem situation could be discussed. For example, in the case of a problem that involves comparing the highest daytime temperatures observed for each day in a particular month in a province, a bar graph would be an appropriate representation, while a pie graph would be a more appropriate representation for a problem situation in which the distribution of the highest temperatures observed in a month in a province within the total month is examined. A similar situation was observed in the dialogue between the student and Gamze given below.

1st University class Implementation

"Student: Why do we need to draw a pie graph? We already know the bar graph.

Gamze: Yes, we know the bar graph. It is a different representation."

The phrase "different representation" used by the PT was discussed in detail during the evaluation meeting. Gamze questioned her statement "I said that, but is it really just a different representation? Then why do we teach different types of graphs?" Similar difficulties were also observed in the second lesson study implementation. The sample excerpts from the class discussion are presented below:

2nd University class Implementation

 "Student: Do we use it [line graph] only for temperature?

Şirin: No, we do not use it only for temperature. Is there anything else that comes to your mind? For example, what else can we use it for? Think about it.

…

Şirin: Why do you think we might have made these connections [points of change]?

Student: To see, for example, whether it decreased like this or whether it increased.

Şirin: Yes, we can see the increase and decrease more easily in this way, can't we? For example, it decreased from Monday to Tuesday here.

Student: It [the change] can also be seen by using a bar graph. Why are we drawing this [line graph]?

Şirin: Yes, then, let's talk about it later…"

The student asking "Why are we drawing this [line graph]?" was responded by the PT as "let's talk about it later", which can be considered as an indication of a difficulty arising from not being able to establish a connection with the purposes of drawing graphs.

The fact that the PTs see graphics only as a means of representation caused them to have difficulty answering questions from students in their practices. These difficulties triggered the PTs to question the role of graphics in SPSP.

PTs' Development of an Understandings About the Function of Graphs as Instruments to Answer Statistical Questions

When the PTs struggled with answering students' questions during the implementations, these issues came up in the evaluation meetings. They discussed the purpose of drawing graphs and began to ask questions such as "Why do we draw graphs?", "Is our purpose just to represent data?". These discussions led them to realize that the tasks they initially formulated lacked a clear purpose or a statistical research question. For the 2nd lesson study related to line graphs, they revised their task so that it included a problem situation given in a context solved by collecting and analysing data (Figure 2).

Initial Task   Revised Task

"I want you to Express the data presented in the table with a graph. What kind of graph could we use?"

Average temperature of Ankara for 5 hours	
Time	Temp. (^{0}C)
07.00	1
10.00	5
13.00	9
16.00	9
19.00	7

"Uncle Hasan will plant a vegetable in his garden. In order to get the highest yield from this vegetable, the temperature change should be the least for 2 days after the day it is planted. Below is the weather forecast for the next 14 days. Let's find the best days for Uncle Hasan to plant."

1	2	3	4	5	6	7	8	9	10	11	12	13	14
20°C	23°C	25°C	22°C	19°C	23°C	26°C	24°C	25°C	26°C	25°C	23°C	20°C	24°C

Figure 2. *Initial task and revised task about line graph-2nd lesson study*

It was noted that the revised task in Figure 3 was structured around a problem situation and a purpose. A similar situation was observed in the tasks prepared for the 3rd lesson study process (Figure 3).

Initial Task   Revised Task

Favorite courses of Class 7/A		The table presents the
Courses	Number of students	favorite courses of students in Class 7/A.
Mathematics	4	Draw the appropriate
Turkish	3	type of graph and
English	2	select three courses
Physical Education	5	and compare each
Visual Arts	1	course's state within
Science	3	the whole, find the
Social Studies	2	percentages.

Favorite courses of Class 7/A		The table presents the
Courses	Number of students	favorite courses of students in Class 7/A. The teacher
Mathematics	4	wants to learn how much
Turkish	3	mathematics is liked among
English	2	all courses. Please draw the
Physical Education	5	appropriate type of graph
Visual Arts	1	and interpret the state of
Science	3	mathematics in comparison
Social Studies	2	to two other courses you selected.

Figure 3. *Initial task and revised task about pie graph-3rd lesson study*

As stated in Figure 2, the revised task includes a clear purpose: the teacher wanted to learn how much mathematics was liked among all courses. In this way, the task required the students to focus on the place of a category (mathematics course) within the whole (all courses). In addition, it has been observed that the contexts in the tasks have diversified and the PTs were more likely to move away from prototypical examples when designing tasks. They also developed a task to show that students needed to consider the purpose or the statistical question when deciding which type of graph would be the most appropriate even if the context of the problem seemed to be related to a specific type of graph (e.g., vote counts are usually shown with pie graphs). (Figure 3).

Number of votes of the candidates for student council		The table presents the number of votes
Candidates	Number of votes	of the candidates for school council in
Pelin	78	our school. Draw a graph that
Veli	57	compares the data and decide who the
Alparslan	99	president and the vice president of the
Aysel	127	council are.

Figure 4. *Task about bar graph- 3rd lesson study*

While this task still required a revision as it presents a small sample, it showed that the PTs began to consider students' thinking process. With regard to this task, the PTs stated that "When it comes to vote counts, it is always thought that the pie graph should be used. We deliberately chose this context and wanted them [students] to learn that it [data set of vote counts] can also be expressed by using a bar graph depending on the purpose." (3rd University class evaluation). During the evaluation meetings, the PTs began to understand the function of graphs as instruments to answer the statistical research questions and considered their purpose when deciding the appropriate type of graphs. They designed tasks around a purpose or a statistical question and encouraged students to evaluate which type of graph is the most appropriate to answer the formulated question. They asked questions such as "The bar graph is used for this purpose: to compare different situations [categories]. So, what about the pie graph? What do we use it [pie graphs] for?" The example presented below shows Gamze's explanation regarding the purpose of using pie graphs in the context of favourite football teams (Number of supporters for each team was presented as Galatasaray: 90 Fenerbahçe: 180 Beşiktaş: 72 and Other teams: 18).

1st Real Class Implementation

"Gamze: Can I say that pie graph allows me to see the ratio of a piece to the whole? Does everybody agree? In this case, I can say that the number of supporters of Galatasaray occupies 90 pieces among the whole,360 pieces. Here, we have 360 data. Some of you could easily convert this into a bar graph. However, sometimes there are so much data that we need to use a pie graph to see the ratio [between parts to the whole]. So, what are pie graphs used for? What do they help us see?"

As mentioned earlier, the PTs initially evaluated the suitability of using the line graph in a given context by focusing on the variable type and carried out their lesson plans and implementations in this direction. They were unable to answer students' questions like "Do we use line graphs only for temperature?", "We can display temperatures in a bar graph, so why do we need to display with a line graph?". While they had previously taken the type of variable or generalizations about contexts as the main consideration in the selection of the most appropriate type of graph, they realized that they should also take the research question or purpose into consideration. In fact, they were able to guide the discussion to focus students' attention to the function of graphs as instruments to answer research questions. The dialogue below showed that Şirin made comments on students' suggestions and emphasized the main purpose of using line graphs as observing change across time.

2nd Real Class Implementation

"Şirin: Now where else can we use line graphs? For example, do you have any problem context that comes to your mind? Where can we use it?

Student: For example, for the number of cars sold in 2016.

Şirin: Yes, the number of cars sold across the years because we want to see increase or decrease. Increase or decrease; that is, when we want to see the change [over time], we can use a line graph.

….

Student: The number of bagels sold on different days.

Şirin: How many bagels were sold on each day? Thus, we can see the change across days."

The development of PTs' understanding of graphs as instruments to answer research questions was observed especially in the third lesson study process. During the university implementation, Beyza emphasized the importance of the purpose in determining the appropriate type of graph and stated that the decision should not be made only based on the type of variable.

3rd University class Implementation

"Beyza: Ok, can you give me an example? You can give me an example as to why a particular graph

should be used to represent a data set.

Student: For temperature change or population change, I can use a line graph.

Beyza: Hımm. For only temperature or population change? What else, what is important here, the temperature or the change?

Student: The change.

Beyza: Yes, the change in something.

…

Student: If we are given a frequency table showing the frequency of number of siblings, then we can show it with a bar graph.

Beyza: Ok. You can also show it by using a pie graph.

Student: We can.

Beyza: Which one would you choose and why?

Student: If we compare everyone with each other, we can use a bar graph because we want to show their relative status. If we are interested in the ratio of parts to the whole like showing each category for the number of siblings in the whole class, then we need to use a pie graph."

The PTs also consulted the difficulties students faced and made additional arrangements in their lesson plans. For example, they started designing tasks deliberating that a problem situation suitable to be represented by using a pie graph could also be represented with a bar graph. Moreover, they used the same approach when comparing the use of line graphs with bar graphs as well as the line graphs with pie graphs at this stage.

In addition, they asked questions and made explanations that would draw more attention to the purpose of the graphs during the real classroom implementation. For example, they gave a specific data set and asked the students to ponder upon which graph would be the most appropriate to represent the given data set. During the class discussion, the PTs emphasized that students should consider its purpose when deciding the appropriate type of graph.

3rd Real Class Implementation

"Beyza: We sometimes say we should draw a bar graph here and sometimes we say that we should draw a pie graph there. Can we clearly decide which one to use? For example, can I say that this set of data should be represented with a bar graph or that set of data should be represented with a pie graph. For example, I have a set of data here [referring to the votes of student council example]…Can't we use a pie graph to draw what we have shown here instead of using a bar graph?

Student: We can draw that.

Beyza: So, why haven't we drawn it?

Student: Here it asks us to select the president and vice president. So, we just need to know the number of votes, we don't need their percentages. That is, we need to show how many votes have been given to each candidate and who received the highest number of votes in order to find this [we can use bar graphs].

Beyza: Yes, we compared them [number of votes for each candidate] with each other. Here there is no certain difference between these types of graphs…For example, I can draw either a bar graph or a pie graph for these data sets [referring to the two tasks: student council and favourite courses]. However, in one of them, I am asked to find the ratio of the piece to the whole [referring to the favourite courses task] while the other [referring to the student council task] asks me to make comparisons. That is, what is important here is what I am asked to do. What should I see in the graph? That is, depending on what I will see in the graph, I will select the graph.

The PTs also ignored the purpose for drawing the graphs while they were interpreting the graphs at the beginning. For instance, when they interpreted a pie graph, they merely focused on comparing groups rather than emphasizing on what makes a pie graph distinct as a instrument to represent data (e.g., see the relative contribution of each category within the whole data set). During the evaluation meetings, such questions as "Let's consider what our purpose for drawing the graph was" were asked by the expert. "Based on this purpose, what can we say about the graph?" led the PTs to reflect on this issue. During the revision meetings, the statements like "Here we should attend that they [students]make comparisons" can be seen as indicators that the PTs started to consider the purpose of drawing graphs during the interpretation of findings. After these discussions, they became more attentive to the function of graphs as instruments to answer research questions. For example, in the first real classroom implementation related to the favourite football teams, Gamze emphasized comparing the categories by asking questions like "Can you see the number of supporters which is two or three times higher than the number of other supporters?" (1st real class implementation). Likewise, they included sample statements related to interpreting pie graphs in their lesson plan about pie graphs: "English is the most favourite course for 10% of the students. Mathematics is the most favourite course for 20% of the class." (3rd university class plan).

DISCUSSION, CONCLUSION, RECOMMENDATIONS

The current documents in teaching statistics emphasize that students should be given opportunities to engage in the SPSP (Bargagliotti, et al, 2020; Franklin, et al, 2015). This perspective expects teachers to address all components of the SPSP (i.e., formulating research question, collecting, and analysing data and interpreting the results) in their instructional practices. However, neither teachers (örn, Litke & Hill, 2020; Şeker-Akın, 2023) nor PTs are familiar with teaching statistics from the statistical problem-solving process. In this study, we focused on 7th grade objectives related to teaching graphs in middle school curriculum and examined PTs' understanding of graphs and the transformation of their understanding about graphs into instructional practices as they participated in the lesson study. The participants' initial understandings of graphs are based on viewing graphs as instruments to represent a data set. This naturally caused them to emphasize the representation function of graphs and focused on the procedural aspects of drawing graphs. The lack of understanding that graphs are instruments to answer statistical research questions formulated at the beginning of the SPSP resulted in certain inadequacies while responding to students' questions. Given that making sense of graphs is considered as higher-order thinking and that today's world requires individuals who can comprehend and interpret different graphical representations, the importance of drawing attention to these difficulties experienced by pre-service teachers becomes evident (Boote, 2014; Patahuddin & Lowrie, 2019).

When the participants began to acknowledge the function of graphs as instruments to answer statistical questions, they were more likely to find different, yet conceptually related ideas and problems understandable, solvable and sometimes even trivial. This fundamental transformation in their understanding resulted in a change in how they designed and implemented their lesson plans. They designed tasks around a problem situation or a statistical research question and made connections with this research question while deciding on the type of graph or interpreting the graphs. In addition, they anticipated students' possible conceptions and misconceptions related to graphs. Hence, they also realized that they need to use this understanding of graph as a criterion when evaluating student learning.

To sum up, understanding that graphs are not only instruments to represent data, but also instruments to answer statistical research questions is an important conceptual development or key development understanding (KDU) for these PTs, which was built on multiple experiences of designing, implementing and evaluating lesson plans. KDUs are effective objectives of mathematics instruction (Simon, 2006) and can play as "powerful springboards for learning" (Silverman & Thompson, 2008, p. 502). When the literature is reviewed, it is seen that researchers are trying to define KDUs that guide statistical concepts (e.g., unconventional modifications to conventional statistical representations, hat plots (placed above dot plots) as transitional representations between uncondensed and condensed data displays) (Groth, 2013). It is argued that

KDUs constructed in relation to mathematical concepts are directly associated with mathematical knowledge for teaching and that KDUs will guide teachers in the process of structuring the instruction (Huang, 2014; Silverman & Thompson, 2008). In this context, the KDU structure proposed by Simon (2006) was used to investigate how PTs established connections to their content knowledge in the process of planning, implementing, and evaluating lesson plans.

The participation of the PTs in the lesson study program contributed initially to the development of their understanding of the function of graphs in SPSP and in the later stages of the process, they set the purpose of drawing graphs as a learning goal. They realized that this is necessary for students to understand the SPSP. In addition, the PTs' discussions on how they could make more satisfying explanations in response to student answers are thought to support this development. Research has shown that teacher training programs should provide teachers with opportunities to establish links between the conceptual and procedural understandings of mathematical contexts, test these understandings and foster the dissemination of these understandings. When the literature is examined, it is seen that teaching strategies (e.g., writing prompts) for the emergence of KDUs have been integrated into teacher training programs in various studies (e.g., Groth, 2013). It is argued that PTs need continuous support to realize profound changes such as the development of KDUs. The promising results obtained from the current study and the activities conducted can be considered to be important steps for this development to emerge (Rhee, 2012). Provision of opportunities for PTs to participate in training programs focused on KDUs and opportunities to work cooperatively to understand how these KDUs will be integrated into the teaching process will help support their development.

Although there is a need for more research to define KDUs needed by PTs / and for teachers in the teaching process, it is believed that the current study will certainly contribute to the recognition of KDUs needed in SPSPand to teach the function of graphs in this process. Furthermore, it can be said that these and similar KDUs revealed can have direct benefits in the determination of instructional goals. While constructing the curriculums, consideration of the KDUs determined by research can have some positive effects on the development of students' mathematics (Silverman, 2005). Recognition of KDUs by PTs can help them understand how students make sense of mathematical concepts. When PTs focus on the KDU of the related mathematical concept, they can better predict and interpret the development of this concept (Fernández, et al., 2018). Hence, they can turn them into pedagogically powerful ideas in the teaching process.

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Preschool Peer Aggression Scale (Teacher Form): Validity Reliability Study

Hülya Gülay Ogelman[1] 🆔 **Seda Sarac[2]** 🆔 **Filiz Erbay[3]** 🆔

Gökhan Kayılı[4] 🆔 **Nazife Koyutürk Koçer[5]** 🆔 **Alev Önder[6]** 🆔

[1] Sinop University, Faculty of Education, Department of Primary Education, Sinop, Turkey
ogelman@sinop.edu.tr

[2] Bahcesehir University, Faculty of Educational Sciences, Department of Primary Education, İstanbul, Turkey
seda.sarac@es.bau.edu.tr

[3] KTO Karatay University, Faculty of Health Sciences, Department of Child Development, Konya, Turkey
filiz.erbay@karatay.edu.tr

[4] Selcuk University, Faculty of Health Sciences, Department of Child Development, Konya, Turkey
gokhankayili@selcuk.edu.tr

[5] Ministry of National Education, İsa Yusuf Alptekin Primary School, İstanbul, Turkey
nazifekoyuturk@gmail.com

[6] Bahcesehir University, Faculty of Educational Sciences, Department of Primary Education, İstanbul, Turkey
alevond@gmail.com

Article Info	ABSTRACT
	This study aimed to develop and establish the validity and reliability of the Preschool Peer Aggression Scale (Teacher Form) (PPAS-TF). The studycarried out with two distinct sample groups. The scale's factor structure was established through Principal Components Analysis on the initial group, which comprised 1106 children (F=508; M=597). The second sample, which included 551 children (F:255; M:296) was utilized to conduct Confirmatory Factor Analysis to validate the factor structure. The scale's validity was also assessed through content and external criterion validity. For content validity, a literature review and expert consultation were employed. Convenience validity was used for criterion validity. For reliability, internal consistency coefficients, item-total correlation coefficients, and correlations between the factors were examined. As a result, the 28-item PPAS-TF for 4-6-year-old children was categorized into three sub-dimensions: social aggression, physical aggression, and verbal aggression. Teachers can use this form to assess aggression levels, with each sub-dimension's score indicating the extent of that specific aggression type. Higher scores in the sub-dimensions signify a greater propensity for that type of aggression. Additionally, an overall assessment can be made using the total score. The distinctiveness of the PPAS-TF arises from its development with a Turkish sample and its incorporation of three sub-dimensions.

INTRODUCTION

The increase in aggression cases among preschool and school-aged children has brought about a crucial concern for educators, parents, and mental health experts. Although the literature underlines that aggressive behaviors are more notable during adolescence, it also states that such behaviors can be observed at a critical level during early childhood (Coyne, Archer & Eslea, 2006; Heizomi, Jafarabadi, Kouzekanani, Matlabi, Bayrami, Chattu & Allahverdipour, 2021; Sharma & Marimuthu, 2014; Su, 2018). Aggression is defined as a specific behavior displayed or targeted to deliberately harm another individual. The aggressor acts by being aware that the aggressive behavior will harm the target individual (Hanratty, Macdonald & Livingstone, 2015; Su, 2018; Şengönül, 2017).

Aggressive behaviors do not always occur physically. Psychologists and field experts underline various types of aggression (Hanratty et al., 2015). One of these is verbal aggression. Verbal aggression refers to behaviors that an individual displays on others through communication such as humiliating, degrading, offending, shouting, threatening, and teasing (Güler & Özgörüş, 2021; Roberto, Meyer, Boster & Roberto, 2003). When compared with physical and relational aggression, it is observed that verbal aggression is displayed at a higher level during free play times in preschool education classrooms (Erbay & Durmuşoğlu-Saltalı, 2022; Ostrov & Keating, 2004). Physical aggression is another type of aggression that commonly occurs during early childhood (Erbay & Durmuşoğlu-Saltalı, 2022). Physical aggression, which refers to using the body or weapons to fight or show hostility, is one of the most common forms of aggression. Physical aggression, which causes physical damage or physically threatens other individuals, is generally the effort to protect self-image and consists of violent crimes such as physical quarrels and theft, and other highly risky behaviors (Denson, Pedersen & Miller, 2006; Lakhdir, Rozi, Peerwani & Nathwan, 2020; Sharma & Marimuthu, 2014; Su, 2018). Heilborn & Prinstein (2008) underline the concept of social aggression which is defined as another type of aggression. Social aggression refers to behaviors that deliberately harm interpersonal relationships or social status through non-conflict and usually confidential methods and that typically require the participation of social members. These behaviors can be exemplified as social exclusion, negative facial expressions, vicious rumors, and friendship manipulation (Heilbron & Prinstein, 2008; Paquette & Underwood, 1999).

Various factors that cause aggressive behaviors in children have been discussed. These are factors such as genetic factors, media, gender, culture, and sedentary lifestyle (Kumari & Kumar, 2018; Su, 2018; Wilson, 2008). It is also believed that harsh parenting, authoritarian parenting, physical punishment, and permissive parenting attitudes increase the likelihood of aggressive behaviors among children (Batool, 2013; Chen & Raine, 2018; De la Torre-Cruz, García-Linares & Casanova-Arias, 2014; Lakhdir et al., 2020; Mendez, Durtschi, Neppl & Stith, 2016; Ojedokun, Ogungbamila & Kehinde, 2013; Savage, 2014). There are also study results indicating that experiencing peer refusal and having aggressive and bullying peers around calls for and reinforces aggressive behaviors among children (Ellis & Zarbatany, 2007; Ladd, 2006).

Aggression tends to reach its peak between ages 2-4 during early childhood (Piquero, Carriaga, Diamond, Kazemian & Farrington, 2012; Tremblay, 2010). Although most children learn socially acceptable ways of coping with their environment as they grow, some can fail in decreasing their aggressive behaviors and can follow a consistently aggressive and anti-social behavior pattern during adolescence and later (Hanratty et al., 2015). Problems related to anger and aggression management can have negative effects on children such as being excluded at school, school dropout, social problems, externalization behavior problems, internalization behavior problems, weak emotional state, and well-being, and adapting to the criminal justice system (Babore, Carlucci, Cataldi, Phares & Trumello, 2017; Estévez, Jiménez & Moreno, 2018; Piquero et al., 2012; Salimi, Karimi-Shahanjarini, Rezapur-Shahkolai, Hamzeh, Roshanaei & Babamiri, 2019). Longitudinal studies have shown that children with aggression problems in early childhood have a higher risk of violence, alcohol, and drug use, getting involved in crime, depression, and committing suicide than their peers during adolescence (Erbay & Durmuşoğlu-

Saltalı, 2022; Jenkins, Demaray & Tennant, 2017; Kokko & Pulkkinen, 2000).

Thus, the importance of appropriate intervention methods concerning aggression has come to the agenda (Michelson, Davenport, Dretzke, Barlow & Day, 2013) Serious and chronic anti-social behaviors can emerge in young children with anger and aggression problems in cases of lack of appropriate intervention. When the prevalence and long-term effectiveness of anger and aggression problems during childhood are considered, it is crucial to identify and conduct effective interventions and to end ineffective interventions (Hanratty et al., 2015). Nonetheless, the initial and crucial step in this process is the accurate and clear identification of aggressive behaviors in children, along with a comprehensive understanding of the types and frequencies of these behaviors. Hence, it is imperative to have a variety of additional measurement instruments available for assessing child aggression.

This study was planned to develop a measurement tool to evaluate children's aggressive behaviors during early childhood through teacher observations. Teacher reports concerning aggressive behaviors are the most frequently used method in evaluating aggression among young children (Perry, Ostrov, Murray-Close, Blakely-McClure, Kiefer, DeJesus-Rodriguez & Wesolowski, 2021). Teachers witness daily peer interactions more than parents and this enables them to be more informed than parents concerning peer-oriented aggression. In addition, teachers generally have experience in peer interactions among children; thus, have an idea about the "typical" behaviors of preschool period children (Perry et al., 2021). On the other hand, teachers can partly develop judgments about a child in the classroom based on how other children react to that child. Thus, it is reasonable to expect teachers to accurately perceive how children interact with each other within the classroom (Huesmann, Eron, Guerra & Crawshaw, 1994). As a result, teachers have become a reliable and valid resource that consistently evaluates the aggressive behaviors of children (Estrem, 2005; Juliano, Stetson Werner & Wright Cassidy, 2006; Perry et al., 2021).

Considering the available literature, it becomes clear that in Turkey, many assessment tools are designed for specific phases of early childhood and primarily focus on evaluating aggressive behaviors in children during their primary school years. Among the tools that are based on parents' and teachers' evaluations is the "Aggression Scale for Children-Parent Form" (Ercan, Ercan, Akyol-Ardıç & Uçar, 2016), which measures behaviors of 7-14 years old children, and the "Aggression Scale for Children-Teacher Form" (Ulu, 2018), which evaluates 7-15 years old children. In addition, the "Preschool Social Behaviour Scale-Teacher Form" (Şen & Arı, 2011), which consists of a total of six sub-dimensions and evaluates preschool period children's aggressive behaviors through the two physical and relational aggression sub-dimensions, and the "Preschool Social Behaviour Scale-Peer Form" (Şen & Teke, 2019), which has a total of 3 sub-dimensions including the physical and relational aggression sub-dimensions, are among measurement tools in the literature used to determine aggressive children. The "Ladd-Profilet Child Behaviour Scale", which consists of an aggressive behavior sub-dimension and was adapted to Turkish by Gülay (2008); the "Selçuk Peer Relationships Evaluation Scale" (Kaynak, Kan & Kurtulmuş, 2016), which evaluates peer relationships and aggression levels of 36-72 months old children through a sub-dimension; and the "48-72 Months Old Children's Aggression Tendency Scale" (Kaynak, Kan & Kurtulmuş, 2016) are used in studies. As evident, it is necessary to develop scales aimed at uncovering the levels and types of aggression among preschool children in Turkey. For this reason, there is a need for measurement tools that are developed according to the Turkish culture, whose validity and reliability studies have been completed, and which only evaluate aggression through various dimensions. Measurement tools that are developed to identify aggressive behaviors in young children emerge as a crucial need. Thus, this study aims to develop a measurement tool to evaluate the aggressive behaviors of 4-6-year-old children.

The research questions of the study are as follows:

1. Is the Preschool Peer Aggression Scale (Teacher Form) (PPAS-TF) developed for preschool children a valid measurement tool?

2. Is the Preschool Peer Aggression Scale (Teacher Form) (PPAS-TF) developed for preschool children a reliable measurement tool?

METHOD

Research Design

This study focused on developing a scale, employing a survey model that avoids any disruption to the individual, case, or situation (Fraenkel, Wallen & Hyun, 2012), which gathered research participants' unaltered opinions about the examined phenomenon (Büyüköztürk, Çakmak, Akgün, Karadeniz & Demirel, 2017). The study aimed to develop a peer aggression measurement tool for preschool children. The purpose of scale development studies is to best reveal the structure of the characteristic being measured (Erkuş, 2019).

Research Sample

This study comprises two distinct sample groups. The factor structure of the scale was initially established through Principal Components Analysis (PCA) in the first sample group. Subsequently, the second sample group was incorporated into the Confirmatory Factor Analysis (CFA) to validate the factor structure derived from the PCA.

The convenience sampling method was preferred when determining the first sample of the research. Convenience sampling is a non-random sampling method where the sample selection from the population is determined by the researcher's judgment. In convenience sampling, data is collected from the population in the easiest, quickest, and most economical way possible (Aaker et al., 2007: 394). However, one child from each of the 12 regions, which are among the first level of the Turkish Statistical Institute (TÜİK) regional classification, was included to achieve an inclusive sample. One province from the 12 regions was selected randomly and data were collected by contacting teachers working in that province. The sample size was calculated to identify the minimum number of children that can be in the sample. According to 2021-2022 TÜİK data, there are a total of 1,226,981 children aged 48-72 months old attending kindergarten and nursery schools. According to this calculation, there should be 666 or more measures conducted to reach 99% reliability and the real value is 5%± close to the measured value. Since there can be incomplete data, it was planned to collect data from 1000 children. Consequently, data from a total of 1106 (F=508; M=597) children were collected. The entire sample consists of typically developing children. Table 1 displays demographics for the first sample.

Table 1. *Demographics for the first sample (n=1106)*

Age	f	%
4 years old	241	21.8
5 years old	583	52.7
6 years old	282	25.5
Total	1106	100.0
Province		
İstanbul region- İstanbul province	201	18.7
West Marmara region-Kırklareli province	44	4.0
Ege region- Muğla province	106	9.6
East Marmara- Bursa provinc	72	6.5
West Anatolia region- Ankara province	145	13.1
Akdeniz region- Isparta province	115	10.4
Anatolia region- Niğde province	50	4.5
West Karadeniz region- Zonguldak province	82	7.4
East Karadeniz region- Trabzon province	89	8.0
North East Anatolia- Kars province	56	5.1
Middle East Anatolia region-Muş province	72	6.5

South East Anatolia region, Batman province	74	6.7
Total	1106	100.0
Mother education	**f**	**%**
Iliterate	13	1.2
Literate	45	4.1
Primary school degree	145	13.1
Middle school degree	95	8.6
High school degree	294	26.6
University degree	514	46.5
Total	1106	100.0
Father education	**f**	**%**
Iliterate	3	0.3
Literate	21	1.9
Primary school degree	115	10.4
Middle school degree	116	10.5
High school degree	319	28.8
University degree	532	48.1
Total	1106	100.0

Whether the factor structure resulting from the PCA, conducted on the first sample, can be confirmed was tested with children in the second sample which consisted of children attending preschools in Istanbul region, Istanbul province. A total of 551 children (F:255; M:296) participated in the research. The entire sample consists of typically developing children. Table 2 displays the demographics for the second sample.

Table 2. *Demographic information for the second sample (n=551)*

Age	f	%
4 years old	162	29.4
5 years old	247	44.8
6 years old	162	29.4
Total	551	100.0
Mother education	**f**	**%**
Iliterate	5	0.9
Literate	18	3.3
Primary school degree	69	12.5
Middle school degree	50	9.1
High school degree	149	27.0
University degree	260	47.2
Total	551	100.0
Father education	**f**	**%**
Iliterate	1	0.2
Literate	8	1.5
Primary school degree	56	10.2
Middle school degree	57	10.3
High school degree	167	30.3
University degree	262	47.5
Total	551	100.0

Research Instruments and Processes

The Preschool Peer Aggression Scale (Teacher Form) (PPAS-TF)

The Preschool Peer Aggression Scale (Teacher Form) was developed in this study. A literature review was carried out before developing the form. In this regard, national and international articles, books, master's theses, and doctoral dissertations on preschool aggression from the years 2000 to 2020 have been reviewed. At the end of the literature review, a form was developed containing 39 items and was sent for expert opinion. In the process of developing measurement instruments, experts are consulted to assess their content validity. These experts evaluate the items of the measurement tool within the framework of content validity (Büyüköztürk, 2005). Opinions of two assessment evaluations and two preschool education academicians with doctoral degrees; one preschool education teacher with a doctoral degree in the field of preschool education were resorted to and the form was updated to 33 items. As a result of the validity and reliability studies, the 5-point Likert-type form gained its final form with 28 items. The Preschool Peer Aggression Scale (Teacher Form) consists of 3 sub-dimensions which are social aggression (10 items), physical aggression (9 items), and verbal aggression (9 items). The Social Aggression Sub-Scale consists of aggressive behaviors such as violating peers' rights, hurting peers' feelings, excluding peers, rejecting peers, and exercising pressure on peers. The Verbal Aggression Sub-Scale consists of aggressive behaviors that aim at harming peers (nicknaming, offending, teasing, provoking, etc.). The Physical Aggression Sub-Scale refers to physically aggressive behaviors (pinching, harming belongings, kicking, etc.). There are no reversed items in the scale. The total score obtained from each sub-dimension indicates the type of aggression. It is confirmed that the extent of displaying the aggression type increases as the score obtained from the sub-dimensions increases.

Ladd and Profilet Child Behavior Scale's Aggression Sub-Scale

This scale was used to test the criterion validity of the measurement tool developed during the study. The scale is one of the sub-scales of the Child Behaviour Scale developed by Ladd and Profilet (1996). It is used to measure aggressive behaviors of preschool-aged children based on teacher observations. The Aggression Sub-Scale consists of 7 items. The teacher evaluates the child with each item through a 3-point Likert tool (0=Inappropriate; 1=Sometimes appropriate; 2=Completely Appropriate). The scale was adapted to Turkish by Gülay in 2008 (Gülay, 2008). The internal consistency coefficient of the sub-scale was observed to the .87 in this study.

Data Analysis

Various methods were conducted to test the validity and reliability of the scale. Content validity, construct validity, and external criterion validity were examined for scale validity. Literature review and expert opinions were resorted for content validity; PCA and CFA were conducted for construct validity; convenience validity analysis was conducted for criterion validity. The Cronbach's Alpha internal consistency coefficients, item-total correlation coefficients, and correlation coefficients between the factors were examined for scale reliability.

The kurtosis and skewness values were examined before the data analysis to figure out whether the data set accounts for the normality assumption. According to Kline (2015), items account for single variable normality assumption in cases when the skewness values are between -3 and +3 and when kurtosis values are between -8 and +8. Concerning the kurtosis and skewness values for the first sample (n=1106), it was observed that the skewness and kurtosis values of item 4 (bites peers), item 10 (scratches peers), item 11 (spits at peers) and item 21 (swears at peers) are not between the values stated by Kline (2015). When frequency distribution of these items is considered, behaviors underlined in these items are carried out rarely, thus it was decided that it is convenient to take the items out of the analysis. The PCA was to be carried out on the remaining 29 items. Concerning the kurtosis and skewness values for the remaining 29 items in the second sample (n=551), it was observed that the

skewness and kurtosis values for every item were between the range stated by Kline (2015).

The Kaiser-Meyer-Olkin Test for Sampling Adequacy was conducted to test the convenience of the sample size; Bartlett Test results were examined to see whether the data set is convenient or not for a factor analysis. Table 3 shows the results of The Kaiser-Meyer-Olkin Test for Sampling Adequacy and Bartlett's Test of Sphericity for both samples. Based on these results, the data set and sample were observed to be convenient for a factor analysis.

Table 3. *The results of The Kaiser-Meyer-Olkin Test for Sampling Adequacy and Bartlett's Test of Sphericity for both samples*

		First sample (n=1106)	Second sample (n=551)
The Kaiser-Meyer-Olkin Test for Sampling Adequacy		.979	.973
Bartlett's Test of Sphericity	Approx. Chi-Square	31665.02	17723.30
	df	406	406
	Sig.	.00	.00

Ethic

Ethics approval of the study was obtained from the Science Research and Publication Ethic Committee of Bahçeşehir University, dated 22.06.2020 and numbered 2020/04.

RESULTS

Construct Validity

Principal components analysis

Data from the first sample (n=1106) were tested through the PCA to identify the factors of the scale that was developed; the Kaiser Normalization, which is an orthogonal rotation method, and the Promax Rotation methods were used to put forward the factors. According to the analysis results, there are 3 factors with an eigenvalue above 1 which account for 71.32% of the total variance. Figure 1 displays the Scree plot.
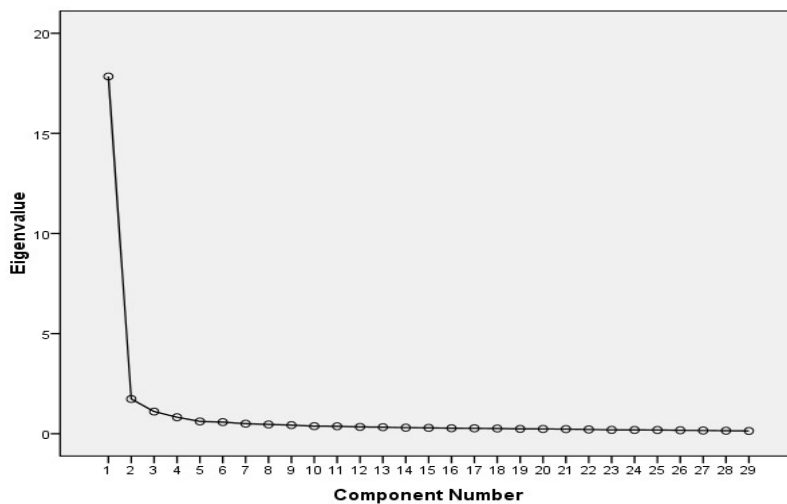
Figure 1. *Scree plot*

The eigenvalue of the first factor is 17.84 and accounts for 61.53% variance; the eigenvalue of the second factor is 1.73 and accounts for 5.98% variance and the eigenvalue of the third factor is 1.11 and accounts for 3.81% variance. However, the rotated components analysis results indicate that Item 13 (Sticks tongue at peers) doesn't have a factor load above .40 in the three-factor structure. For this

reason, the analysis was repeated by excluding this item from the analysis. As a result of the repeated analysis, a 3-factor structure was developed with an eigenvalue above 1 which accounts for 71.93% of the total variance. It was observed that the eigenvalue of the first factor is 17.30 and accounts for 61.79% variance; the eigenvalue of the second factor is 1.73 and accounts for 6.19% variance and the eigenvalue of the third factor is 1.11 and accounts for 3.95% variance. All items were loaded above .40 for the related factor. When the items in the factors are considered, it is evident that the first factor can be named Physical Aggression, the second factor can be named Social Aggression, the third factor can be named Verbal Aggression, and that this 3-factor structure is theoretically significant. The items and their names were shared with field experts (n=3), the factors were finally named after obtaining the positive opinions of the experts. Table 4. displays the results of the Rotated PCA.

Table 4. *Results of the rotated principal components analysis*

	Physical Aggression	Social Aggression	Verbal Aggression	Explained variation	Cronbach α
Item 3	**1.00**			61.79	.94
Item 1	**.95**				
Item 6	**.83**				
Item 2	**.82**				
Item 8	**.76**				
Item 12	**.76**				
Item 5	**.66**				
Item 9	**.65**				
Item 24	**.55**				
Item 23		**.96**		6.19	.95
Item 25		**.96**			
Item 17		**.83**			
Item 14		**.75**			
Item 15		**.73**			
Item 31		**.72**			
Item 28		**.72**			
Item 33		**.52**			
Item 29		**.51**			
Item 7		**.44**			
Item 26			**.94**	3.95	.95
Item 18			**.92**		
Item 22			**.84**		
Item 32			**.78**		
Item 16			**.77**		
Item 19			**.70**		
Item 20			**.70**		
Item 27			**.65**		
Item 30			**.56**		

Note: The highest factor load of the items is given in bold.

Confirmatory factor analysis

The 3-factor structure of the measurement tool, which was developed after the PCA, was tested through the CFA. Data from the second sample (n=551) were used for the CFA. To evaluate the fitness of the 3-factor structure the chi-square (χ^2) goodness of fit value, RMSEA, CFI, and SRMR fit indexes (Kline, 2015) were taken as a basis. The χ^2/sd rate should be below 5 (Sümer, 2000), the CFI value should be above .90, the SRMR value should be below .10 and the RMSEA value should be below .08 to reach an acceptable fitness level (Hu & Bentler, 1999). The results underline that the 28-item and 3-factor structure of the scale has been confirmed. Table 5. shows the results in a tabular form.

Table 5. *Goodness-of-fit indicators for the 3-factor model*

Model	χ^2/sd	CFI	SRMR	RMSEA
3-Factor	4.82	.92	.04	.08

Criterion validity

The Aggression Sub-Scale of the Ladd and Profilet Child Behavior Scale was carried out on 130 children from the second sample and correlations between the scores were examined to test the criterion validity of the scale. Table 6 displays the Ladd and Profilet Child Behaviour Scale's Aggression Sub-Scale scores and correlation coefficients of the scale regarding both the sub-dimensions and the total score.

Table 6. *The Preschool Peer Aggression Scale (Teacher Form), Ladd and Profilet Child Behaviour Scale's Aggression Sub-Scale score, and correlation coefficients between the factors*

	1	2	3	4	5
1. Physical Aggression	1				
2. Social Aggression	.77*	1			
3. Verbal Aggression	.79*	.86*	1		
4. The Preschool Peer Aggression Scale (Teacher Form) Total	.91*	.95*	.94*	1	
5. Aggression Sub-Scale of the Ladd and Profilet Child Behaviour Scale	.81*	.76*	.78*	.83*	1

*p < .01

It is evident in Table 4 that there is a highly significant positive correlation between the sub-dimensions. These results indicate consistency within the scale. The Aggression Sub-Scale of the Ladd and Profilet Child Behaviour Scale, used to examine criterion validity, has a high level of positive and significant relationship with both the sub-dimensions and the total scale score; this indicates that the children in the same sample get similar scores from different scales measuring similar structures and thus, the scale is at an acceptable level for criterion validity.

Reliability

Internal consistency

The internal consistency coefficients were examined in both samples for the reliability of the measurement tool. Values of the first sample (n=1106) were identified as .95 for Physical Aggression, .95 for Social Aggression, and .94 for Verbal Aggression. The internal consistency coefficient of the total scale was measured as .98. Since all values are above .80, both the sub-dimensions and also the total scale are highly reliable (Akgül & Çevik, 2003). Values of the second sample (n=551) were identified as .95 for Physical Aggression, .95 for Social Aggression, and .95 for Verbal Aggression. The internal consistency coefficient of the total scale was measured as .98. Since all values are above .80, both the sub-dimensions and also the total scale are highly reliable (Akgül & Çevik, 2003). Thus, it can be concluded that the internal consistency of the scale is high for both samples.

Item-total score correlation

The item-factor total score and item-total score correlations were examined to observe whether the scale can be measured reliably. Table 7 presents the correlation coefficients. It was observed that all the items have a positive correlation with the factor total score and total scale score of the factor they belong to and that the lowest correlation value is .65. These results indicate that the items exemplify similar features.

Table 7. *Item-factor total score and item-total score correlations*

	Item-Factor Total Score Correlation	Item-Total Score Correlation	
Physical Aggression			Physical Aggression
	.89	.76	Item 3
	.89	.77	Item 1

.87	.79	Item 6
.83	.73	Item 2
.88	.81	Item 8
.86	.78	Item 12
.72	.65	Item 5
.74	.67	Item 9
.86	.86	Item 24
Social Aggression		Social Aggression
.81	.72	Item 23
.78	.71	Item 25
.87	.82	Item 17
.84	.80	Item 14
.79	.73	Item 15
.86	.81	Item 31
.86	.81	Item 28
.82	.81	Item 33
.84	.83	Item 29
.81	.82	Item 7
Verbal Aggression		Verbal Aggression
.78	.70	Item 26
.85	.78	Item 18
.82	.76	Item 22
.86	.81	Item 32
.87	.82	Item 16
.88	.84	Item 19

Correlations between the factors

Correlation values between the sub-dimensions are presented in Table 7 to show the relationships between sub-dimensions. According to Tabacknick and Fidel (2007), to prove that a scale is reliable, correlation values between the sub-dimensions should be significant and shouldn't be too high or too low. High values show that the dimensions are overlapping, and low values show that the dimensions are divergent. According to the Table, the correlation coefficients of the sub-dimensions are .77, .79, and .86. The scale was approved to be reliable based on the fact that these coefficients are at acceptable levels.

DISCUSSION, CONCLUSION, RECOMMENDATIONS

Based on the findings of this study, it was observed that The Preschool Peer Aggression Scale (Teacher Form) is a valid and reliable measurement tool for 4-6-year-old children with typical development. The Preschool Peer Aggression Scale (Teacher Form), which consists of 28 items and three sub-dimensions, is a 5-point Likert (Never, Rarely, Sometimes, Mostly, Always) type scale. The Preschool Peer Aggression Scale (Teacher Form) consists of 3 sub-dimensions which are social aggression (10 items), physical aggression (9 items), and verbal aggression (9 items). In the form that was filled in through teacher observations, the total score for each sub-dimension refers to the related aggression type. It is confirmed that the extent of displaying the aggression type increases as the score obtained from the sub-dimensions increases. The total score of the scale can also be evaluated. There are no reversed items in the scale. The measurement instrument possesses distinct value due to its origin from a Turkish sample, its original development rather than adaptation from an international scale, and its inclusion of three sub-dimensions.

Reviewing research in Turkey reveals the existence of diverse instruments designed to assess children's aggressive behavior, with a primary focus on elementary school-aged children but also extending to the preschool years. There are measurement tools available that rely on assessments from parents and teachers, such as the "Children's Aggression Scale Parent Form " (Ercan et al., 2016), which evaluates behaviors of children aged 7-14, and the " Children's Aggression Scale Teacher Form " (Ulu,

2018), which assesses children aged 7-15. Furthermore, there are measurement tools used to identify aggressive behaviors in preschool children, which assess these behaviors in terms of two sub-dimensions: physical aggression and relational aggression. One such tool is the "Preschool Social Behavior Scale - Teacher Form" (Şen and Arı, 2011), which consists of six sub-dimensions in total. Another tool is the "Preschool Social Behavior Scale - Peer Form" (Şen and Teke, 2019), which assesses physical and relational aggression as well, with a total of three sub-dimensions, and is also utilized to identify aggressive children. The "Ladd-Profile Child Behavior Scale," adapted into Turkish by Gülay (2008) and including a dimension for aggressive behavior, along with the "Selçuk Peer Relationship Assessment Scale" by Özmen (2013) for assessing peer relationships and aggression levels in children aged 36-72 months, and the "Aggression Orientation Scale for Children Aged 48-72 Months" (Kaynak, Kan, and Kurtulmuş, 2016), are frequently utilized in studies. The Peer Aggression Scale (Teacher Form) developed in this study possesses distinctive value as it covers the age range of 4-6 years and consists of three sub-dimensions (social aggression, physical aggression, and verbal aggression), enabling assessment from both sub-dimensions and overall perspectives.

Identifying aggressive behaviors of children through valid and reliable measurement tools will contribute to developing educational programs that are based on these determinations and offer guidance in resorting to school psychological counselors or psychologists when necessary. For this reason, the Preschool Peer Aggression Scale (Teacher Form) can be considered to contribute to researchers, teachers, mental health experts, and early childhood educators.

Limitations

The validity and reliability are limited to 4-6-year-olds with typical development and who are attending preschools. In addition, the measurement tool evaluated the aggressive behaviors of children according to teacher opinions. Alternative evaluations such as peer opinions, parent opinions, and observation were not included in this study. Various suggestions can be set based on these limitations. Measurement tools can be developed that examine aggression regarding various data collection sources such as peer opinions and observation. The Preschool Peer Aggression Scale (Teacher Form) can be carried out on different age groups. Designing measurement tools that evaluate aggressive behaviors of preschool children through different peer, teacher, parent, observation, etc. perspectives can enable us to reach more accurate and reliable results when evaluating such behaviors. Furthermore, structural equation modeling was not utilized in the analysis of the measurement instrument in this study. Therefore, it is recommended that future studies consider conducting analyses using structural equation modeling.

It is believed that the PPAS-TF can be a significant resource for collecting information about the social, physical, and verbal aggression levels of young children. Future research efforts can employ this scale to investigate aggression in young children in connection with a range of different variables.

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Lifelong Learning and Media Relationship According to the Opinions of Pre-service Teachers

Adem Karataş[1] (iD) **Süleyman Ünlü[2]** (iD) **Pınar Demiray[3]** (iD)

[1] Uşak University / Faculty of Education, Department of Social Studies, Uşak, Türkiye
adem.karatas@usak.edu.tr

[2] Uşak University / Faculty of Education, Turkish Education Department, Uşak, Türkiye
suleyman.unlu@usak.edu.tr *(corresponding author)*

[3] Uşak University / Faculty of Education, Department of Educational Sciences, Uşak, Türkiye
pinar.demiray@usak.edu.tr

Article Info	ABSTRACT
	Lifelong learning has an essential place in every aspect of our lives. Lifelong learning refers to individualized learning based on individuals' personal and professional interests at times of need. This research aims to reveal the relationship between lifelong learning and media based on the opinions of pre-service teachers. The research data was obtained from Turkish, Social Studies, Preschool, and Classroom Teaching students (N =246) attending Uşak University Faculty of Education. To reveal the relationships of the pre-service teachers in the study group with lifelong learning and the media, the data were collected with the "Lifelong Learning (LLL) and Media" form, which the researcher prepared, and expert opinion was taken. The obtained data were analyzed by content analysis. As a result of the analysis, 13 themes were obtained because of the opinions of the pre-service teachers. As a result, pre-service teachers expressed the relationship between lifelong learning and media from different perspectives and revealed a clear pattern between media and lifelong learning. Pre-service teachers stated that "contribution to lifelong learning by using media as a teaching tool" (f:38) and "contribution to lifelong learning by increasing accessibility to accurate information" (f:34) were made. They also put forward opinions covering these themes, stating that "the media as a whole contributes to lifelong learning" (f:33) and "the media contributes to lifelong learning due to its contribution to vocational education" (f:32). The idea that media can make a significant contribution to the lifelong learning process emerges clearly in the research.

INTRODUCTION

Learning, in its simplest sense, can be expressed as the change that occurs in the individual due to knowledge and experience (Şahin & Yurdakul, 2017). Based on the ideas that Locke (1999) examines on the source of knowledge, it can be inferred that learning that emerges based on knowledge and experience can also be defined as the external perception of the individual's internal development by interacting with innate abilities traditions and senses. Albert Bandura explains the learning process. While theorizing that we learn by modeling others, Lev Vygotsky suggested that we learn through social interaction, and both psychologists expressed learning as a social activity (Taylor & Hamdy, 2013; Yardley, et al., 2012).

Learning can happen at any age and in different ways. The learning process in life's journey cannot be limited to schools and similar institutions. Many names have been given to our age, the most commonly used being "Information Age" or "Digital Age."

In a human learning process, he or she becomes informed, encounters new information, and adapts the acquired knowledge to future learning processes. In the "Information Age," with the advancement of the internet and technology, the speed of information production and communication has reached significant levels. The continuous development of learning has introduced the concept of lifelong learning.

Although the term lifelong education, which was first used by UNESCO in 1960, is not a new and modern idea, it has started to come to the fore in recent years due to the increasing problems arising in the business world and the field of vocational education (Medel-Añonuevo, et al., 2001). As a matter of fact, since the early 1990s, it has been observed that many countries have taken action to restructure their education systems with a lifelong learning approach and implemented legal regulations.

Lifelong learning: Learning lasts a lifetime and is centered on "from the cradle to the grave." Learning is a process that begins with an individual's birth and continues throughout his life. (Hargreaves, 2004)

Lifelong learning is a comprehensive definition of the learning activities people carry out throughout their lives to improve their knowledge and skills, personally or socially. This type of learning can occur in many areas, from formal education processes that last from preschool to retirement age to vocational training in the workplace, and from the information people learn from each other to the information they acquire through media. Lifelong learning is an important concept that aims to use the learned knowledge and skills effectively in daily life (Ersoy & Yılmaz, 2009).

According to the idea expressed by Demirel (2011), lifelong learning is a necessity not only for the personal success of the individual but also for every individual who wants to be active in society. It means adapting to changing world conditions, developing skills and competencies, spreading learning to all areas of their lives, enabling people to renew themselves constantly, and thus supporting both individual and social development. It also plays an essential role in lifelong learning, increasing social integration, encouraging active citizenship practices, and providing equal opportunities (Göksan, et al., 2009).

Ways of living, learning, and working in the 21st century are changing rapidly. The Montreal conference was the first international meeting to identify lifelong learning as a goal for the future policies of states (Aksoy, 2013). With the lifelong learning approach, it can be said that the concepts, values, and principles related to education, which were formed according to the values of the industrial society, are redefined in line with the needs of the information society (State Planning Organisation, 2006).

The goals of lifelong learning are a higher-skilled workforce, a broader democracy that includes the whole of society, and a more valuable life for individuals. In this context, lifelong learning should

be considered an opportunity given to individuals to update their knowledge (Chapman, et al., 2005).

Media use in education seems to be compatible with the lifelong learning approach. Conscious learning from the media is necessary because it allows efficient use of time, does not create space or location limitations, and because of young people's intense contact with new media and communication technologies. Students can socialize with their friends through social media applications that have been developed or will be developed, and they can continue their learning processes while traveling, at home, or at work at appropriate times.

The relationship between lifelong learning and the media is very close and mutually interactive. These two concepts support and strengthen each other. Actions that strengthen the relationship between lifelong learning and media can be listed as follows: Access to information, education and training materials, news and information, cultural and artistic content, social media and interactive learning, professional development, critical thinking, and media literacy. Looking at these actions, they are connected to the media and are also associated with lifelong learning. Jeanneney (1998) states that animals approach events and phenomena instinctively, while humans use logic and instinct. In this direction, the interaction of knowing and logic results in prediction, according to A. Comte: "To foresee and achieve, it is necessary to know." The desire and know and predict has created media and communication tools throughout history.

Teachers are the professional group that undertakes the task of teaching in society. For teachers to shape future generations with the lifelong learning paradigm, they, as a leading professional group, must have adopted this paradigm and adapted it to their lives.

The teaching profession is considered an essential element that affects the individual and society. Increasingly complex social life increases the importance of the duties and responsibilities of the teaching profession day by day (Kaskaya, et al., 2011). Teachers are the professional group that undertakes the task of teaching in society. Because today, the validity period of the knowledge and skills taught in schools is shortening. In the past, an individual who had a profession could continue this profession throughout his life with the knowledge he had now; this is no longer valid. In other words, the individual cannot rely only on the knowledge and skills he acquired at school; he needs to gain new knowledge and skills throughout life. Therefore, it is of great importance to restructure education systems to encourage individuals to adapt to the changing world and acquire lifelong learning abilities (Demiray & Karadeniz, 2008). Since there are not enough studies in this field, this study is important as it will pioneer other studies.

The purpose of this research is to determine the correlation between lifelong learning and media based on the opinions of pre-service teachers. In line with this primary purpose, answers were sought to the following questions:

1. What are the results of pre-service teachers ' preferences for lifelong learning and media use according to gender and department variables?

2. How are the views of pre-service teachers shaped when expressing the relationship between lifelong learning and media?

METHOD

Research Design

Basic qualitative research is one of the most common qualitative research methods used in the field of education. In this method, data are usually obtained through interviews, observations or document analysis. In analyzing the data obtained, it is important to characterize the data and identify recurrent patterns, and the findings section consists of recurrent patterns or themes supported by the

data from which they are derived (Merriam, 2013). A semi-structured interview form prepared by the researchers was used as a data collection tool.

Study Group/Participants

The study group for this research consists of Turkish Language Teaching (TLT), Primary School Teaching (PST), Social Studies Teaching (SST), and Preschool Teaching (PT) students who continue their education at Uşak University.

This research was done with an easily accessible sampling method that aims to carry out the data collection process faster. In this sampling method, the study group is selected from an easy and close environment (Yıldırım & Şimşek, 2005). Information about the study group for the research is shown in Table 1. It is included in Table 1.

Table 1. *Distribution of the Working Group*

Gender / Department	Female		Male		Sum
	F (frequency)	% (percent)	F (frequency)	% (percent)	
Turkish Language Teaching	37	62.72%	22	37,28%	59
Primary School Teaching	48	60.00%	32	40,00%	80
Social Studies Teaching	25	58.14%	18	41,86%	43
Preschool Teaching	53	82.81%	11	17,19%	64
Sum	163	66.26%	83	33,74%	246

Research Instruments and Processes

In the research, first, the literature was scanned, and the information and results that would form the basis of the research were obtained. Afterward, social media and students who actively use media were identified by the researcher. To reveal the lifelong learning and media relations of the prospective teachers in the study group, the "LLL and Media" form, prepared by the 2 researchers and receiving expert opinion, was used. Opinions were sought from a social studies education specialist, a Turkish education specialist, a media education specialist, and an assessment specialist. Based on the received opinions, the final version of the interview form was determined. This form contains six open-ended questions and two questions to determine demographic variables.

Data Analysis

In the research, validity was ensured by obtaining participant confirmation, followed by colleague or expert confirmation. Participant confirmation was obtained through questions such as "Did you mean this?" or "Should I interpret it this way based on your words?" addressed to the pre-service teachers. For expert confirmation, besides the researchers, another expert was involved in reviewing the data. The reliability of the study was established by applying the measurement tool to 30 pre-service teachers six months prior to the research, resulting in similar outcomes. The research sample was expanded to obtain new and updated results.

The research data was obtained from 279 pre-service teachers studying in the 4th grades of Social Studies Teaching, Preschool Teaching, Primary School Teaching, and Turkish Language Teaching students. Twenty-one data points were excluded from the study because they could not fully establish the relationship between YBL and the media. In addition, a total of 33 forms were excluded from the study because the forms coded (TLT) 4, (TLT) 28, (TLT) 41, (TLT) 42, (TLT) 58, (TLT) 60, (PT) 3, (PT) 13, (PT) 14, (PT) 20, (PT) 23, and (PT) 25 were filled out incompletely. The research findings were obtained through content analysis applied to 246 pieces of data.

The data obtained from the pre-service teachers through the "LLL and Media" form was analyzed by a Turkish education expert, a measurement expert, and a basic education expert using the Nvivo Qualitative Data Analysis Program.

Ethics

The authors confirm that ethical approval was obtained from Uşak University the Committee for Research and Publication Ethics in the Social Sciences and Humanities (Approval Date: 19/01/2023 and Number 2023-01).

FINDINGS / RESULTS

As a result of these analyses, pre-service teachers were asked, "Explain the relationship between lifelong learning and media." 13 themes emerged in response to the qualitative question. These themes were formed as follows:

Theme 1: Media's contribution to LLL as entertaining content

Theme 2: Contribution of media to LLL as course material

Theme 3: Contribution to LLL as advantages and disadvantages

Theme 4: Contribution of Turkish to LLL in terms of language skills and correct use

Theme 5: Contribution to LLL by increasing accessibility to accurate information

Theme 6: Contribution of the media to LLL by focusing on its positive effects

Theme 7: Contribution of the media to LLL

Theme 8: Contribution to LLL formally and informally

Theme 9: Contribution to different development areas and LLL by using media correctly

Theme 10: Contribution of critical thinking skills to LLL

Theme 11: Contribution of diversity of media tools to LLL

Theme 12: Contribution to LLL by using media as a teaching too

Theme 13: Contribution of media to LLL due to its contribution to vocational education
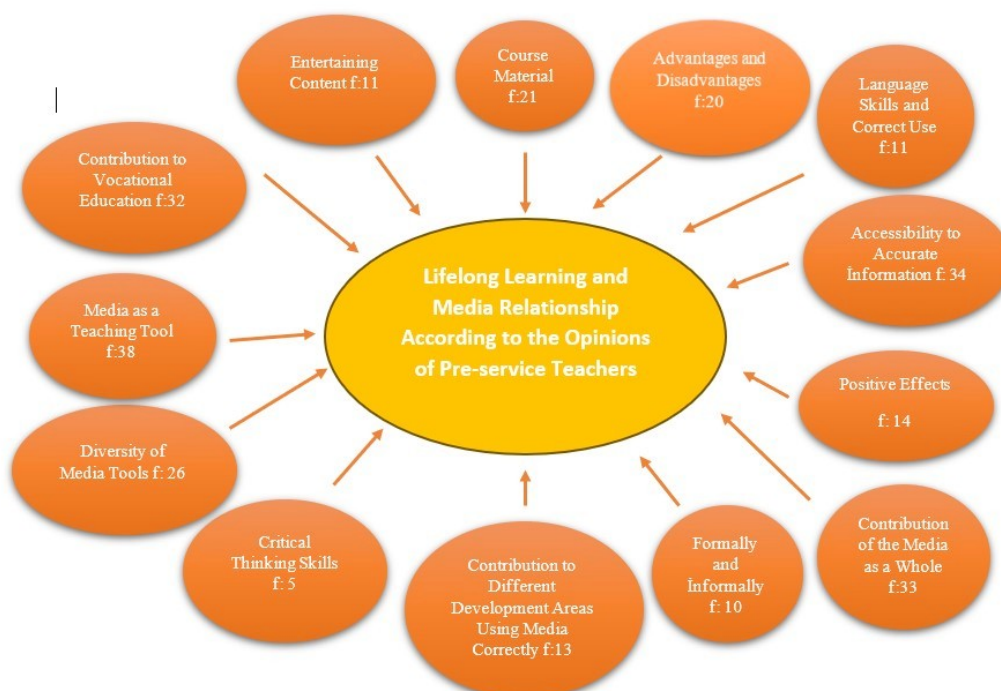
Figure 1. *Themes for Pre-Service Teachers' Relationship with LLL and the Media*

Theme 1: Expressions of 11 pre-service teachers were included in the theme of media's contribution to LLL as entertaining content. The expressions taken as examples are as follows:

PT 48: "Lifelong learning and media relations in preschool education are important for the development of children. Media supports children's development by supporting activities and accessing entertaining content. E-books, digital stories, audio stories, and educational games support both the development and entertainment of 3–6-year-olds. The important thing is to use media and communication tools in sufficient quantities at the right place and at the right time for the preschool period."

PST 26: "As a classroom teacher, I use technology in my lessons. I can make lessons more enjoyable and entertaining, and I can help students remember them more. I show students quiz applications and help them play games and gain knowledge. I teach lessons together with games."

PST 30: "I think it will be a fun and focused teaching experience. It should be used both at the entrance of the course to attract attention and during the application. It should aim to provide students with digital media literacy."

Examining these statements, pre-service teachers state that when media is included as an entertaining element in the learning process, it facilitates learning, gamifies the lessons, and supports their development.

Theme 2: Statements of 21 pre-service teachers were included in the theme of the contribution of the media to LLL as course material. The expressions chosen as examples are as follows:

PT 28: "Lately, media has been very much in our lives, and we cannot ignore it. I plan to use videos, audio recordings, and constantly updated content, such as songs and educational cartoons, in pre-school education. "I think children should see content in every field."

PST 1: "As a classroom teacher, I think using media is very effective in classroom education. Because the age group is 6-9, they are at play age and active. Relevant animations, songs, and game materials can be used in lessons to make students eager to learn. In this way, learning will be affected positively as attention and enthusiasm for the lesson will increase."

PT 43: "Lifelong learning and media relations are related in the preschool period. For example, preschool teachers have the opportunity to convey stories about their activities to children more effectively through magazine works, music, animations, and movies through media. They both save time and allow children to have different experiences."

Examining these statements, prospective teachers emphasized that using media and technology in education enriched students' learning experiences and could make the learning process more effective.

Theme 3: Opinions of 20 pre-service teachers were included in the theme of contribution to LLL as advantages and disadvantages. The expressions chosen as examples are as follows:

TLT 12: "We use media very effectively in our lives. This situation has both benefits and harms. Wrong information can be obtained through the media. Foreign words in the media will also negatively affect the students' language skills. The benefits are that we can access information quickly. Another benefit is that students can research and study subjects they do not understand in class. Using media actively in lessons allows students to listen to the lesson more effectively. He can do activities online after class."

> *PST 59: "Today, media occupies a large place in our lives. There is much information in the media that we know or do not know, true or false. Since media occupies a large place in our lives, we constantly obtain information from there. However, we must also be careful while obtaining information."*

> *TLT 43: "Media has many benefits in Turkish education, especially in helping students learn new words. There are also a few negative situations for students in teaching Turkish. If we want to give some examples, "I see that the rate of students listening to each other has decreased significantly."*

Examining these statements, both the benefits and risks of the media are pointed out. While effective use of media may facilitate access to information, it also brings with it the risk of being exposed to misinformation, so it has been emphasized that media use should be done consciously and critically.

Theme 4: The contribution of Turkish to LLL in terms of language skills and correct use included the opinions of 11 pre-service teachers. The expressions chosen as examples are as follows:

> *TLT 6: "The media contributes greatly to four language skills. For example, there are dozens of benefits that we have noticed, such as improving visual reading on social media, improving reading and understanding on news or research sites, and making sense of a song when listening to it."*

> *TLT 54: "Individuals who receive Turkish education ensure the correct use of language, diction, and pronunciation through media. It is beneficial to get to know the culture and increase this awareness by accessing extensive information through the media."*

Examining these expressions, it is suggested that the media plays a positive role in language skills and Turkish education. It is emphasized that various media platforms can support language learning processes and increase cultural awareness. This shows that media is an essential resource in education and language learning processes.

Theme 5: Opinions of 34 pre-service teachers were included in the theme of contribution to LLL by increasing accessibility to accurate information. The expressions chosen as examples are as follows:

> *TLT 1: "Lifelong learning is an ongoing process in all areas of life. Since Turkish Education is an activity carried out through language and language is a living being, we continue to learn even if we are teachers. "One of the areas where we learned the most during this learning process is media."*

> *PST 52: "A person learns things as his life continues. This learning can be related to any field. As individuals, we use more media when learning new things. Because it takes less time to access information, and the things we can learn increase even more thanks to the media. I think media will have an important place in my future professional life. I think it will make it easier for students to learn, access information, and access the information I can offer."*

> *TLT 3: "Today, everyone turns to the media on every subject they want to be informed about and accepts the media primarily as a source. This importance also includes students. For this reason, teachers should guide students in using media in Turkish lessons; students should use media actively and raise students' awareness about media for lifelong learning."*

Examining these expressions, both statements emphasize the importance of lifelong learning and draw attention to the role of the media in this process. The statement coded PST 52 offers a perspective that the media accelerates accessing information and learning and will become even more important in business life.

Theme 6: The theme of the media's contribution to LLL, by focusing on its positive effects, included the opinions of 14 pre-service teachers. The expressions chosen as examples are as follows:

TLT 11: "Learning is a lifelong action. With the increasing use of technology in today's world, there is much information in various media types. We should obtain this information selectively and by questioning and not accepting every information we encounter as true. It is necessary to use the media consciously and be careful against information pollution."

PT 52: "Media tools are necessary for children to socialize, learn, and be more active. Environmental factors that affect game fiction, eating and drinking, and the characters displayed are almost under the influence of the media today. Media tools change children's emotions, thoughts, and behaviors, and these effects continue throughout life. Media will positively affect developing a sense of research in children throughout their lives."

PT 29: "Media is involved in almost all areas of our lives. Our learning continues at all ages. We should bring the media to our classroom in our future teaching years. The ages we will be transferring information to are between the ages of 6-10. At this age, current generations are intertwined with tablets, phones, and computers. Even though we think these are harmful, they also benefit children's learning. Considering my current experience, when I give my students the end-of-subject assessment test on paper, they get bored and do not want to do it. However, when I do this with Wordwall, a simple example of media, he not only has fun but also corrects his mistakes more easily and enthusiastically."

Examining these expressions, both statements include thematic topics of learning, the role of media, and the approach to information. However, while the statement coded TLT 11 focuses more on using media critically and emphasizing being careful about information, the statement coded PT 52 focuses on the effects of media on children's development and sense of inquiry.

Theme 7: The media's contribution to YLL as a whole theme included the opinions of 33 pre-service teachers. The expressions determined as examples are as follows:

TLT 51: "Since the priority in Turkish education is language, communication is an important part of lifelong learning; they integrate. Since we are now in the age of communication and technology, our learning mostly occurs through the media. "Lifelong learning can no longer take place independently of the media."

SST 34: "With the media being a part of life, there is a close relationship between lifelong learning and the media. "The relationship between these two concepts will produce much more positive results by making the media as useful as possible."

SST 12: "Social studies, as the name suggests, is intertwined with today's life. They can benefit greatly from the media. Can benefit from certain news regarding current events in today's events. Social studies continue throughout our learning lives. "We can also learn about many social issues outside of school, at home, or in any environment."

Examining these expressions, it is seen that the focus is on the importance of media in lifelong learning processes and emphasizes the close relationship between these two concepts. Concepts such as communication, technology, language, and media appear as the main focal points of the expressions.

Theme 8: The opinions of 10 pre-service teachers were included in the theme of formal and informal contributions to LLL. The expressions determined as examples are as follows:

PST 6: "Classroom education is the most important process for a child. If the

information he will learn here is permanent, it will continue throughout his life. Lifelong learning is a process that continues both inside and outside the classroom. Using media in the classroom brings the child closer to the principle of vitality."

SST 18: "Authentic materials in social studies and museums can be conveyed through the media. Virtual museum visits are also effective in lifelong learning. The student acquires the information in the museum, benefits from the media, and realizes lifelong learning."

TLT 61: "Lifelong learning is learning in all areas of life, not limited to schools. Turkish education does not only take place at school but also in all areas of life, thanks to the media. We can improve Turkish education with different activities and apply it in other environments outside of school."

Examining these expressions, it is seen that the focus is on the concepts of education and learning processes, in-class and out-of-class learning, media use, and lifelong learning. In the statements of pre-service teachers, the focus is on education, media use, and lifelong learning. While the PST 6 statement provides a perspective on how classroom instruction and media can impact children, the SST 18 text focuses on social studies teaching and provides examples of how media can be used.

Theme 9: The opinions of 13 pre-service teachers were included in the theme of media's contribution to different development areas and LLL by using the media correctly. The expressions determined as examples are as follows:

TLT 40: "Turkish education helps to read the media well and analyze the news in the media well. It best adapts the four basic skills we acquire in Turkish (listening, reading, speaking, and writing) to the media. Media is especially effective in reading skills. The source of the news, its content, who wrote it, etc. He analyzes everything very well and thinks critically."

PST 23: "As a primary school pre-service teacher, I should first show my students the correct media use. Because in today's conditions, almost everything happens through the media. However, I am not a fan of depending entirely on the media. First, an environment should be created that will provide our students with a self-learning environment. I know that life is continuous learning and that I need to instill this process in my students along with the skill of questioning. "I can use the media in this process."

PT 24: "Based on my experiences, even when I do a book reading activity first when I project the book images to the children on the smart board, it attracts more attention from the children. They are much better at implementing what they see. However, there should be no media use during childhood, except for certain activities."

Examining these expressions, the focus is on Turkish education, media literacy, and providing students with critical thinking skills. While TLT 40's statement points out that Turkish skills can support media literacy, PST 23's statement emphasizes the importance of teaching students the correct use of media and developing self-learning and questioning skills.

Theme 10: Expressions of 5 pre-service teachers were included in the theme of the contribution of critical thinking skills to LLL. The expressions chosen as examples are as follows:

TLT 40: "The source of the news, its content, who wrote it, etc. He analyzes everything very well and thinks critically. "An individual who has studied Turkish will make the most of the media throughout his life."

TLT 56: "We raise individuals' awareness through media and prepare them for life. That's why media is and will continue to be with us in every field throughout our lives. Therefore, we should prepare individuals for conscious media use by carrying out

awareness-raising activities about media use. We must encourage individuals to think critically through conscious media use and develop their reasoning powers, thus enabling them to become qualified individuals for life and reintegrating them into society. That is why the influence of media is significant for lifelong learning."

SST 26: *"Lifelong learning is a form of learning that highlights a person's critical thinking skills. Media helps a person by supporting research on a subject."*

Examining these opinions, it focuses on the role and importance of media. It emphasizes that media use is a critical factor for raising individual awareness, developing critical thinking skills, and lifelong learning. When examined in detail, conscious media use is essential for a person's development and learning process. Additionally, attention is drawn to the media's potential to encourage critical thinking and bring qualified individuals to society.

Theme 11: Expressions of 26 pre-service teachers were included in the theme of the contribution of the diversity of media tools to LLL. The expressions chosen as examples are as follows:

TLT 57: *"Video contents can be opened via the smart board. Tests or various contents can be prepared and implemented via Canva. Web 2.0 tools can be used effectively. I used the boards and materials on Zoom effectively in the lessons. We watched the listening texts again through the media. We made a test solution using the WordPress application."*

PT 62: *"We learn most of our learning from our teachers at school. However, we also have the opportunity to learn the rest from the media. As the preschool department, we use web 2.0 tools such as Canva and Powtoon to attract children's attention better. Thus, we enrich learning by taking advantage of the digital environment."*

PT 54: *"Technology is very effective in our lives due to the century we live in. It is not possible to keep children completely away from technology and media. As preschool teachers, we can ensure that children benefit from media in a qualified way. For example, we can teach a value or concept to children by using digital stories and online games. Of course, we should be careful about screen time and make qualified preparations when introducing children to the media. We can benefit from the media through various events."*

Examining these expressions, it is seen that the focus is on the use of technology and digital tools in education processes. While the first statement (TLT 57) explains how the teacher teaches with technological tools in the classroom, the second statement (PT 62) explains how students include technology in their learning processes. Both statements emphasize how technology can be used in education and how it can contribute to enriching the learning experience. Effective use of such digital tools by teachers and students can make the educational process more attractive and efficient.

Theme 12: Statements of 38 pre-service teachers were included in the theme of contribution to LLL by using media as a teaching tool. The expressions chosen as examples are as follows:

PST 28: *"For example, when trying to provide students with the achievements of environmental cleanliness, clean and dirty environments can be compared through the media instead of just giving the subject a plain explanation. Examples from real-life countries can be shown. It can be supported with animations. It creates awareness in students about environmental cleanliness. It transforms the subject into information that should be used at every moment of life, rather than useless information that is only taught at school."*

PST 73: *"I think that media and lifelong learning are intertwined. As a classroom teacher, I must make my students active in the lesson, prevent them from being distracted, motivate them, and enable them to learn better through activities that attract their attention.*

This is due to social media, where students interact the most. I can use the games they play to explain the subject using applications such as Wordwall and Guizizz. I can explain the subject with eye-catching videos and animations. Because the age group I will be teaching is 7-11, it is essential to use the media to keep them in class."

PST 30: "Lifelong learning aims to learn from all active and passive sources, from birth to death of the individual. We use the media actively in this process, where we constantly acquire new information. As a classroom pre-service teacher, I think media should be used as much as possible in the teaching process. It is inevitable to include media in lesson plans because the target audience is digital natives who frequently use media."

Examining these expressions, it is seen that the role of media in education and how media can be used are emphasized. From these views, media is an effective tool in the education process, and ways to provide students with more attractive, interactive, and meaningful learning experiences are discussed.

Theme 13: The theme of the media's contribution to LLL due to its contribution to vocational education includes the opinions of 32 pre-service teachers. The expressions chosen as examples are as follows:

PT 40: "With new regulations, developments regarding preschool change occasionally. For example, the differences between former and newly graduated preschool teachers are visibly clear. 10-15 years ago, preschool institutions seemed to consist of child distraction and childcare, and indeed, the teachers of that period were providing their education based on this approach. The media plays a big role in these and similar changes and developments. Since we cannot send a previously trained preschool teacher back to university due to the developments, we will make up for their shortcomings by teaching them lifelong through the media. The demand for preschool education has increased in recent years, and new areas are planned to be added. I think the media will eliminate the deficiencies in this field for former teachers."

PT 63: "Media is now inevitably part of our lives. The media has a great impact on all our decision-making processes, from the department we read to the food we eat. Media also has an impact on preschool education. In our department, daily plans, activities, and materials are essential. Of course, we use our creativity, but we cannot design many activities. That is why we use media so often. Throughout our careers, conditions will change, and new curricula will be added. It will be thanks to the media that we learn and adapt to these new conditions."

PST 60: "Lifelong learning should be in classroom education as in every moment of our lives. Because we have responsibility for the education of our students, we need to improve ourselves constantly. We must constantly try to learn new things and renew ourselves. We can also do this learning through the media. The media acts as an assistant teacher for us. I will try to use the media a lot in my teaching role."

PST 34: "We obtain a lot of necessary and unnecessary information from the media. I think that most of the information we have acquired is useful and provides benefits for lifelong learning. I also benefited from media use in our department courses and gained useful information. I will benefit from these in my professional life as well."

Examining these opinions, it is seen that the importance and effect of media in education is emphasized. These statements emphasize how media can be used by educators to provide better instruction to students and to improve themselves continually. Effective media use in education can make learning experiences more prosperous and attractive.

DISCUSSION, CONCLUSION, RECOMMENDATIONS

In line with the analysis of the research data, 13 themes emerged. These themes were discussed in the findings section. In line with the themes obtained or emerging from this study, all pre-service teachers who participated in the application expressed the relationship between lifelong learning and media.

In the theme "The contribution of media to lifelong learning as entertaining content," preschool teaching students used it more intensively than students of other departments. "The reason is that they create more game and event applications and access these contents through media compared to other levels."

In the theme "The contribution of media as course material to lifelong learning," preschool teaching students took part more than the other three departments. Pre-service teachers' use of media to make what was learned permanent, considering the preschool-age children who are in the concrete operational period, may have enabled them to take part in this theme.

In the theme "Contribution to lifelong learning as advantages and disadvantages," Turkish, primary school and preschool pre-service teachers created the theme stating that media has disadvantages and advantages. Given that not all content in today's media is accurate information, individuals face the potential of encountering disinformation if they are not cautious. This awareness is particularly evident among pre-service teachers, highlighting the relationship between media engagement and lifelong learning.

Turkish pre-service teachers were generally included in the theme "The contribution of Turkish to lifelong learning in terms of language skills and correct use." Only one primary school pre-service teacher student expressed an opinion that fell into this theme. The reason for this situation might be related to the concerns of Turkish pre-service teachers regarding the correct and proper use of Turkish and their profession. Emphasizing the importance of the correct spelling of words in news texts, Turkish pre-service teachers stated that taking examples of people who use the language correctly and checking the spelling of words from the TDK (Turkish Language Institution) dictionary will contribute to the correct spelling of words.

In the theme "Contribution to lifelong learning by increasing accessibility to accurate information," Pre-service teachers emphasized using media regarding access to and confirmation of information. They stated that it was related to lifelong learning. While the media provides many resources to access accurate information, it is also considered the environment where the flow of information is most intense in quantitative terms. For this reason, the statements of the pre-service teachers are logical in terms of access to information and confirmation in the media-lifelong learning relationship. We must question the information in the media and be careful against information pollution. In their study, Erdoğan and Eker (2020) stated that Turkish pre-service teachers have high perceptions of competence in media and technology skills, which are among the sub-dimensions of 21st century skills, and that they consider themselves competent in accessing information, obtaining information, and using technological tools to analyze it. In this respect, the study is compatible with the results in the literature.

In the theme "Contribution of media to lifelong learning by focusing on its positive effects." pre-service teachers believe that media is inevitable in this process; it is essential; it is an indispensable part of our lives; they can process lessons more efficiently with different activities in the media, and children's emotions, thoughts and imagination are affected by media. They emphasized that positive effects were created in the world. In his study, Boyacı (2019) examined the lifelong learning tendencies of pre-service teachers. As a result of the study, he stated that lifelong learning offers a positive perspective for pre-service teachers. At the same time, pre-service teachers have a high level of lifelong learning tendencies. This situation coincides with the results of the study.

In the theme "The contribution of the media as a whole to lifelong learning," pre-service teachers emphasized that since all courses are related to media, there is integrity, and that this integrity exists in harmony with lifelong learning. They emphasized that learning cannot be independent of the media and that the media covers every field.

Under the "contribution to lifelong learning, both formally and informally," theme, pre-service teachers emphasized the media-lifelong learning relationship by stating that lifelong learning is not limited to school but is a process that continues inside and outside the classroom. In addition, social studies pre-services teachers stated that learning could be made permanent by turning informal environments (online museums, 3D animations, etc.) into formal environments.

In the theme "Contribution to different development areas and lifelong learning by using the media correctly," Turkish pre-service teachers stated that they critically evaluated the news and content in the media; preschool pre-service teachers included activities that could attract the attention of children; and primary school and social studies pre-service teachers stated that they evaluated the media and their students. They emphasized that they could use the media correctly and effectively by providing them with questioning skills.

In the theme "The contribution of critical thinking skills to lifelong learning," Turkish pre-service teachers asked the question, "Who created the news/text source?" which is based on media literacy. In the context of the question, they mentioned that they increased their evaluation skills by using critical thinking skills with the media. While Turkish pre-service teachers generally mentioned the critical aspect of the media, primary school and preschool pre-service teachers did not mention the critical dimension. Only one of the social studies pre-service teachers touched upon the critical dimension and its contribution to lifelong learning.

In the theme "The contribution of the diversity of media tools to lifelong learning," pre-service teachers will be able to design activities by using various web 2.0 tools and applications (Canva et al., etc.), benefit from applications such as Zoom, Google Meet, etc., educational videos, digital stories, and games in lessons. They stated that they could integrate it into lessons. "Taylan (2020) and Kurbanoğlu (2010) stated in their study that pre-service teachers should not only develop lifelong learning competence, which is one of the twenty-first-century skills, but also develop the skills to use digital platforms and educational technologies competently and have the competence to integrate these skills into lessons. Teachers who think that lifelong learning is essential stated that they must be willing to learn lifelong to improve themselves, keep up with the times, and follow up-to-date information in their fields and that teachers and pre-service teachers who attach importance to personal and professional development have a high tendency to learn lifelong (Bulac & Kurt, 2019; Demir et al., 2022), which supports the findings of this study and similar studies.

In the theme of "Contribution to lifelong learning by using media as a teaching tool," prospective teachers stated that the use of media integrated with the curriculum would be economical and functional by making use of smart boards in lessons with the FATIH (Increasing Opportunities Improving Technology Movement) project. Pre-service teachers stated that they would use media to activate and motivate students in class and that they would benefit from educational animations, current events, and newspaper news in their lessons.

In the theme of "Media's contribution to lifelong learning due to its contribution to vocational education," pre-service teachers stated that they could renew themselves with the media, have up-to-date information, and quickly access course-related daily plans, activities, and practices from the media. With developing technologies, pre-service teachers declared they could contribute to teachers' professional lives by sharing the Web 2.0 tools and digital games they prepared as course materials. Ellez et al. (2021) stated in their study that teachers are open to self-improvement through lifelong

learning, willing to learn, and, at the same time, tend to learn continuously. They also concluded that Turkish pre-service teachers perceived themselves as competent in organizing learning, valuing the contribution of those around them regarding the learning process, and gaining knowledge and skills with information sources related to their profession, among the sub-dimensions of lifelong learning (Erdoğan & Eker, 2020). In their study, Kozikoğlu and Altunova (2018) discussed the positive relationship between lifelong learning and 21st-century skills. This supports the results of the study.

Evaluating the findings obtained from this study, they can be applied to different education levels. It can be designed by adding different demographic variables. Different parts can be applied in different provinces. This study was conducted for pre-service teachers. Studies can also be carried out for teachers. Apart from media, different concepts related to lifelong learning can be studied.

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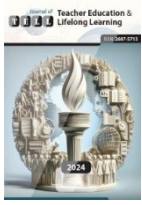
Investigation of Teacher Candidates' Self-Employability, Responsibility Capability and Perspectives on Scientific Research

Rıdvan Önden[1] 🆔 Rafet Aydın[2] 🆔 Sadık Yüksel Sıvacı[3] 🆔

[1] Mehmet Akif Ersoy University Institute of Educational Sciences Department of Educational Sciences, Burdur, Türkiye
ruudy@hotmail.com

[2] Burdur Mehmet Akif Ersoy University, Faculty of Education, Department of Educational Sciences, Burdur, Türkiye
raydin@mehmetakif.edu.tr

[3] Prof. Dr. Burdur Mehmet Akif Ersoy University, Faculty of Education, Department of Educational Sciences, Burdur, Türkiye
sysivaci@mehmetakif.edu.tr

Article Info	ABSTRACT
	The purpose of this study is to investigate the relationship between teacher candidates' perspectives on scientific research and their capacity for self-employment and responsibility. The survey model was implemented in the design of the study. The population of the research is 2347 teacher candidates from the Faculty of Education at Burdur Mehmet Akif Ersoy University. There are 479 teacher candidates in the sample, 370 of them are women and 109 men. Data were gathered online using two different subject-related scales. Aligned with the study's findings, it was concluded that the teacher candidates' self-employability and responsibility capability differs significantly according to the idea of pursuing a master's degree and the grade level. It was also discovered that the perspectives of the teacher candidates on scientific research differed significantly according to gender, the idea of pursuing a master's degree, weighted grade point average, the department they studied and the degree of satisfaction with the department. It was also revealed that there is a low-level positive noteworthy relationship between teacher candidates' self-employability and responsibility capability and their perspectives on scientific research. The present situation has been assessed in light of the research's findings, and ideas for additional work have been suggested.

INTRODUCTION

Education can be evaluated as a process that starts in the family, expands with the social environment and continues in a planned and programmed way. This is ensured formally in schools and informally throughout life. Education is the ongoing effort done to bring about specific changes in human behavior in terms of personality qualities such as knowledge, skills, understanding, interest, perspective and character (Yıldırım, 1983). It is also the process of creating an intentional modification in the acts of a person through his own life (Ertürk, 2016). Aydın (2009), on the other hand, states that what is meant by education is a more planned, programmed and purposeful process.

Education can also be considered as a system. The state involves a lot of different systems and one of them is the education system. The teacher, the student, and the curriculum make up the three basic parts of the educational system. However, the most crucial and prominent one is the teacher. Because the teacher is the one who will carry the students to the aimed level and make the system useful (Aydın & İşlek, 2021). The purpose of all components in the education system is to increase the qualifications of students so that they can be more creative and productive. For this reason, there is a need for more qualified teachers, modern teaching programs suitable for the changing conditions of the day, physical environments, management and eager students (Ministry of National Education [MNE], 2006). Therefore, teacher candidates should be provided with an efficient teaching profession, in which they will apply their experiences and knowledge throughout their professional careers (Baki & Gökçek, 2007).

In recent years many university graduates do not feel ready for the profession despite having studied for a long time. Research shows that people with a university degree are inadequate especially in practice-based skills and acquisitions. Communication, analytical thinking, troubleshooting, professional ethics, cooperation and collaboration, technology use, leadership, and project management are among the competencies involved (Kanmaz, 2021).

The importance of abilities like critical thinking, troubleshooting, mathematical literacy, taking initiative, and self-learning, which are expressed as 21st century skills, have increased recently. One of the organizations that classify 21st century skills is Battelle for Kids. The basic mission of this non-profit organization is defined as developing the 21st century skills of every student. The classification made by Battelle for Kids within the scope of the Partnership for 21st Century Learning (P21) study is shown in Table 1.

As seen in Table 1, when the skills determined by P21 (2019) within the framework of the 21st century are examined, it is acknowledged that people require a variety of abilities to keep up with modern time. Among the 21st century skills that an individual needs to develop are important competencies such as types of thinking, problem-solving skills, and various types of literacy. It is also clear that individuals are obliged to accomplish their own responsibilities while trying to adapt to the rapidly changing world. The basic principles of taking initiative and self-management skills, which are given under life and career skills, are included in P21 (2019) under the heading of management and independent work. According to these principles, individuals are expected to set a goal for themselves, use their time efficiently in line with this goal and take initiative of their works. In this context, the need for the person to gain the ability to manage their own learning process without the need for any control mechanism arises (P21, 2019).

Table 1. *Classification of 21st Century Skills*

Learning and Renewal Skills	Information, Media and Technology Skills	Life and Career Skills
Creativity	Information literacy	Flexibility and adaptability
Innovation	Media literacy	Taking initiative and self-management
Critical Thinking	Digital literacy	
Problem solving		Social and intercultural productivity
Communication		Leadership and responsibility

Collaboration

Source: Battelle for kids; Partnership for 21st century [P21], 2019.

Self-learning skill, among the skills of the 21st century, can be defined as "an individual's following his/her own learning process". This skill is extremely important for teachers and prospective teachers who implement lifelong learning and self-directed learning skills, education policies and training programs. Because people should be capable of organizing, executing and handling. (Arnandho & Sutheejariyawattana, 2022).

Students with high ability to work independently do not need another person during learning (Basic Education Program, 2013). Teachers, who are expected to provide students with the capacity for self-employment, should be competent enough to transfer this to their students (Schleicher, 2012). With Turkey's entry into the Bologna process in 2001, the National Qualifications Framework for Higher Education in Turkey was determined in 2010. Within the framework of these competencies, the self-employability and responsibility capability includes some skills. Being able to carry out an advanced study in the field independently, assuming accountability both as a person and as a team member to resolve unexpectedly complicated situations in the field are some examples (Council of Higher Education [CHE], 2022). It is seen that the 21st century skills determined within the scope of Partnership for 21st century and the competencies required to be acquired in Turkey Higher Education Qualifications Framework are similar. Accordingly, it can be said that a teacher should be able to work independently and take responsibility in order to be a role model for the student as well as being responsible for providing the student with the necessary knowledge and skills.

Responsibility is a virtue that can be observed directly, transformed into behavior, started to be given from an early age, has a crucial part in the lives of individuals and continues until death (Sezer et al. 2017). Responsibility is the active side of morality and is described as a person's being attentive to himself and others, performing his duties, taking part in the social process and making efforts to solve problems (Lickona, 1991), approving the results and effects of the choices made (Popkins, 1987). While Glasser (1990) defines the responsible individual as a person who can meet their own needs without preventing other people from meeting their own needs, Yavuzer (1998) describes it as a person who performs the duties in accordance with his age, gender and developmental level from an early age. One of the objectives of the education is to develop a sense of responsibility in order to ensure that individuals can maintain their existence in a harmonious manner in the society and be accepted (MNE, 2006).

Raising individuals with the capacity to generate new information and to think critically, creatively, and scientifically is among society's top priorities. For this reason, countries that want to have a developed society care about the development of individuals who question, have different perspectives and express themselves comfortably (Erdem, 2012). It is possible to say that teachers have the most responsibility in the process of raising the desired human type in the education system (Korkmaz et al., 2011). Because one of the vital targets of education is to improve the scientific perspectives of individuals (Büyüköztürk, 1999). While perspective is defined as a phenomenon that is assumed to affect an individual's behaviors and decisions (McCoach et al., 2013), scientific perspective is expressed as thoughts and behaviors that facilitate problem solving, producing knowledge, researching and learning (Olasehinde & Olatoye, 2014). In line with these statements, it is understood that students are expected to grow a wide perspective to scientific studies, especially with the contribution of teachers in the education process they receive. It is important for students with scientific perspectives to be competent on how to access information instead of getting information ready.

The methods developed or adopted by individuals in their own learning processes and the skills they have are described and examined in different ways by researchers. These methods or skills are defined as study strategies by Deryakulu (2004), study habits by Hotaman (2009), self-learning skills by Abalı Öztürk et al. (2017), and independent research skills by Alanoğlu and Doğan (2021). According

to the literature review, it is seen that many studies have been conducted on the various skills, perceptions, perspectives and opinions of teacher candidates. Recently, it has been determined that teacher candidates have been studied especially on teacher competencies and 21st century skills (Başbay & Bektaş, 2010; Çelik et al., 2019; Tuğluk & Kürtmen, 2018; Yavuz et al., 2015). Additionally, it is evident that there are also studies on the perspectives of teachers and teacher candidates on scientific studies (Korkmaz et al., 2011; Dombaycı & Ercan, 2017; Baykara, 2019). There are also studies on teachers' perception of responsibility or their ability to raise awareness of responsibility (Sezer et al., 2017; Yurtal & Yontar, 2006). It is also seen that concepts such as independent work, taking responsibility and scientific research skills are mostly examined within the scope of 21st century skills (Ananiadou & Claro, 2009; Karakoyun & Lindberg, 2020; Kivunja, 2014; Pipere & Salite, 2006; Sulaiman & Ismail, 2020; Urbani et al., 2017).

In the light of the scope of the study and the literature review it is aimed to find out teacher candidates' self-employability and responsibility capability. It is also expected to determine teacher candidates' perspectives on scientific research. Finally, the relationship between self-employability and responsibility capability and perspectives on scientific research of teacher candidates is examined. Based on these problems, answers to the succeeding questions were sought

1. What is the level of teacher candidates' self-employability and responsibility capability?

2. Do teacher candidates' self-employability and responsibility capability show a significant difference according to gender, department, class, weighted grade point average, idea of getting a master's degree, and satisfaction with the department?

3. What is the level of teacher candidates' perspectives on scientific research?

4. Do teacher candidates' perspectives on scientific research differ significantly according to gender, department, class, weighted grade point average, the idea of pursuing a master's degree, and their satisfaction with the department?

5. Is there a noteworthy association between teacher candidates' self-employability and responsibility capability and their perspectives on scientific research?

METHOD

Research Design

One of the descriptive research models, the survey model, was applied in this study. A study strategy known as the survey model seeks to show the previous or current situation as it actually is. The research's subject's events, people, or things are attempted to be described exactly as they are. There is no attempt to affect or alter them in any way (Karasar, 2016). Due to the nature of this research, the relationship between teacher candidates' self-employability, taking responsibility and their perspectives on scientific research was tried to be described by using the scanning model.

Research Sample

The universe of this study involves a total of 2347 prospective teachers from different departments at the Faculty of Education of Burdur Mehmet Akif Ersoy University. The universe is the whole of the elements that the results of the research are intended to be generalized (Büyüköztürk et al., 2013). Since participation in the study was voluntary, the entire population could not be reached. 479 teacher candidates make up the study's sample, including 370 women and 109 men selected by convenient sampling method. As the research was conducted in a short period of time, convenient sampling method was preferred. Since there are constraints on resources such as time, money, and effort, appropriate (accidental) sampling refers to the selection of the sample from readily available and applicable units (Balcı, 2009). Information on the distribution of teacher candidates partaking in the study is given in Table 2.

Table 2. *Distribution of Teacher Candidates Partaking in the Research*

		f	%
Gender	Female	370	77.2
	Male	109	22.8
Grade	1	95	19.8
	2	95	19.8
	3	169	35.3
	4	120	25.1
Department	Mathematics	57	11.9
	Social Sciences	143	29.9
	Turkish	24	5.0
	English	35	7.3
	Fine Arts	48	10.0
	Basic Education	31	6.5
	Pre-School	101	21.1
	Guidance and Counselling	40	8.4
Weighted Grade Point Average (GPA)	2.50-2.99	83	17.3
	3.00-3.49	207	43.2
	3.50-4.00	189	39.5
Idea of Getting Master's Degree	Yes	292	61.0
	No	187	39.0
Satisfaction with the Department	Yes	337	70.4
	No	35	7.3
	Partially	107	22.3
Total		479	100

When Table 2 is examined, 370 (77.2%) of the teacher candidates partaking in the research are female and 109 (22.8%) are male. Looking at the distribution of by grades, 95 (19.8%) from 1st grades, 95 (19.8%) from 2nd grades, 169 (35.3%) from 3rd grades and 120 (25.1%) from 4th grades teacher candidates participated. According to the departments of teacher candidates, 143 (29.9%) from the Social Studies department, 101 (21.1%) from the Preschool Department, 57 (11.9%) from the Elementary Mathematics Department, 48 (10%) from the Fine Arts Department, 40 (8.4%) from the Guidance Department, 35 (7.3%) from the Department of English, 31 (6.5%) from the Department of Classroom Teaching, and 24 (5%) from the Turkish department took part in this study.

When the weighted grade point averages of the prospective teachers are observed, it is realized that 207 (43.2%) students are in the range of 3.00-3.49, 189 (39.5%) students are in the range of 3.50-4.00, and 83 (17.3%) students are in the range of 2.50-2.99. None of the teacher candidates participated in the study had a weighted average score below 2.50. In addition, while the number of teacher candidates who are considering a master's degree is 292 (61%), the number of those who do not is 187 (39%). According to the satisfaction of the teacher candidates with their department, it is seen that 337 teacher candidates (70.4%) are satisfied with the department, 35 candidates (7.3%) are not satisfied with the department, and 107 candidates (22.3%) are partially satisfied with the department.

Resarch Instrument and Processes

In this research, three distinct data collection tools were employed. One of them is the Personal Information Form created by the researchers. This personal information form includes gender, class, weighted grade point average, department, the idea of pursuing a master's degree and the degree of satisfaction with the department.

The Self-Employability and Responsibility Capability Scale

For the purpose of collecting data about the abilities of teacher candidates' independent work and taking responsibility, the The Self-Employability and Responsibility Capability Scale (SERC) developed by Sıvacı and Kuzu (2017) was used. 20 items in this 5-point Likert-type scale were scored as "1= I'm not competent at all, 2= I am not competent, 3= I am moderately competent, 4=I am competent, 5=I am very competent". The Kaiserk-Meyer-Olkin (KMO) coefficient was calculated to test the size of the sample and

the KMO value was found to be .915. The significance value was found as p<.01 with Bartlett's test. Moreover, the total variance explained was found to be 46.193%. Therefore, a scale with high validity and reliability was obtained and with this scale, the competency levels of pre-service teachers to work independently and take responsibility were examined in terms of various variables (Sıvacı and Kuzu, 2017).

The cronbach alpha value was computed as .931 based on the results of the reliability test. If the Cronbach alpha number has a value in the range of 0.80<α<1.00, the measuring instrument employed is regarded as credible. (Tezbaşaran, 2008).

Table 3. *The Results of Self-Employability and Responsibility Capability Scale Reliability Analysis*

Scale	α
Self-Employability and Responsibility Capability Scale	.931

Attitude Scale Toward Scientific Research

The "Attitude Scale Toward Scientific Research (ASTSR)" developed by Korkmaz et al. (2011) was used to determine the perspectives of prospective teachers on scientific research. According to the results of the explanatory factor analysis, the inventory is composed of four factors. When the factor loads, factor eigenvalues and detected variance rates are considered; it can be confirmed that the inventory has structural validity (Korkmaz et al., 2011). This is a 5-point likert scale based on two main factors of 'negative attitude towards scientific research' and 'positive attitude towards scientific research'. These two main factors have four sub-dimensions of "reluctance to assist researcher", "negative perspective on research", "positive perspective on research" and "positive perspective on the researcher". Table 4 contains the information about the reliability analysis of the scale.

Table 4. *The Results of Attitude Scale Toward Scientific Research Reliability Analysis*

Scale	Sub-dimensions	α
Attitude Scale Toward Scientific Research	Reluctance to assist researcher	.883
	Negative perspective on research	.882
	Positive perspective on research	.861
	Positive perspective on the researcher	.879
	ASTSR Total	.828

As seen in Table 4, it is obvious that the Attitude Scale toward Scientific Research used in the research has sufficient Cronbach alpha values both in all sub-factors and in general. According to these results, it is understood that both scales in the study are reliable.

Data Analysis

The scores of participants gained from Self-Employability and Responsibility Capability Scale express the competency level of the participants. As the score obtained increases, the level of self-employability and responsibility capability also increases. In the Attitude Toward Scientific Research Scale, the increase in the scores gotten from scale shows that the negative perspective increases for the first (reluctance to assist researchers) and second (Negative Perspectives on Research) factors, while the third (Positive Perspective on Research) and fourth (Positive Perspective on Researchers) factors show that positive perspective increases. The first two factors and the last two factors are inversely proportional to each other. All of the items in the first and second factors are negative statements, while rest of the statements are positive. Therefore, high average points gained from the first two factors show negativity, and high scores in the third and fourth factors indicate positivity. Because of this inverse proportionality, calculating a total score for the whole scale is not meaningful and requires separate operations on the factors (Korkmaz et al., 2011:971).

Within the framework of the main purpose of the research, the necessary statistical analyzes were made on the data collected for the sub-problems whose answers were sought, using the SPSS 22 package program. Among the descriptive statistical methods, (f) frequency, (%) percentage and (Γ) arithmetic mean analysis was performed. Mann-Whitney U and Kruskall Wallis H tests, which are non-parametric tests, were

applied to determine the direction of the difference in multiple comparisons. Correlation test was done to find out the association between the ability to self-employability and responsibility capability and the attitude toward scientific research. The interpretation of the results obtained from the scale items was based on the value ranges recommended by Field (2002). These ranges are given in Table 5 and Table 6.

Table 5. *Self-Employability and Responsibility Capability Scale Score Ranges*

Value Range	Self-Employability and Responsibility Capability Scale	Level of competency
1.00 – 1.80	I'm not competent at all	Very low
1.81 – 2.60	I'm not competent	Low
2.61 – 3.40	I'm moderately competent	Medium
3.41 – 4.20	I'm competent	High
4.21 – 5.00	I'm very competent	Very high

Table 6. *Attitude Toward Scientific Research Scale Score Ranges*

Value Range	*Attitude* Toward Scientific Research Scale	Perspective
1.00 – 1.80	I totally disagree	Very low
1.81 – 2.60	I disagree	Low
2.61 – 3.40	I'm undecided	Medium
3.41 – 4.20	I agree	High
4.21 – 5.00	I totally agree	Very high

Before the collected data of the research were analyzed, the normality test was applied to decide which tests to be done. The normality tests are done separately for each scale. The results of the normality test based on the overall score averages are revealed in Table 7.

Table 7. *Normality Test Results of the Data Obtained from the Scale*

Scales	Factors	Kolmogorov-Smirnov		
		Statistics	df	p
Self-Employability and Responsibility Capability Scale	Self-Employability and Responsibility Capability	.063	479	.000
Attitude Toward Scientific Research Scale	Positive Perspective on Research	.084	479	.000
	Negative perspective on research	.077	479	.000

According to the results of the normality test in Table 7, it is understood that the scores obtained from both Self-Employability and Responsibility Capability Scale and the scores obtained from Attitude Toward Scientific Research Scale do not have a normal distribution. Since the first two and the last two factors in the Attitude Toward Scientific Research Scale measure different perspectives, they were analyzed separately. In this case, it is seen that non-parametric tests should be applied in data analysis.

Ethic

The ethics committee application of the study was made to Mehmet Akif Ersoy University Ethics Committee.

RESULTS

The research's findings will be presented in the sequence specified by the sub-problems in this section. In this regard, the first sub-problem tries to find the level of teacher candidates' self-employability and responsibility capability. The average scores related to the sub-problem are given away in Table 8.

Table 8. *The Level of Teacher candidates' Self-Employability and Responsibility Capability*

	N	$\bar{\chi}$	Ss
Self-Employability and Responsibility Capability	479	3.88	.56431

When Table 8 is examined, it is seen that the teacher candidates' self-employability and responsibility capability is at 'I'm competent' level (Γ =3.88). Accordingly, it is understood that teacher candidates are diligent about working independently and fulfilling their responsibilities. However, it can be said that the competence level of the teacher candidates, who are expected to be a role model for their students in this

regard, should be at the level of 'I am very competent'.

Table 9. *Mann Whitney U Test Results of Teacher candidates' Self-Employability and Responsibility Capability by Gender*

Gender	N	Mean Rank	Z	p
Female	370	244.66	-1.359	.174
Male	109	224.17		

In order to evaluate the research's findings in relation to the second sub-problem, binary (Mann Whitney U) or multiple (Kruskal Wallis H) comparison tests were applied using non-parametric tests, since the data did not show normal distribution. When the data in Table 9 is analyzed, it is observed that there is no gender-related difference (p<.174) in the self-employability and responsibility capability of teacher candidates. According to this finding, it can be said that gender does not have any effect on the self-employability and responsibility capability.

Table 10. *Mann Whitney U Test Results of Teacher candidates' Self-Employability and Responsibility Capability According to the Idea of Getting Master's Degree*

Idea of Getting Master's Degree	N	Mean Rank	Z	p
Yes	292	255.55	-3.074	.002
No	187	215.72		

As stated in Table 10, a notable difference has been figured out (p>,002) in support of those considering a master's degree in the self-employability and responsibility capability. Accordingly, it can be thought that teacher candidates who are considering a master's degree have better self-employability and responsibility capability.

Table 11. *Post-Hoc test with Bonferroni Correction Results of Teacher candidates' Self-Employability and Responsibility Capability According to Grade Level*

Grade Level (I)	Grade Level (J)	Mean Difference	p
1	2	-1.80	1.00
	3	-.76	1.00
	4	-3.76	.032
2	1	1.80	1.00
	3	1.03	1.00
	4	-1.96	1.00
3	1	.76	1.00
	2	-1.03	1.00
	4	-2.99	.019
4	1	3.76	.032
	2	1.96	1.0
	3	2.99	.019

According to Table 11, the ability of teacher candidates' self-employability and responsibility capability differs significantly at the grade level. As a result of the analysis, it was understood that this difference was in favor of the 4th grade students. This situation was also determined in favor of senior students against both 2nd and 3rd grade students. Accordingly, it's reasonable to state that as the education level of teacher candidates increases, they are more competent in carrying out independent work and taking responsibility. At this point, it can be thought that the education given at the university supports to the advance of the students' self-employability and responsibility capability.

Table 12. *Kruskal Wallis H Test Results of Teacher candidates' Self-Employability and Responsibility Capability According to Department*

Department	N	Mean Rank	p
Mathematics	57	231.17	
Social Sciences	143	225.76	
Turkish	24	214.23	
English	35	208.39	0.217
Fine Arts	48	262.15	
Basic Education	31	238.97	
Pre-School	101	263.79	
Guidance and Counselling	40	260.76	

When Table 12 is examined, it is evident that teacher candidates' self-employability and responsibility capability does not show a statistically significant difference according to the department they study. Therefore, it can be demonstrated that the branch has no impact on teacher candidates' capacity for responsibility and self-employment.

Table 13. *Kruskal Wallis H Test Results of Teacher candidates' Self-Employability and Responsibility Capability According to Weighted GPA*

Weighted GPA	N	Mean Rank	p
2.50-2.99	83	212.51	
3.00-3.49	207	241.62	.114
3.50-4.00	189	250.29	

According to Table 13, it is understood that teacher candidates' self-employability and responsibility capability does not differ significantly according to the weighted GPA of the teacher candidates. According to these findings, although the teacher candidates with high grade point averages have higher self-employability and responsibility capability, this difference does not seem to be significant. The fact that the weighted GPA of each of the teacher candidates participating in the study is different from each other makes it difficult to make statistical calculations. For this reason, the weighted GPAs of the teacher candidates were analyzed by dividing them into groups of 0.50 points each.

Tablo 14. *Post-Hoc test with Bonferroni Correction Results of Teacher candidates' Self-Employability and Responsibility Capability According to Satisfaction with the Department*

Satisfaction (I)	Satisfaction (J)	Mean Difference	p
Yes	No	.91	1.00
	Partially	4.47	.001
No	Yes	-.91	1.00
	Partially	3.55	.306
Partially	Yes	-4.47	.001
	No	-3.55	.306

According to Table 14, it is understood that teacher candidates' self-employability and responsibility capability differs significantly in terms of their satisfaction with the department. A noteworthy difference is discovered in favor of the teacher candidates who say 'yes' to being satisfied with the department and against the teacher candidates who say 'I am partially satisfied'. According to these findings, the fact that most of the teacher candidates are satisfied with the department they are studying, therefore they are competent in conducting independent studies and taking the necessary responsibilities individually.

The average scores of the teacher candidates contributing to the study on the Attitude Scale toward Scientific Research are given in Table 9. While two of the sub-dimensions in the scale are related to negative perspective, the other two sub-dimensions are related to negative perspective. For this reason, the averages obtained from two factors, positive and negative, are shown instead of total scores.

Table 15. *Teacher candidates' Average Scores on Attitude Toward Scientific Research Scale*

Perspective Toward Scientific Research	N	$\bar{\chi}$	Ss
Negative Perspective Toward Scientific Research	479	2.38	.70199
Reluctance to assist researchers	479	2.61	.82550
Negative perspective on research	479	2.17	.72014
Positive Perspective Toward Scientific Research	479	3.86	.53860
Positive Perspective Toward Research	479	3.65	.63283
Positive Perspective on Researchers	479	4.11	.65121

In Table 15, it is clear that the negative perspectives of the teacher candidates on scientific research are low (Γ = 2.38), while their positive perspectives are high (Γ = 3.86). Looking at the sub-dimensions, it is understood that the perspectives of the teacher candidates are low in the sub-dimensions of reluctance to assist researchers (Γ =2.61) and Negative perspective on research (Γ =2.17). In the sub-dimensions of positive perspective on research (Γ =3.65) and positive perspective on researchers (Γ =4.11),iIt is apparent that teacher candidates have high degrees of perspective. According to these findings, it is understood that teacher candidates respect science, scientific studies and scientists. At this point, it is possible to predict that teacher candidates will benefit from scientific research-based methods and techniques during their teaching profession and will enable their students to develop positive perspectives on scientific research. Non-parametric double (Mann Whitney U) or multiple (Kruskal Wallis H) comparison tests were applied to analyze the results of the fourth sub-problem as the data did not show normal distribution.

Table 16. *Teacher candidates Perspectives on Scientific Research by Gender Mann Whitney U Test Results*

	Kruskal Wallis			
Grade	Reluctance to assist researchers	Negative perspective on research	Positive Perspective on Research	Positive Perspective on Researchers
Female	225.97	228.54	240.20	248.64
Male	287.62	278.89	239.31	210.68
Z	-4.092	-3.344	-.060	-2.535
p	.000	.001	.952	.011

According to Table 19, teacher candidates' perspectives on scientific research differ significantly by gender it is apparent that there is a significant difference in countenance of male teacher candidates in the "Reluctance to assist researchers" sub-dimension (p>.000) and "Negative perspective on research" (P>.001) referring to negative perspective. According to this result, it is understood that male teacher candidates have a more negative perspective on scientific research. In the "Positive Perspective on Researchers" sub-dimension, it was revealed that there was a significant difference in favor of female teacher candidates (p>,011). According to these findings, it is understood that female teacher candidates have a more positive perspective on scientific studies and scientists than male teacher candidates. In this case, it is possible to say that female teacher candidates pay attention to their studies to be more systematic and regular. Considering that scientific researches are carried out in a certain system and in a planned manner, it's acceptable to state that female teacher candidates will do the teaching profession with the same care.

Table 17. *Teacher Candidates' Perspectives on Scientific Research by Grade Level Kruskal Wallis H Test Results*

	Kruskal Wallis			
Grade	Reluctance to assist researchers	Negative perspective on research	Positive Perspective on Research	Positive Perspective on Researchers
1	244.58	250.49	245.01	219.85
2	248.35	240.36	244.64	275.65
3	220.81	214.34	236.49	244.63
4	256.80	267.55	237.31	221.21
P	.140	.011	.943	.012

According to Table 17, it is clear that teacher candidates' perspectives on scientific research indicate a noteworthy difference in terms of the class variable. This difference was determined in favor of the 4th grade students in the 'Negative perspective on research' sub-dimension, and in favor of the 2nd grade students in the 'positive perspective on researchers' sub-dimension. Accordingly, it is seen that fourth-grade students have a Negative perspective on researches rather than researchers. It can be said that this situation is caused by the fact that senior students are generally used in researches done with teacher candidates. It is understood that those who have the most positive perspectives on researchers are second grade students.

Table 18. *Teacher Candidates Perspectives on Scientific Research by Department Kruskal Wallis H Test Results*

Department	Kruskal Wallis			
	Reluctance to assist researchers	Negative perspective on research	Positive perspective on research	Positive perspective on researchers
Mathematics	221.07	246.67	219.94	235.61
Social Sciences	250.60	275.84	231.48	219.46
Turkish	259.58	196.83	265.65	257.29
English	307.13	278.43	211.66	238.21
Fine Arts	240.46	235.88	259.13	257.01
Basic Education	248.24	233.08	223.23	235.47
Pre-School	209.55	195.36	255.23	244.26
Guidance and Counselling	228.53	217.69	260.08	283.24
P	.026	.000	.376	.293

According to Table 18, the perspectives of teacher candidates on scientific research differ significantly according to the department. It is understood that this difference is on behalf of the English Language Teaching Department teacher candidates in the negative perspective dimensions of the scale. That is to say, it is understood that English teacher candidates have a more negative perspective than others. At this point, it is possible to say that it is necessary to examine why students studying in the English language teaching department have a negative perspective on scientific research. It can be assumed that this fact rises from the nature of the scientific research conducted in that department or the perspectives of the researchers conducting these studies.

Table 19. *Teacher Candidates' Perspectives on Scientific Research According to Their Weighted Grade Point Averages Kruskal Wallis H Test Results*

Weighted GPA	Kruskal Wallis			
	Reluctance to assist researchers	Negative perspective on research	Positive Perspective on Research	Positive Perspective on Researchers
2,50-2,99	277.34	271.20	215.86	219.70
3,00-3,49	240.67	247.34	240.87	238.55
3,50-4,00	222.87	218.26	249.65	250.50
P	.011	.009	.176	.230

According to the data in Table 19, when the weighted grade point averages are taken into account, it is clear that the scores of negative perspectives on scientific research are higher in those with a grade point average of 2.50-2.99. At the same time, it is understood that this difference is statistically significant. Accordingly, the perspectives of teacher candidates with GPA between 2.50-2.99 are more negative on scientific research. Considering the weighted grade point averages, it can be said that the students with low academic achievement levels do not have a positive perspective on scientific research. In other words, it is possible to say that it is not surprising that students with low grade point averages have a negative perspective on scientific research in a university where courses are based on scientific research methods.

Table 20. *Perspectives On Scientific Research According to Teacher candidates' Idea of Getting Master's Degree Mann Whitney U Test Results*

Idea of Getting Master's Degree	Kruskal Wallis			
	Reluctance to assist researchers	Negative perspective on research	Positive Perspective on Research	Positive Perspective on Researchers
Yes	227.59	227.48	273.43	248.41
No	259.38	254.54	187.80	226.86
Z	-2.455	-2.478	-6.630	-1.674
p	.014	.013	.000	.094

Table 20 reveals a considerable difference in favor of applicants who do not plan to pursue a master's degree in terms of the negative perspective. In the dimension of "Positive Perspective on Research", a statistically important difference was found in support of those considering graduate education. According to these findings, it is possible to evaluate it as normal that students who are thinking of doing a master's degree show a positive approach on scientific research. Similarly, it can be said that the perspectives of the students who do not intend to do a master's degree on these researches are negative because they do not have a purpose to carry out scientific research and take part in these researches.

Table 21. *Teacher Candidates' Perspectives on Scientific Research According to the Degree of Satisfaction with the Department Kruskal Wallis H Test Results*

Satisfaction with the Department	Kruskal Wallis			
	Reluctance to assist researchers	Negative perspective on research	Positive Perspective On Research	Positive Perspective On Researchers
Yes	230.73	226.59	251.30	250.85
No	271.46	299.74	253.93	217.59
Partially	258.91	262.70	199.87	213.17
P	.070	.002	.003	.029

According to the information in Table 21, it was determined that the prospective teachers differed statistically significantly in terms of their degree of satisfaction with the department they studied. Accordingly, it is seen that in the negative perspective dimension it is in favor of those who are not satisfied with the department, and in the positive perspective dimension, it is in favor of those who are satisfied with the department. In line with these findings, it is understood that the degree of satisfaction with the department they are studying is directly proportional to the perspectives of teacher candidates on scientific research. In this case, it is probable to state that teacher candidates who enjoy their education are willing to contribute to science and scientists.

Table 22. *Results of Spearman Correlation Analysis Between Self-Employability and Responsibility Capability and Perspective on Scientific Research*

	1		2		3		4		5	
	r	P	*r*	P	*r*	P	*r*	P	*r*	P
1 Self-employability and responsibility capability	-									
2.Reluctance to assist researchers	-.179	.000	-							
3.Negative perspective on research	-.117	.010	.663	.000	-					
4.Positive Perspective on Research	.290	.000	-.257	.000	-.182	.000	-			
5.Positive Perspective on Researchers	.194	.000	-.189	.000	-.286	.000	.408	.000	-	

According to Table 22, it is seen that there is a significant but negative correlation between self-employability and responsibility capability, and Negative perspective on research sub-dimensions. It is also understood that there is a low level of positive and significant relationship between self-employability and responsibility capability and positive perspective on research sub-dimensions. In light of this consequence, it may be claimed that as teacher candidates' self-employability and responsibility capability increases, their positive perspective on scientific researches increases as well. Similarly, as teacher candidates' self-employability and responsibility capability decreases, their negative perspective on scientific research increases.

DISCUSSION, CONCLUSION, RECOMMENDATIONS

In the study, it was concluded that the teacher candidates were at the level of 'I am competent' according to the average score of The Self-Employability and Responsibility Capability Scale. Similarly, in the research conducted by Cesur (2018), teacher candidates' self-employability and responsibility capability level was determined as 'I am competent'. Again, in another research on 21st century skills (Shidiq & Yamtinah, 2019), it is understood that the teacher candidates gave high-level positive responses to the statements about personal and social responsibility. In another study on the self-efficacy levels of teachers by Aydın and Kurt (2022), teachers similarly are found to have high levels of self-efficacy. Accordingly, it can be said that teacher candidates will fulfill their responsibilities both individually and, in the group. It can also be concluded that they will not have any problems in reaching the solution on their own by using their strengths.

As a result of the statistical tests, teacher candidates' self-employability and responsibility capability did not indicate a meaningful discrepancy in terms of gender. This result is in line with Sıvacı's (2017) study, which found no apparent gender-related difference was found. Again, in the research of Sulaiman and Ismail (2020) on teacher competencies, the same conclusions were reached in terms of 21st century skills. However, this study is not similar to the studies of Akçöltekin (2018) and Cesur (2018), who detected a notable difference in support of women in their studies. Similarly, in the study (Sucuoğlu, 2022), in which it was emphasized that female teacher candidates work more planned and using time effectively, women were found to be significantly better off in online self-regulation skills. According to these results, it can be said that it is not possible to make a definite judgment about whether gender has any effect on teacher candidates' self-employability and responsibility capability.

The study's findings indicate that teacher candidates' self-employability and responsibility capability differs statistically significantly according to the idea of doing a master's degree. It has been found that the difference favors individuals who are thinking about pursuing a master's degree. It can be said that this result is similar to the finding of a significant difference in favor of "those who take part in a scientific study" in the research conducted by Akçöltekin (2018). In line with these results, it can be thought that teacher candidates who are considering a master's degree can carry out their scientific studies without needing any support and fulfilling their responsibilities during their education at the university.

According to another result, teacher candidates' self-employability and responsibility capability differs significantly at the class level. Accordingly, it has been found out that there is a significant difference in support of the 4th grade teacher candidates compared to the 2nd and 3rd grade students. In this case, it is conceivable to state that the final year teacher candidates have a higher level of individual working skills and ability to take initiative, thanks to the experiences they have gained during their education. In other words, it can be said that as the grade level of teacher candidates increases, they are more successful in working alone and taking responsibility.

The perspectives of teacher candidates on scientific research were also examined. According to the results, the teacher candidates are found to have a high level of positive and moderately negative perspectives on scientific research. In other words, the attitude of teacher candidates toward scientific

research has been found to be favorable and researchers. In a study on the scientific research skills of pre-service biology teachers (Aripin et al., 2021), the results showed that teacher candidates received the best marks in the sub-dimension of self-confidence, willingness to learn, self-awareness and self-discipline skills. In this respect, it can be said that these studies are similar to each other. Accordingly, it can be thought that teacher candidates are moderate toward science and researchers and do not approach scientific research with prejudice.

The results of the research revealed that the perspectives of teacher candidates on scientific research differed significantly according to gender, the idea of doing a master's degree, grade point average, department and degree of satisfaction with the department they studied. When we look at the studies in the literature, a significant difference was found in favor of women in the research conducted by Polat (2014). It has been concluded that the perspectives of teacher candidates on scientific research are more positive for female teacher candidates than for male teacher candidates. Based on this result, it is understood that female teacher candidates have a more positive view of science and they are more curious and willing to do so. In addition, it can be predicted that female teacher candidates will use their scientific process skills more than male teacher candidates while performing their profession. On the other hand, Aşiroğlu's (2016) study does not overlap with this study because there was not a noticeable gender-related difference.

The significant difference between prospective teachers in favor of those who are considering a master's degree and those with a high-grade point average shows that students who are academically successful in their education life are also inclined to conduct scientific research. The fact that students with a low-grade point average have a high score in the sub-dimension of reluctance to assist researchers can be interpreted as seeing scientific studies as a chore.

The significant differentiation of teacher candidates' perspectives on scientific research according to the department also coincides with the results obtained by Göksel and Yıldız (2021). In this study, it was seen that English teacher candidates achieved higher scores in the dimensions of "reluctance to assist researcher" and Negative perspective on research, while in the study of Göksel and Yıldız (2021), it was concluded that the students of the Recreation Department had a more positive perspective. In this context, it is possible to say that the education received by the teacher candidates in the department they study can affect their view of scientific research positively or negatively. Bicer et al. (2013) with Turkish teacher candidates, significant differences were found at the grade level.

Another result included in the study revealed that there is a significant relationship between teacher candidates' self-employability and responsibility capability and their positive perspectives on scientific research. Additionally, a reasonably significant association was found, between reluctance to assist researchers and Negative perspective on research. Again, a low-level significant relationship was found between positive perspective on research and positive perspective on researchers. At this point, it is possible to assume that candidates who can direct their own studies and are aware of their own responsibilities are also inclined to conduct scientific research. Similarly, in the study conducted by Aktaş and Sançar (2021), an effective association was discovered between the nurse candidates' positive perspective on scientific research and their academic self-efficacy level.

According to the results obtained from the research, it was seen that the competencies of the teacher candidates' self-employability and responsibility capability differed significantly according to their grade level and their satisfaction with the department. Similarly, it was determined that the perspectives of teacher candidates on scientific research differed significantly according to gender, the idea of doing a master's degree, the degree of satisfaction with the department. Considering these results, it can be considered important to examine the situation of current working teachers via a similar study and variables such as branch, age, seniority, place of work and type of institution.

While no significant difference was found in the gender variable in some skills examined in this

study, it was revealed that there were significant differences according to gender in similar studies. In this context, a study can be conducted with a larger sample in order to make a clearer decision whether gender has an effect on 21st century skills.

In fact, it can be suggested that this research, which was carried out with teacher candidates, should be carried out at previous education levels in order to have clearer information about future generations and to guide them better. Because today, there are some skills that students are expected to have. These include essential skills such as self-learning and problem solving. When considered from this perspective, the implementation of a similar study in secondary education and even in the second level of primary education is important in terms of providing students with the necessary skills from an earlier age.

It can be suggested that a similar study can be applied to previous education levels, as well as to be carried out with our teachers who are actually practicing the teaching profession. Considering that one of the criticisms that teachers are exposed to is that they are inadequate in improving themselves, it can be said that determining teachers' perspectives on scientific research will also give an idea about this issue.

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Investigation of Preservice Science Teachers' Attitudes Towards Nanotechnology According to Various Variables

Şeyma Çalık Bostancı[1] 🆔 Erhan Zor[2] 🆔

[1] Necmettin Erbakan University, Institute of Educational Sciences, Department of Science Education, Konya, Türkiye
calikseyma95@gmail.com

[2] Necmettin Erbakan University, Ahmet Keleşoğlu Faculty of Education, Department of Science Education, Konya, Türkiye
ezor@erbakan.edu.tr

Article Info	ABSTRACT
	This study aims to examine the attitudes of preservice science teachers towards nanotechnology according to various variables such as gender, class level, and academic achievement. The cross-sectional survey method was employed in the study. The sample of the study consists of 199 preservice science teachers (170 females, 29 males). The used data collection tool is the Attitude Scale Towards Nanotechnology consisting of three sub-components (positive, negative, and utility). Descriptive statistics including mean and standard deviation scores were used in the descriptive analysis of the data, while Independent Samples t-test and ANOVA were used in the inferential analysis. According to the results, it was observed that the attitudes of preservice science teachers towards nanotechnology were at a "high" level. When the attitudes of preservice science teachers towards nanotechnology were examined according to the gender variable, it was determined that male preservice science teachers had a higher average attitude score than female preservice science teachers. When the attitudes were examined based on the class level variable, it was observed that the preservice science teachers in the 3rd year of education had the highest average attitude score, while those in the 2nd year had the lowest average attitude score. Regarding the academic achievement level variable, it was observed that the preservice science teachers with high academic achievement had a higher average attitude score than those with low academic achievement.

INTRODUCTION

Nanoscience and nanotechnology (NST) are considered to be at the forefront of modern research and are acknowledged as the revolution of the 21st century (Sebastian & Gimenez, 2016). While the terms nanoscience and nanotechnology are often used interchangeably on the World Wide Web, there are distinct differences between these concepts (Ng, 2009). Nanoscience involves the manipulation of materials at the atomic and molecular scales, bringing together the fields of biology, physics, and materials science (Bayda et al., 2020). On the other hand, nanotechnology encompasses a set of technologies that enable the manipulation, control, and design of matter on the nanoscale to develop new products or applications or enhance the capabilities of existing products and applications (Baalousha et al., 2014).

The interdisciplinary nature of nanotechnology, encompassing various disciplines such as physics, chemistry, biology, pharmacy, and materials science, is a distinctive feature of the innovations in this field (Manjunatha et al., 2016; Singh, 2017). According to some, nanotechnology, which represents a new era in social transformation, has started to be used in many products and production steps with its various properties such as conductivity, hardness, softness and durability (Güzeloğlu, 2015 & Murty, 2013). Research and innovations in this field are leading breakthroughs in areas such as nanomaterials and manufacturing, medicine and healthcare services, nanoelectronics, information technology, national security, energy, biotechnology, aerospace and space, the food sector, cosmetic products, textiles, and agriculture (Bhushan 2015; Erkoç 2012; Singh 2017; The Royal Society & The Royal Academy of Engineering, 2004; Yakar, 2018). Nanotechnology is considered one of the most important technologies of today, thanks to its ability to impart significantly different new properties to materials among the developed technologies (Güzeloğlu, 2015).

The emerging technologies involve an understanding and research on how the fundamental ideas of nanotechnology can be taught (İpek et al., 2020). Despite scientists having conducted research at the nanoscale for many years, the development of new tools and techniques has led to interdisciplinary advancements defining this field (Jones et al., 2013). These developments, which enable us to understand the world at the nanoscale, hold significant potential to engage and excite scientists, educators, students, and the public (Newberry, 2012). Possessing specific knowledge, skills, and abilities in nanotechnology is synonymous with having nanotechnology itself. The realization of this depends on how well individuals have been educated in this field and how effectively they can utilize their skills (Ekli, 2010). In this regard, nanotechnology represents both a need and an opportunity for the transformation of our education system (Roco & Bainbridge, 2005). Consequently, schools, universities, and science centers providing education in the field of nanoscience and nanotechnology have begun to develop and test new courses and curricula with different approaches (Jones et al., 2015).

Advancements and innovations in science are rapidly progressing. In this context, it is important for research in science education to keep pace with these developments to shape effective educational practices (Jones et al., 2013). Nanotechnology, being a multidisciplinary field, is actively used in science education. Science education serves as an effective tool for students to enthusiastically learn about emerging technologies such as nanotechnology (Ekli & Şahin, 2010). Introducing students to some interesting concepts related to nanotechnology is important to capture their interest and attention (Lan, 2012). By integrating nanoscale phenomena into science education initially, adapting the education to technology, science, social sciences, and humanities is believed to be possible (Roco & Bainbridge, 2005). Considering that the science curriculum aims to develop individuals as scientifically literate (Republic of Türkiye Ministry of National Education, 2018), there is a connection between nanotechnology and science education (Şenel-Zor, 2017). As a new technology, incorporating nanotechnology into formal education where students can learn about new advanced technology will be an incentive for transformation (Ghattas, 2015). To harness the benefits of nanotechnology, it is necessary to educate individuals with the required expertise and transfer the knowledge base to future

generations (Ekli & Şahin, 2010). Teacher training should be a significant goal to successfully implement nanotechnology education (İpek et al., 2020).

The ultimate goal in the professional development of teachers is to impact students' learning. Therefore, it is crucial to examine what teachers actually do with the new knowledge in nanotechnology concerning what students learn (Jones et al., 2013). This is because, in today's world, it is widely accepted that real power comes not from physical strength but from intellectual strength. The first step to embracing the era of nanotechnology is to educate future teachers in this field (Ekli & Şahin, 2010). Training for educators is essential to advance nanotechnology education. Educators encourage excitement and creativity by providing technical content. To cultivate a skilled workforce in the growing field of nanotechnology, it is necessary to attract and educate students. Therefore, providing education with suitable and sufficient educators becomes imperative (Winkelmann & Bhushan, 2017). Additionally, teachers should know every aspect (applications, potential risks arising from applications, benefits, importance, etc.) of nanotechnology. This is because information acquired about one dimension of nanotechnology can influence people's attitudes toward nanotechnology (Ekli & Şahin, 2010).

Attitudes have been a fundamental topic in social psychology for many years due to their influence on both our social perceptions and behaviors (Kağıtçıbaşı & Cemalcılar, 2014). Attitude is a way of evaluating things we like and dislike, feel close to or detest, and our relationship with our surroundings (Zimbardo & Leippe, 1991). It is believed to guide individuals in adapting to their surroundings, facilitate their adjustment, and also have an impact on directing their behaviors (Tufan & Güdek, 2008). In recent years, discussions about interactions between science and society increasingly emphasize the importance of public acceptance and response to emerging technologies (Burri & Bellucci, 2008). Determining the public's attitude toward nanotechnology and identifying the sources of this attitude are crucial for both shaping nanotechnology policies and the global development of nanotechnology (Zhang et al., 2015). The future position of nanotechnology will be determined by society's attitude toward it (Roco & Bainbridge, 2001). Therefore, measuring attitudes toward nanotechnology is considered crucial to fully harness its potential (Şenel-Zor & Kan, 2021). In the field of education, traditional thinking is the direct influence of knowledge on the learner's attitude and the conversion of this attitude into behavior (Chien-Yun et al., 2012). Therefore, it is important, especially for science teachers and preservice science teachers, to determine their attitudes toward nanotechnology. In this respect, using appropriate tools to determine attitudes towards nanotechnology and providing the necessary support for the development of these attitudes after obtaining the results is important (Şenel-Zor & Kan, 2021).

Studies on attitudes toward nanotechnology in the literature have been reviewed. In this context, research has been conducted on the attitudes toward nanotechnology of the general public (Chen et al., 2013; Fischer et al., 2012; Lee et al., 2005; Macoubrie, 2006; Scheufele et al., 2008), social scientists (Khalid et al., 2016), middle school students (Ekli, 2010), high school students (Kim et al., 2011), undergraduate students (Nerlich et al., 2007), preservice teachers (Şenel-Zor et al., 2019; Şenel-Zor & Kan, 2018), science teachers (Kim & Hong, 2010), and students and teachers (Much et al., 2019). It has been observed that many studies conducted in recent years have focused on the attitudes toward nanotechnology. As a result of these studies, it is evident that there are positive attitudes toward nanotechnology (Ekli, 2010; Kim & Hong, 2010; Kim et al., 2011; Macoubrie, 2006; Şenel-Zor et al., 2019). While the majority of studies in the literature focus on the attitudes of the general public toward nanotechnology, research on the attitudes of students and preservice teachers toward nanotechnology is relatively limited.

Teachers' attitudes toward nanotechnology and the integration of related content, materials, and activities into science classrooms can significantly influence their behaviors in implementing these practices in science classrooms (Ghattas, 2015). Competencies such as teachers' knowledge level about

emerging technologies will have an impact on students' attitudes. It is crucial for preservice science teachers to have a sufficient level of knowledge about nanotechnology and be able to integrate nanotechnology into science subjects to foster a positive attitude towards nanotechnology in students. Research on the attitudes of preservice science teachers toward nanotechnology and its implementation in school curricula, one of today's technologies, is limited. It is believed that this study will contribute to the literature by determining the attitudes of preservice science teachers toward nanotechnology, understanding nanotechnology comprehensively, determining its future role, and adapting to the nanotechnology era.

This research aims to determine the attitudes of preservice science teachers toward nanotechnology and to examine them based on variables such as gender, grade level, and academic achievement. The following research questions were addressed in line with the stated aim:

1. What are the attitudes of preservice science teachers (1st, 2nd, 3rd, and 4th grades) toward nanotechnology?

2. Is there a difference in the attitudes of preservice science teachers toward nanotechnology based on gender?

3. Is there a difference in the attitudes of preservice science teachers toward nanotechnology based on grade level?

4. Is there a difference in the attitudes of preservice science teachers toward nanotechnology based on academic achievement level?

METHOD

Research Design

In this study, the cross-sectional survey method, a quantitative research method, was employed as one of the quantitative research methods. Survey research is a research method that determines the opinions or characteristics such as interest, attitude, skill, and ability of participants related to an event or subject and allows research on larger samples compared to other types of research. Cross-sectional survey research describes a method in which variables are measured at a single point in time, the sample is large, and the research includes diverse groups (Büyüköztürk et al., 2018). In cross-sectional research, information is collected at one time from a pre-determined population (Fraenkel & Wallen, 2009). In this research, quantitative data were analyzed using the "Attitude Towards Nanotechnology Scale" (ATNS) to determine the existing attitudes of preservice science teachers towards nanotechnology.

Research Sample

The population of this study consists of preservice teachers studying in the Department of Science Teaching in Turkey. Since the population is located in a very large geography, easier access to preservice teachers and time were effective in determining the sample. In this study, convenience sampling, one of the non-random sampling methods, was used. Convenience sampling is the selection of a group of individuals who are suitable for a research (Fraenkel & Wallen, 2009). Accordingly, the sample of the study consisted of 3rd and 4th grade students who took the "Applications of Science in Technology" course, which is one of the courses of the Department of Science Teaching and includes topics such as semiconductor technologies and nanotechnology, and 1st and 2nd grade students who did not take this course. Thus, a total of 199 pre-service teachers (170 female, 29 male), including 57 pre-service teachers from the 4th grade, 71 pre-service teachers from the 3rd grade, 47 pre-service teachers from the 2nd grade, and 24 pre-service teachers from the 1st grade, were included in the data analysis process.

Research Instruments and Processes

The Nanotechnology Attitude Scale for Preservice Science Teachers was used in this study to collect data for the examination of preservice science teachers' attitudes toward nanotechnology based on various variables. The scale, developed by Şenel-Zor and Kan (2018, 2021) and subjected to validity and reliability analyses, consists of a total of 24 items prepared on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The highest possible score that can be obtained from the scale is 120, while the lowest is 24. An increasing score on the scale implies a higher attitude toward nanotechnology. The scale comprises three factors: the positive component (items 5, 14, 16, 17, 19, 20, 22, 23, 24), the utility component (items 1, 2, 4, 6, 8, 10, 12, 15, 18), and the negative component (items 3, 7, 9, 11, 13, 21). In their studies, Şenel-Zor and Kan (2018, 2021) conducted a reliability analysis to demonstrate the reliability of the scale. The Cronbach's alpha (Cr-α) reliability coefficient of the scale was found to be 0.926, while the reliability coefficients for each factor were determined as 0.889, 0.892, and 0.813, respectively. In the present study, the reliability analysis conducted on preservice science teachers yielded a Cronbach's alpha (Cr-α) reliability coefficient of 0.90 for the overall scale, and for each factor, the reliability coefficients were 0.859, 0.883, and 0.789, respectively.

Data Analysis

The data obtained using the ATNS were analyzed through descriptive and inferential statistical methods using the SPSS 21 program to determine the attitudes of the preservice science teachers towards nanotechnology. Descriptive analysis involved examining the mean (M) and standard deviation (SD) scores, while inferential analysis employed parametric tests such as Independent Samples t-test and One-Way Analysis of Variance (ANOVA) tests based on the fulfillment of assumptions.

The arithmetic means of the items were interpreted using the coefficient of variation. The coefficient of variation can be calculated by dividing the difference between the highest and lowest measurements by the number of groups determined by the researcher (Büyüköztürk et al., 2012). Since the scale used in the study is a 5-point Likert scale, the number of groups was set to 5. Accordingly, the coefficient of variation in this study was determined as $\alpha = (5-1)/5 = 0.80$. Based on this coefficient of variation, the grouping was interpreted as follows: average values between 1.00-1.80 were considered as "Strongly Disagree," values between 1.81-2.60 as "Disagree," values between 2.61-3.40 as "Undecided," values between 3.41-4.20 as "Agree," and values between 4.21-5.00 as "Strongly Agree."

Before conducting inferential analyses to determine whether the total scores obtained from the attitude scale and the scores obtained from the sub-dimensions of the scale differed by gender, grade level, and academic achievement level, it was examined whether the scores met the assumption of normal distribution. Skewness and kurtosis coefficients were examined to determine whether the scores met the assumption of normal distribution. To ensure a normal distribution of the scores, the accepted value for the skewness coefficient should be less than 3, and the kurtosis coefficient should be less than 10 (Kline, 2005). In the study, the skewness coefficients of the variables ranged from -2.137 to 0.345, and the kurtosis coefficients ranged from -0.051 to 7.983. In cases where the distributions were homogeneous, parametric tests, specifically independent t-tests and one-way analysis of variance (ANOVA), were utilized for analysis, and the results were interpreted based on a significance level of p=0.05.

Ethic

Ethical principles (Miles & Huberman, 1994) were taken into consideration throughout the study. A consent form was presented to the preservice science teachers, assuring them that their participation was voluntary and that they could freely terminate their participation at any point in the study.

FINDINGS

In this section, the data obtained through the ATNS for Preservice Science Teachers were analyzed to examine preservice science teachers' attitudes toward nanotechnology concerning variables such as gender, grade level, and academic achievement level. The findings resulting from the analysis

of these data are presented below.

Findings Regarding the Attitudes of Preservice Science Teachers Towards Nanotechnology

According to the results of the descriptive statistics obtained from the ATNS applied to determine the attitudes of preservice teachers towards nanotechnology, it is seen that preservice teachers have an average attitude score of (M=3.78) in the whole scale.

As the scores obtained from ATNS increase, preservice science teachers' scores related to nanotechnology also increase. The scores obtained from this scale range from 24 to 120. This range is divided into three equal parts, where individuals scoring between 24-55 are categorized as having a "low" level of attitude, those scoring between 56-87 are categorized as having a "moderate" level, and those scoring between 88-120 are categorized as having a "high" level of attitude. The attitude levels of preservice science teachers participating in the research based on the total scores they obtained related to nanotechnology are presented in Table 1.

Table 1. *Distribution level of total attitude scores of preservice science teachers participating in the research*

Attitude Level	N	%
Low (24-55)	1	0.50
Medium (56-87)	74	37.19
High (88-120)	124	62.31
Total	199	100

According to Table 1, it is observed that 62.31% (N=124) of preservice science teachers have a "high" level of attitude towards nanotechnology. It is determined that 37.19% of preservice science teachers (N=74) show a "medium" level of attitude, and 0.50% (N=1) exhibit a "low" level of attitude.

Findings on Preservice Science Teachers' Attitudes Towards Nanotechnology Based on Gender Variable

Descriptive statistics results on the attitude levels towards nanotechnology based on the gender of preservice science teachers are presented in Table 2.

Table 2. *Descriptive statistics results on the mean scores of preservice science teachers' attitude towards nanotechnology, obtained from the sub-dimensions of ATNS, according to gender*

Factor	Gender	N	M	SD
Positive	Female	170	29.67	5.81
	Male	29	32.31	5.83
Benefit	Female	170	37.41	4.93
	Male	29	37.79	5.70
Negative	Female	170	24.21	3.54
	Male	29	24.59	4.79
Total	Female	170	90.23	10.77
	Male	29	93.51	11.12

As seen in Table 2, the average scores obtained by female preservice science teachers in the positive sub-dimension (M=29.67), benefit sub-dimension (M=37.41), and negative sub-dimension (M=24.21) of ATNS are lower than the scores obtained by male preservice science teachers in the positive sub-dimension (M=32.31), benefit sub-dimension (M=37.79), and negative sub-dimension (M=24.59) of the scale. Additionally, when the total attitude scores are examined, it is observed that the average scores of female preservice science teachers (M=90.23) are lower than the average scores of male preservice science teachers (M=93.51).

A parametric independent t-test was conducted to determine whether there is a significant difference in the attitudes towards nanotechnology, as measured by the ATNS, among science preservice science teachers based on the gender variable. The obtained results are presented in Table 3.

Table 3. *T-test results for the relationship between the sub-dimensions of ATNS and total attitude scores of preservice science teachers based on gender*

Factor	Gender	N	M	SD	df	t	p
Positive	Female	170	29.67	5.81	197	-2.256	.025
	Male	29	32.31	5.83			
Benefit	Female	170	37.41	4.93	197	-.382	.703
	Male	29	37.79	5.70			
Negative	Female	170	24.21	3.54	197	-.498	.619
	Male	29	24.59	4.79			
Total	Female	170	91.21	11.63	197	-1.510	.133
	Male	29	94.76	12.02			

According to Table 3, there is a significant difference in the average attitude scores of preservice science teachers based on gender in favor of male preservice science teachers (M=32.31; SD=5.83) compared to female preservice science teachers (M=29.67; SD=5.81) in the positive sub-dimension of ATNS [t(197)=-2.256, p <0.05]. However, there is no significant difference between female preservice science teachers (M=37.41; SD=4.93) and preservice science teachers (M=37.79; SD=5.70) in the benefit sub-dimension of ATNS [t(197)=-0.382, p>0.05]. Likewise, there is no significant difference between female preservice science teachers (M=24.21; SD=3.54) and male preservice science teachers (M=24.59; SD=4.79) in the negative sub-dimension of ATNS [t(197)=-0.498, p>0.05]. Additionally, there is no significant difference in the average total attitude scores between female preservice science teachers (M=91.21; SD=11.63) and male preservice science teachers (M=94.76; SD=12.02) [t(197)=-1.510, p>0.05] based on the scores obtained from ATNS.

Findings Regarding the Attitude Towards Nanotechnology Among Preservice Science Teachers Based on the Grade Level Variable

Descriptive statistical results of preservice science teachers' attitude levels towards nanotechnology according to grade levels are provided in Table 4.

Table 4. *Descriptive statistical results of the average scores obtained by preservice science teachers in the sub-dimensions and total attitude scores of ATNS according to the grade level variable test*

Factor	Grade Level	N	M	SD
Positive	1st Grade	24	29.41	5.65
	2nd Grade	47	28.51	6.13
	3rd Grade	71	31.70	5.25
	4th Grade	57	29.56	6.12
Benefit	1st Grade	24	38.17	4.32
	2nd Grade	47	36.74	4.41
	3rd Grade	71	37.51	6.45
	4th Grade	57	37.70	3.66
Negative	1st Grade	24	23.46	4.02
	2nd Grade	47	24.28	2.71
	3rd Grade	71	24.45	4.60
	4th Grade	57	24.37	3.14
Total	1st Grade	24	90.63	9.79
	2nd Grade	47	89.02	9.17
	3rd Grade	71	92.20	12.71
	4th Grade	57	90.30	10.05

As seen in Table 4, the average scores obtained by preservice science teachers from ATNS vary. When the sub-dimensions of the attitude scale are examined, in the positive sub-dimension, preservice science teachers in the 3rd grade (M=31.70) have the highest average score, while those in the 2nd grade (M=28.51) have the lowest average score. In the benefit sub-dimension, preservice science teachers in the 1st grade (M=38.17) have the highest average score, while those in the 2nd grade (M=36.74) have the lowest average score. In the negative sub-dimension, preservice science teachers in the 3rd grade (M=24.45) have the highest average score, while those in the 1st grade (M=23.46) have

the lowest average score. When the average of the total scores obtained from the attitude scale is examined, preservice science teachers in the 3rd grade (M=92.20) have the highest average score, while those in the 2nd grade (M=89.02) have the lowest average score.

A one-way analysis of variance (ANOVA), a parametric test, was conducted to determine whether there is a significant difference in the average scores obtained by preservice science teachers in the sub-dimensions and total attitude scores of ATNS based on the grade level variable. The results obtained are presented in Table 5.

Table 5. *One-way analysis of variance (ANOVA) test results for the average scores obtained by preservice science teachers in the sub-dimensions and total attitude scores of ATNS according to the grade level variable*

Factor	Source of Variation	Sum of Squares	Mean Squares	df	F	p	η^2	Mean Difference
Positive	Between Groups	328.875	109.625	3	3.3	.022	.048	2-3
	Within Groups	6492.402	33.294	195				
	Total	6821.276		198				
Benefit	Between Groups	39.522	13.174	3	.516	.672	.008	
	Within Groups	4979.946	25.538	195				
	Total	5019.467		198				
Negative	Between Groups	18.681	6.227	3	.442	.723	.007	
	Within Groups	2746.203	14.083	195				
	Total	2764.884		198				
Total	Between Groups	300.900	100.300	3	.849	.469	.013	
	Within Groups	23035.773	118.132	195				
	Total	23336.673		198				

According to Table 5, there is a significant difference in the average attitude scores obtained by preservice science teachers in the positive sub-dimension of ATNS based on the grade level variable (F=3.293; p<0.05). To determine which groups exhibit significant differences, post hoc test comparisons using Tukey results indicate that preservice science teachers in the 3rd grade (M=31.70; SD=5.25) have a significantly higher attitude towards nanotechnology compared to those in the 2nd grade (M=28.51; SD=6.13). There is no significant difference in the average attitude scores obtained by preservice science teachers in the benefit sub-dimension of ATNS based on the grade level variable (F=0.516; p>0.05). There is no significant difference in the average attitude scores obtained by preservice science teachers in the negative sub-dimension of ATNS based on the grade level variable (F=0.442; p>0.05). Additionally, there is no significant difference in the average attitude scores obtained by preservice science teachers based on the grade level variable in terms of the total attitude scores from ATNS (F=0.849; p>0.05).

Findings Regarding the Attitude Towards Nanotechnology Among Preservice Science Teachers Based on the Variable of Academic Achievement Level

The descriptive statistical results regarding the attitude levels towards nanotechnology based on the academic achievement levels of preservice science teachers are provided in Table 6.

Table 6. *Descriptive statistical results of the average scores obtained by preservice science teachers in the sub-dimensions and total attitude scores of ATNS according to the variable of academic achievement level*

Factor	Achievement Level	N	M	SD
Positive	High	98	30.32	5.79
	Low	101	29.81	5.97
Benefit	High	98	38.10	4.41
	Low	101	36.84	5.52
Negative	High	98	24.89	3.62
	Low	101	23.66	3.76
Total	High	98	91.73	10.94
	Low	101	89.72	10.72

As seen in Table 6, preservice science teachers with high academic achievement levels have higher average scores in the positive sub-dimension (M=30.32), benefit sub-dimension (M=38.10), and negative sub-dimension (M=24.89) of ATNS compared to preservice science teachers with low academic achievement levels, who obtained average scores of (M=29.81), (M=36.84), and (M=23.66) in the positive, benefit, and negative sub-dimensions, respectively. Additionally, when total scores are examined, it is observed that preservice science teachers with high academic achievement levels have higher average scores (M=91.73) compared to the average scores of preservice science teachers with low academic achievement levels (M=89.72).

Parametric tests, specifically independent samples t-tests, were conducted to determine whether there is a significant difference in the average scores obtained by preservice science teachers in the sub-dimensions and total attitude scores of ATNS based on the variable academic achievement level. The obtained results are presented in Table 7.

Table 7. *Independent samples t-Test results for the sub-dimensions of ATNS and the total attitude score according to the variable of academic achievement level of preservice science teachers*

Factor	Achievement Level	N	M	SD	df	t	p
Positive	High	98	30.32	5.79	197	-.605	.546
	Low	101	29.81	5.97			
Benefit	High	98	38.10	4.41	197	-1.775	.077
	Low	101	36.84	5.52			
Negative	High	98	24.89	3.62	197	-2.337	.020
	Low	101	23.66	3.76			
Total	High	98	91.73	10.94	197	-1.309	.192
	Low	101	89.72	10.72			

According to Table 7, there is a significant difference in the average attitude scores of preservice science teachers in the negative sub-dimension of ATNS based on the variable academic achievement level. Preservice science teachers with high academic achievement levels (M=24.89; SD=3.62) have significantly higher average attitude scores than those with low academic achievement levels (M=23.66; SD=3.76) [t(197)=-2.337, p<0.05]. In contrast, there is no significant difference in the average attitude scores obtained by preservice science teachers in the positive sub-dimension of ATNS based on the variable academic achievement level. Preservice science teachers with high academic achievement levels (M=30.32; SD=5.79) and those with low academic achievement levels (M=29.81; SD=5.97) have similar average attitude scores [t(197)=-0.605, p>0.05]. Similarly, there is no significant difference in the average attitude scores obtained by preservice science teachers in the benefit sub-dimension of ATNS based on the variable academic achievement level. Preservice science teachers with high academic achievement levels (M=38.10; SD=4.41) and those with low academic achievement levels (M=36.84; SD=5.52) have similar average attitude scores [t(197)=-1.775, p>0.05]. Additionally, there is no significant difference in the total attitude scores obtained from ATNS based on the variable of academic achievement level. Preservice science teachers with high academic achievement levels (M=91.73; SD=10.94) and those with low academic achievement levels (M=89.72; SD=10.72) have similar total attitude scores [t(197)=-1.309, p>0.05].

DISCUSSION AND CONCLUSION

Discussion and Conclusion on the Attitude Towards Nanotechnology Among Preservice Science Teachers

The average attitude scores of preservice science teachers towards nanotechnology in all dimensions were found to be M=3.78 using the ATNS. Furthermore, the majority of sci preservice science teachers exhibit attitudes towards nanotechnology at the level of 'Agree/Strongly Agree.' This result aligns with similar findings in the literature (Khalid et al., 2016; Kim & Hong, 2010; Kim et al., 2011; Macoubrie, 2006; Şenel-Zor et al., 2019). When examining the literature, attitudes towards

nanotechnology have been associated with perceptions of nano concepts, knowledge, exposure, and the perception of benefits and risks of nanotechnology. Ghattas (2015) emphasized that the attitudes of science teachers towards the implementation of nanotechnology in science classrooms are influenced by various factors such as lack of knowledge, self-confidence, social influences, school and student type, personal perspective, and time and resource constraints. The literature suggests that science teachers have a positive attitude and diverse perspectives on the benefits and risks of nanotechnology (Kim & Hong, 2010), there is a positive relationship between students' knowledge levels and their attitudes toward nanotechnology (Ekli, 2010; Kim, 2011), there is a positive relationship between academic career and attitudes towards nanotechnology (Khalid et al., 2016), and attitudes towards nanotechnology are associated with trust in scientists (Lee et al., 2005).

When examining the studies in the literature, it is observed that the attitude toward nanotechnology is associated with sensations. These sensations are most commonly obtained from various media sources such as TV, radio, and the Internet (Ekli, 2010; Kim & Hong, 2010; Kim et al., 2011). However, it has been found that students trust their teachers and nanotechnology researchers the most (Kim et al., 2011).

In ATNS, it is observed that the majority of preservice science teachers encounter nanotechnology through TV, news, or advertisements, and their attitudes toward nanotechnology are at a high level. There are studies related to the coverage of nanoscience and nanotechnology in national newspapers published in Turkey (Çalık et al., 2021; Kamanlıoğlu & Güzeloğlu, 2010; Şenocak, 2017). These studies found an increase in the number of nanotechnology-related news over the years, with the content of the news mostly focusing on scientific discoveries and commercial applications of nanotechnology. The content of the news also showed a positive approach. In this context, the increasing numbers of nanoscience and nanotechnology-related news in newspapers in our country over the years may be associated with preservice science teachers encountering nanoscience and nanotechnology more frequently, leading to an increase in their attitudes towards nanotechnology.

The average scores obtained by preservice science teachers in the benefit sub-dimension of ATNS, which includes the benefits of nanotechnology for daily life and society (M=4.16), were found to be higher than the overall average scores from the scale (M=3.78). It is concluded that there is a relationship between attitudes toward nanotechnology and attempting to perceive the benefits and risks of nanotechnology (Chen et al., 2013; Ekli, 2010; Fischer et al., 2012; Kim & Hong, 2010; Kim et al., 2011; Nerlich et al., 2007). Considering that encountering nanotechnology mostly occurs through media such as TV, news, or advertisements, the extent to which the media addresses the benefits and risks of nanotechnology becomes significant. The focus of preservice science teachers in the current study on the beneficial aspects of nanotechnology may be associated with encountering the benefits of nanotechnology more frequently in the media, while exposure to its risks is relatively rare.

Discussion and Conclusion on the Attitude Towards Nanotechnology Based on the Gender Variable of Preservice Science Teachers

When examining the attitudes towards nanotechnology based on the gender variable of preservice science teachers, it is observed that although male preservice science teachers have higher average scores from ATNS compared to female preservice science teachers, there is no significant difference between gender and attitudes towards nanotechnology in the negative and benefit sub-dimensions of the scale and in total attitude scores. However, a significant difference is found in favor of male preservice science teachers in the ATNS positive sub-dimension. When similar studies in the literature are examined, Senocak (2014) concluded that there was a significant difference between familiarity with nanotechnology and gender in favor of males. Similarly, Ekli (2010) found a significant difference in favor of males between the basic knowledge and views of elementary school second level students towards nanotechnology according to gender, while a significant difference was found in favor of male students in students' attitudes towards technology. On the other hand, Şenel-Zor et al. (2019) aimed to

examine the attitudes of preservice physics, chemistry, biology and science teachers towards nanotechnology according to various variables and found that there was no significant difference between the average attitude scores of preservice teachers according to gender.

When examining attitudes towards nanotechnology based on gender, it was determined that male preservice science teachers have higher attitudes towards nanotechnology compared to female preservice science teachers. Chang et al., (2009), in their studies examining students' attitudes towards technology, attributed differences in attitudes towards technology and gender to psychological and identity factors, social factors, curriculum, pedagogy and school factors, and career factors. In this context, differences in attitudes towards technology based on gender can arise due to variations in the knowledge levels that male and female students have about technology, as well as the greater interest that males show in new technological topics compared to females (Fang et al., 2007). In the study by Ekli (2010), it was found that male students exhibit an interest in technology in their daily lives, find technology more appealing and interesting, and express a desire to pursue careers in this field. On the other hand, it was observed that female students do not have a strong inclination towards pursuing careers in the field of technology. In this study, the higher attitudes of male preservice science teachers towards nanotechnology may be associated with greater interest and inclination towards nanotechnology, which is one of today's technologies, among male preservice science teachers.

Discussion and Conclusion on the Attitude Towards Nanotechnology Based on the Grade Level Variable of Preservice Science Teachers

When examining the attitudes of preservice science teachers towards nanotechnology according to the grade level variable, it was observed that preservice science teachers in the 3rd grade had the highest average scores on the ATNS, while those in the 2nd grade had the lowest average scores. Additionally, there was no significant difference in the attitudes towards nanotechnology between grade levels in terms of ATNS negative and benefit sub-dimensions, as well as total attitude scores. However, it was found that in the ATNS positive sub-dimension, preservice science teachers in the 3rd grade had a higher attitude towards nanotechnology compared to those in the 2nd grade. This difference may be attributed to the elective courses that preservice science teachers prefer at their respective grade levels. The fact that topics such as semiconductor technologies, nanotechnology and different physical sensors are covered in the "Applications of Science in Technology" course, which is one of the field education elective courses taught in the 3rd grade of the Science Teacher Education Department, may be associated with the fact that the 3rd grade pre-service teachers have higher attitudes towards nanotechnology. This could explain why 3rd-grade preservice science teachers have a higher attitude towards nanotechnology. The results suggest a potential influence of the content of elective courses on the attitudes of preservice science teachers toward nanotechnology.

Discussion and Conclusion Regarding Preservice Science Teachers' Attitudes Towards Nanotechnology Based on Academic Achievement Level

When examining the attitudes of preservice science teachers towards nanotechnology based on the variable of academic achievement level, it is observed that preservice science teachers with high academic achievement have higher total scores on ATNS than those with low academic achievement. Additionally, there is no significant difference in the positive and benefit sub-dimensions, as well as total attitude scores of ATNS based on academic achievement level. However, a significant difference in favor of preservice science teachers with high academic achievement is found in the negative sub-dimension of ATNS.

Similar to the literature, academic achievement in the field of science has been shown to influence the development of preservice science teachers' attitudes toward nanotechnology (Kim et al., 2011; Şenel-Zor et al., 2019), the positive opinions of students towards nanotechnology (Ekli, 2010), and the positive development of students' cognitive awareness (Emrahoğlu & Öztürk, 2010). The

literature suggests that increasing awareness of nanotechnology has a positive impact on the development of positive attitudes toward nanotechnology. Ahmed et al., (2015) found that the level of awareness of nanotechnology significantly increases with the increase in educational duration, and a higher level of awareness and higher education level has a positive effect on participants' attitudes towards nanotechnology. Furthermore, Şenel-Zor (2017) demonstrated in her study that activity-based nanoscience and nanotechnology education led to a positive increase in preservice science teachers' awareness of nanotechnology. In this context, there seems to be a connection between high academic achievement and the development of positive attitudes towards nanotechnology, as well as high awareness and opinions regarding nanotechnology.

As a result of the conducted study, it is observed that preservice science teachers have a high level of attitude towards nanotechnology. Considering that attitude towards nanotechnology is thought to be associated with the level of knowledge and sensation, it is seen that incorporating nanotechnology into school curricula from primary school onwards and giving more prominence to nanotechnology in media sources can enhance individuals' attitudes towards nanotechnology. Taking into account that the use of various technological materials increases positive attitudes towards technology (Ekli, 2010), it is also believed that early exposure to technology and a tendency towards technology positively influence the attitude towards nanotechnology.

RECOMMENDATIONS

In line with the findings of this study, recommendations are presented for researchers aiming to explore a similar topic and for educators in this field, highlighting the groups that could potentially be affected by the results and benefit from them.

In this study, only the attitudes of preservice science teachers towards nanotechnology were examined based on variables such as gender, grade level, and academic achievement level. In future studies in this field, the attitudes of preservice science teachers from other fields towards nanotechnology can be investigated, and a comparison can be made between the attitudes of preservice science teachers in science fields and those in various other fields.

Furthermore, while there are studies examining the attitudes of students and preservice teachers towards nanotechnology in our country, there is a lack of research specifically investigating the attitudes of teachers. The attitudes of teachers towards nanotechnology could be explored and compared based on variables such as subject area, educational background, age, gender, and the type of institution they work in (public or private).

It is believed that the attitudes of future science teachers who will train the next generation of nanotechnology experts will improve as their perceptions of the benefits and risks of nanotechnology are enhanced. At this point, media, as one of the sources of nanotechnology perception, can provide more coverage not only on the benefits but also on the risks of nanotechnology.

There is an interaction between the level of knowledge in the field of nanotechnology and attitudes toward nanotechnology. To enhance positive attitudes towards nanotechnology, knowledge gaps in the field of nanotechnology should be addressed, and national and international planning can be implemented to increase knowledge levels.

Since the benefits and risks of nanotechnological applications will be perceived more consciously with the increase in the level of knowledge towards nanotechnology, it can be thought that the attitude towards nanotechnology can reach a higher level. In this direction, it can be thought that increasing the knowledge level of preservice science teachers by including nanotechnology in science curricula may lead to an increase in attitudes towards nanotechnology. The studies aiming to identify the sources of attitudes towards nanotechnology in the literature are limited. A qualitative study is recommended to be conducted to identify the sources of attitudes towards nanotechnology for researchers working in this field.

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Investigation of Classroom Teachers' Technostress Levels in Terms of ICT Competence Perceptions and Various Variables

Fatih Saltan[1]   **Çetin Bozbey[2]**   **Fatih Bozyokuş[3]**

Sefa Koçak[4]   Muhammet Özdemir[5]

[1] Amasya University, Educational Faculty, Instructional Technology Department, Amasya, Türkiye
fsaltan@gmail.com

[2] National Ministry of Education, Erzurum, Türkiye
cetinbozbey@gmail.com

[3] National Ministry of Education, Erzurum, Türkiye
beratmeric15@hotmail.com

[4] National Ministry of Education, Erzurum, Türkiye
sefa617@hotmail.com

[5] National Ministry of Education, Erzurum, Türkiye
efesaid2535@outlook.com

Article Info	ABSTRACT
	Technostress refers to the negative psychological and physical effects of technology use (Brod, 1984; Shu, Tu, & Wang ,2011). The reasons for this include factors such as information overload and inability to cope with the pressure to stay up to date with technology. Undoubtedly, there is a strong relationship between technostress and technology use (Brod, 1984). This study aims to reveal the relationship between the levels of technostress that classroom teachers may have experienced and their perceptions of competence towards Information Communication Technologies (ICT). In addition, teachers' technostress levels and ICT efficacy perceptions were examined in terms of various descriptive variables. The study was conducted with the relational survey model, one of the quantitative research methods, and two scales and various descriptive questions were used. In the study, independent sample t-test, Mann-Whitney U test and one sample ANOVA were used to determine the difference between multi-group variables. Bivariate Pearson correlation analysis was applied to test the relationship. The results of the analysis showed that there was a statistically significant relationship between teachers' technostress levels and their perceptions of ICT efficacy ($r= 0.343$; $p<0.01$). Accordingly, it was determined that as teachers' perceptions of ICT competence increased, their technostress levels decreased significantly. In addition, it was shown that ICT efficacy perceptions did not create a statistically significant difference in terms of gender, grade taught, place of teaching and social media use. On the other hand, the analysis revealed that teachers' professional experience made a difference in terms of ICT perceptions.

INTRODUCTION

In this period, which is also called the age of technology, it is generally accepted that technology has significant effects on human behavior in many fields. Technology offers many determinants that affect the way individuals approach their work (Yu & Yu, 2010). Technostress refers to the negative psychological and physical effects resulting from the use of technology (Brod, 1984; Shu, Tu & Wang ,2011). Among the reasons for this are factors such as information overload and inability to cope with the pressure to stay up to date with technology. Technostress can manifest itself with symptoms such as anxiety, frustration, fatigue, and decreased productivity based on psychological pressure (Chiappetta, 2017; Nelson & Kletke, 1990). It can also lead to more serious problems such as burnout and digital addiction (Califf & Brooks, 2020). Managing technostress involves setting boundaries for technology use, practicing digital detox, and finding ways to reduce the impact of technology on daily life. Undoubtedly, there is a strong relationship between technostress and technology use (Brod, 1984). Over time, the concept of technostress has become more comprehensive and has been used to describe the psychological and emotional reasons for learning or using ICT technologies, which may prevent one from further learning or using the relevant technologies.

It has gained a broader meaning as a reflection of the individual's anxiety, fear, worry and distress that prevents him/her from using technology (Kıncı & Özgür, 2022). Technology use plays an important role in people's daily lives, including learning, and factors such as dependence on technology, constant connection, and information overload can lead to technostress (Hayta, 2007). With the use of technology, behaviors such as constantly checking e-mails, updating social media accounts, and constantly checking mobile applications may occur. For many people, this can create a sense of being constantly busy, feeling stressed and emotionally exhausted. In addition, the use of technology can also lead to information overload for many people. It increases the risk of experiencing information overload and the need to constantly keep up with incoming information such as emails, news, social media updates, etc. in order to learn new information. For these very reasons, there is a close relationship between technology use and technostress. Using technology correctly is important to reduce technostress (Califf & Brooks, 2020). In addition, it is important to individually set limits on technology use, take technological breaks from time to time, and implement strategies to reduce the negative effects of technology use.

Today, technostress has become a common problem among teachers (Madigan & Kim, 2021). Since teachers have to use technology in educational processes, they may be exposed to technostress intensively with the use of technology (Gökbulut & Dindaş, 2022). Factors such as being busy with technological devices, being exposed to information bombardment and the necessity to follow up continuously brought about by the use of technology wear teachers out in their professional lives (Burke, Greenglass & Schwarzer, 1996). This constant preoccupation can increase teachers' feelings of stress and burnout. Teachers can also deal with information overload resulting from the use of technology. As teachers take on the responsibility of providing information and content to their students, they may have to be constantly updated with new information and resources. This puts teachers under constant pressure to access and evaluate information. As a result, teachers can be considered as a group exposed to technostress. In order to reduce technostress, it is important for teachers to manage technology use properly, set limits on technology use, and implement strategies to reduce the negative effects of technology use (Çalışkan, 2022). In addition, it is emphasized that it is useful to provide in-service trainings for teachers on technology integration in online and distance education fields (Kıncı & Özgür, 2022).

Information and communication technologies (ICT) play a very important role in education. The use of ICT in education enables students to learn more effectively and teachers to teach and monitor students more efficiently. There are many different ways of using ICT in education. Although future teachers have many skills in these areas, it is a fact that they do not have enough comfort in using ICT

(Martinovic & Zhang, 2012). On the other hand, students can access information, study online resources and conduct research using technological tools such as the Internet, computer programs and digital devices. This makes it easier for students to access learning materials and helps them acquire knowledge from authentic sources. At the same time, educators can increase student engagement by using technology effectively in their classrooms. In this way, students can participate with more interest and motivation.

The use of technology in education is the use of technological tools and resources to improve the learning process and teaching methods. Nowadays, the importance of using technology in the field of education together with pedagogy and qualified up-to-date knowledge has increased (Saltan & Arslan, 2017). Understanding learners' behaviors, perceptions and their impact on learner performance is crucial for predicting their use of technological systems in education (Yu & Yu, 2010).

The use of online learning platforms comes in many different forms. Teachers can use tools such as presentation software, digital whiteboards, interactive games and online learning platforms to make lessons more effective and engaging. In this way, students can better understand the course material and participate with more motivation. Technology also offers students the opportunity for individualized learning in education. Using the Internet, students can access online resources, conduct research and learn from authentic sources. In addition, students can communicate and share ideas with other students on platforms such as online discussion forums or student communities. The benefits of using technology in education include a more interactive and collaborative learning environment. As a result, the use of technology in education improves the learning process, encourages students to actively participate and allows instructors to provide training more effectively. Technology expands the boundaries of education and enhances its lifelong dimensions. On the other hand, as technostress affects individuals working in many different sectors, it also negatively affects teachers working at all levels of the education sector (Chen, 2012; Effiyanti & Sagala, 2018). In his study, Gökbulut (2021) revealed a negative relationship between technostress and teaching profession field competencies. It is important to investigate the relationship between classroom teachers, who lay the most important foundations of formal education, and their perceptions of ICT competencies that they should use while performing their profession and their technostress levels in terms of other characteristics that define them. With this research, it is aimed to reveal the relationship between the technostress levels that classroom teachers may have experienced and their perceptions of competence towards Information and Communication Technologies. In addition, teachers' technostress levels and ICT efficacy perceptions were examined in terms of various descriptive variables. In line with this objective, answers to the following questions were sought in the study;

1. Classroom Teachers' Perceptions of ICT Competence; Differences in terms of gender, place of teaching, professional seniority, grade taught, age and social media and internet use does it show?

2. Technostress Levels of Classroom Teachers; Gender, place of teaching, professional seniority, grade taught, age and social media and internet usage does it show?

3. Is there a relationship between classroom teachers' technostress levels and their perceptions of ICT competence?

METHOD

The study employed a relational survey model, which is a quantitative research method. Relational survey models are methodologies for research that try to assess the existence and/or degree of change among two or more variables. Although correlational survey models do not provide a true cause-and-effect relationship, they allow for the prediction of the other variable if the situation in one variable is known. (Karasar, 2006)

Research Sample

In the study in which convenience sampling method was used, data were collected online from 190 teachers in the 2023-2024 academic year using Google Forms. Of the teachers participating in the study, 169 (52.3%) were male and 154 (47.7%) were female. Of the teachers who participated in the study, 201 (62.2%) were working in the center and 122 (37.8%) in the village.

Research Instruments and Processes

Two measurement tools and various descriptive questions were used in the study. The first scale is the "Scale for Determining Teachers' Technostress Levels" developed by Çoklar, Efilti, and Şahin (2017). The scale consists of 28 items of 5-point Likert-type questions and the internal consistency Cronbach's alpha coefficient for the scale was calculated as .917. The second scale is "Information and Communication Technologies (ICT) Competence Perception Scale" developed by Şad and Nalçacı (2015). The scale consists of 30 items of 5-point Likert-type questions and the internal consistency Cronbach's alpha coefficient for the scale was calculated as .960. In addition to these two scales, information on gender, place of teaching, professional seniority, grade, age and social media usage were collected through a form.

Data Analysis

The data were analyzed in two ways: descriptive and interpretive. SPSS 22.00 package program was used to analyze the data. Before analyzing the data, the assumptions necessary for conducting parametric tests were checked. To test the normality of the data, histograms and standardized Skewness and kurtosus values, as well as Kolmogorov-Smirnov tests were used. As a result of normality analyses, variables with normal distribution were reported as mean and standard deviation and variables without normal distribution were reported as median and IQR (inter Quartile range) in cases where serious violations were observed, taking into account the sample numbers in the groups. For two-group variables, differences between groups were investigated using the Independent sample t-test or Mann-Whitney U test, depending on normality. Differences between multigroup variables were tested with one-sample ANOVA. The significance value was set as $p < 0.05$ in statistical analyses. Bivariate Pearson correlation analysis was applied to test the relationship.

FINDINGS

The findings from the analysis of the data obtained are explained below depending on the research problems. But first, demographic information is summarised in Table 1. As can be seen, 47.7 per cent of the participants were female and 52.3 per cent were male teachers. The distribution according to working years is as follows: 22.9 percent for 0-5 years, 24.5 percent for 6-10 years, 25.1 percent for 11-20 years and 27.6 percent for more than 20 years. The classes taught by the primary school teachers participating in the study are distributed in similar proportions. 62.2 percent of the participants work in the city centre and 37.8 percent work in villages. All but 7.1 per cent of the participants use social media. The ICT competence perceptions of the participants were calculated as 3.9 out of 5. On the other hand, the average technostress levels were calculated as 2.37 out of 5.

Table 1. *Demographic data of the study*

Variables	N(%)
Gender	
Female	154 (47,7)
Male	169 (52,3)
Active classroom teaching	
0-5 years	74 (22,9)
6-10 years	79 (24,5)
11-20 years	81 (25,1)
20 years	89 (27,6)
Grade He/She teach	
1st grade	82 (25,4)

2nd grade	91 (28,2)
3rd grade	74 (22,9)
4th grade	76 (23,5)
Place of duty	
City Center	201 (62,2)
Village	122 (37,8)
Social media usage	
Use	300 (92,9)
Not use	23 (7,1)
ICT competence perceptions	3,90
Technostress Levels	2,37

How do ICT competence perceptions change according to independent variables?

In the study, it was examined how teachers' ICT competence perceptions were affected according to certain variables. Table 2 presents descriptive data and interpretation statistical findings for variables based on ICT proficiency.

Table 2. *Teachers' ICT competence perceptions*

Variables	N(%)	X	Sd	P	Post-hoc
Gender[1]				0,64 (-,46)	
Female	154 (47,7)	3,79	,67		
Male	169 (52,3)	3,75	,62		
Active classroom teaching[3]				**0,04 (4,51)***	**1>4**
0-5 years	74 (22,9)	3,91	,47		**2>4**
6-10 years	79 (24,5)	3,87	,63		
11-20 years	81 (25,1)	3,76	,66		
20 years	89 (27,6)	3,58	,72		
Grade He/She teach[3]				0,36 (1,06)	
1st grade	82 (25,4)	3,74	,59		
2nd grade	91 (28,2)	3,77	,68		
3rd grade	74 (22,9)	3,88	,56		
4th grade	76 (23,5)	3,70	,72		
Place of duty[4]				0,53 (-0,61)	
City Center	201 (62,2)	3,75	,67		
Village	122 (37,8)	3,80	,61		
Social media usage[1]				0,18 (1,38)	
Use	300 (92,9)	3,79	,61		
Not use	23 (7,1)	3,52	,92		
Daily Internet Usage[2]				**0,03 (2,84)***	**3>4**
Less than 1 hour	92(28,5)	3,69	,69		
v1-3 hours	162 (50,2)	3,80	,61		
3-5 hours	51 (15,8)	3,93	,58		
More than 5 hours	18 (5,6)	3,48	,78		
Age[2]	323 (100)	37,65	9,28	**0,01 (-0,18)***	

1, Man Whitney U-Test with Z Value; 2, Bivariate correlation with Perason Correlation value; 3, One-Way ANOVA with F Value; 4, Independent sample t-test with t value

As a result of the analyses, it was shown that ICT efficacy perceptions did not show a statistically significant difference in terms of gender, grade taught, place of teaching and social media use. On the other hand, the ANOVA analysis revealed that teachers' professional experience made a difference in terms of ICT perceptions. Accordingly, the duration of active classroom teaching is a determinant in

terms of ICT competency levels. Post-hoc analysis with Bonferoni correction was conducted to determine in which groups this significant difference occurred. The findings revealed that teachers with 20 or more years of experience (x=3.58; ss=0.72) had lower ICT averages than both teachers with 0-5 years of experience (x=3.91; ss=0.47) and teachers with 6-10 years of experience and this difference was statistically significant (p<0.05). Teachers' daily internet use was found to be a determinant of their perceptions of ICT competence. As a result of the ANOVA analysis, it was concluded that the hours of daily internet use had a significant effect on ICT levels, with a difference in at least one group $F(3,319)= 2.84$. Post-hoc analysis results with Bonferoni correction to determine in which groups the difference occurred, the mean values of the group that used the Internet between 3 and 5 hours (x=3.93 SD=0.58) were significantly higher than the group that used it for more than 5 hours (x=3.48 SD=0.78).

In the study, the relationship between age and ICT competence perception levels was analyzed by Bivariate correlation analysis and the results of the analysis revealed a statistically significant relationship (r=0.18; p<0.01). This finding indicated that there was a decrease in ICT efficacy perception levels with increasing age. However, depending on the Pearson correlation value obtained, the relationship between the two variables is at a low level.

How do teachers' technostress levels change according to independent variables?

It was also examined how teachers' technostress levels were affected according to certain variables. Table 3 summarizes the findings based on technostress levels.

Table 3. *Teachers' technostress levels and analysis*

Variables	N(%)	X	Sd	P	Post-hoc
Gender[1]				0,26 (-1,11)	
Female	154 (47,7)	2,33	,65		
Male	169 (52,3)	2,42	,71		
Active classroom teaching[2]				0,59 (0,64)	
0-5 years	74 (22,9)	2,46	,69		
6-10 years	79 (24,5)	2,32	,68		
11-20 years	81 (25,1)	2,36	,69		
20 years	89 (27,6)	2,36	,66		
Grade He/She teach[2]				**0,00 (5,52)***	**1>3**
1st grade	82 (25,4)	2,55	,71		**4>3**
2nd grade	91 (28,2)	2,32	,61		
3rd grade	74 (22,9)	2,15	,63		
4th grade	76 (23,5)	2,45	,71		
Place of duty[1]				0,86 (0,17)	
City Center	201 (62,2)	2,38	,63		
Village	122 (37,8)	2,36	,75		
Social media usage[1]				0,94 (-0,07)	
Use	300 (92,9)	2,37	,67		
Not use	23 (7,1)	2,38	,75		
Daily Internet Usage[2]				0,87 (2,21)	
Less than 1 hour	92(28,5)	2,38	,69		
v1-3 hours	162 (50,2)	2,38	,61		
3-5 hours	51 (15,8)	2,23	,58		
More than 5 hours	18 (5,6)	2,70	,78		
Age[3]	323 (100)	37,65	9,28	0,87 (0,00)	

1, Independent sample t-test with t value; 2, One-way ANOVA with F value; 3, Bivariate correlation with

Perason Correlation Value

Once different variables were considered in the analysis of the instructors' technostress levels, it was determined that there were no significant differences in technostress levels in terms of gender, duration of active classroom teaching, place of teaching, social media use and daily internet use. On the other hand, the differences in terms of the grade level are statistically significant (p<0.05). ANOVA analysis findings showed that technostress levels differed significantly in at least one of the 4 groups F(3,319)=5.25 p=0.002. Post-hoc analysis with Bonferonni correction was conducted to determine in which groups the difference occurred. The results showed that the technostaress levels of the teachers teaching 1st grade (x=2,55 SD=0,71) were higher and statistically significant (p<0,05) than those teaching 3rd grade (x=2,15 SD=0,63). Similarly, the technostress levels of the 4th grade teachers (x=2,45 SD=0,71) were higher and statistically significant than the 3rd grade teachers (p<0,05).

Is there a relationship between classroom teachers' technostress levels and their perceptions of ICT competence?

Bivariate Pearson correlation analysis was applied to determine the relationship between teachers' technostress levels and ICT competency perception levels. The results of the analysis showed that there was a negative and statistically significant relationship between the two variables below 0.01 significance level (r= 0.343; p<0.01). Accordingly, it was determined that technostress levels decreased significantly as teachers' ICT competency perception levels increased. The results are shown in table 4.

Table 4. *Descriptive data and correlation values for Technostress Levels and ICT levels*

Variables	X	Sd	1
Teknostress levels	2,77	,68	-
ICT competence perceptions	3,90	,64	-0,343(0,00)*

* p<0,01

DISCUSSION and CONCLUSION

Technostress experienced by teachers is a new concept that emerges as stress and burnout caused by the use of technology. However, the use of ICT in education has long been an issue that teachers have been encouraged to use, even as a government policy. With the increased use of ICT in education, the learning experience is expected to become more effective and efficient. On the other hand, this raises the question of how this affects the technostress experienced by teachers. In this study, the relationship between the levels of technostress that classroom teachers may have experienced and their perceptions of ICT competence was revealed, and teachers' technostress levels and ICT competence perceptions were examined in terms of various descriptive variables. It was shown that ICT efficacy perceptions did not show a statistically significant difference in terms of gender, grade taught, place of teaching and social media use. On the other hand, teachers' professional experience made a difference in terms of ICT perceptions, and it was found that teachers with 20 years of experience or more had lower ICT averages than both teachers with 0-5 years of experience and teachers with 6-10 years of experience, and this difference was statistically significant. In the study conducted by Dikmen, Akyıl, and Akçay (2021) with classroom teachers, it was found that while there was no significant difference in teachers' perceptions of ICT competence according to the gender variable; it was found that there was a significant difference according to the grade level taught, years of professional seniority, age variable, educational status and willingness to use technology in lessons. Similarly, in the study conducted by Akgün (2013) on internet technologies, it was found that the gender variable did not create a significant difference, while there was a significant difference between the variables of branch and frequency of internet use. On the contrary, Topal and Akgün (2013) show that male pre-service teachers have significantly higher selfefficacy perceptions of Internet use for educational purposes than female pre-service teachers. In the current study, the relationship between age variable and ICT efficacy perception levels was examined by correlation analysis and the results of the analysis revealed a statistically significant but low level relationship. As expected, a decrease in ICT efficacy perception levels was

observed with increasing age. Eryılmaz, Sarıçayır, and Yıldız (2020) found that there was no significant difference between ICT competence perception and gender, but there is a moderate relationship between internet addiction and internet addiction and the age variable also creates a significant difference. It was seen that there were no significant differences in the technostress levels of teachers in terms of gender, duration of active classroom teaching, place of teaching, social media use and daily internet use. It is seen that there are studies supporting these findings in the literature. When we consider gender, it is seen that technostress levels do not show a significant difference (Gökbulut, 2021). Similarly, Çoklar, Efilti, and Şahin (2019) determined that there was no significant difference between branch and technostress in their study. In the study conducted by Kıncı and Özgür (2022), the relationship between teachers' technostress levels and their education levels was examined and similarly, no significant difference was observed according to the education level. Akman and Durgun (2022) revealed the following results in their study; Accordingly, teachers' professional motivation levels do not differ according to gender and graduation field. However, it was determined that there is a relationship between teachers' professional motivation and technostress levels. On the other hand, the differences in terms of the class taught are statistically significant. The grade level of the teachers at the time of data collection is a determinant of their technostress levels. The 1st grade teachers' technostress levels were significantly higher and statistically significant than the 3rd grade teachers. Similarly, the technostress levels of teachers teaching 4th grade were higher and statistically significant than those teaching 3rd grade. The literature cites daily stress as the most important explanatory factor of technostress (Brod, 1984; Chiappetta, 2017; Shu, Tu, & Wang ,2011; Nelson & Kletke, 1990). In the context in which the study was conducted, classroom teachers work very hard to provide 1st grade students with very important skills such as reading-writing and school adaptation. In Grade 4, they make a similar effort to place them in qualified secondary schools where they will be placed according to their achievement status, and they have more difficulties and work result-oriented compared to other levels. Correlation analysis was performed to determine the relationship between teachers' technostress levels and ICT competence perception levels and a negative, statistically significant relationship was found at a moderate level. Accordingly, it was determined that as the ICT competence perception levels of teachers increased, their technostress levels decreased significantly.

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Examination of Science and Art Center Course Materials According to Maker Differentiation Principles

Hamza Kaynar[1] 🆔 **Ahmet Kurnaz[2]** 🆔 **Canan Şentürk Barışık[3]** 🆔

[1] Necmettin Erbakan University, Faculty of Education, Department of Special Education, Konya, Turkiye
hkaynar@erbakan.edu.tr

[2] Necmettin Erbakan University, Faculty of Education, Department of Special Education, Konya, Turkiye
akurnaz@erbakan.edu.tr

[3] Akşehir Bilim ve Sanat Merkezi, Konya, Turkiye
canansenturkbarisik@gmail.com

Article Info	ABSTRACT
	The main factor in the emergence of this research is that the current educational materials prepared for gifted students are not based on a theoretical basis, curriculum differentiation and models are not taken into consideration in the preparation of activities for gifted students, gifted education principles are not reflected in the curricula, and applications related to gifted students are not monitored and evaluated. This study aims to examine the activities included in the supplementary course materials prepared for Science and Technology in Science and Art Centers according to the Maker-Banks Differentiated Instruction Assessment Model. In line with the research objective, a total of 31 activities in the field of science and technology were examined for students included in the support education program prepared in 2022 by the Directorate General of Special Education and Guidance Services. The "Instruction Program Evaluation Form According to the Maker-Banks Model" was used as the data collection tool. It was concluded that the activities included in the supplementary course materials prepared for Science and Technology in Science and Art Centers do not meet the content and process conditions according to the Maker-Banks Differentiated Instruction Assessment Model. It was found that the activities met the conditions of economy, reasoning, teaching pace, openness, exploratory learning, higher-order thinking, real-life problems, and product evaluation. When new activities and materials are prepared for gifted students, the criteria that were weak in the Maker-Banks Model in this study can be strengthened. The qualities of the prepared activities can be evaluated according to the criteria in the Maker-Banks Model. It is believed that this study will pave the way for new studies by evaluating activities prepared for areas other than science and technology and for different grade levels according to the criteria in the Maker-Banks Model.

INTRODUCTION

When considering the cognitive, affective, and personal characteristics, needs, and potentials of gifted and talented children, it is evident that they require special education. Due to the fact that the current educational programs implemented in today's education system are prepared considering the learning characteristics and needs of typical students, the areas and subjects covered by the program do not meet the needs of gifted students. Therefore, gifted students may experience various disadvantages in a regular classroom environment if certain measures are not taken (Özbay, 2013). Currently, in Turkey, the only out-of-school support education model implemented for gifted students is the Science and Art Centers (BİLSEM) model. BİLSEM aims to respond to the needs of students with leadership spirit and creativity, to provide project-based learning through hands-on experience, and to integrate the social and emotional development of students into their education (Ministry of National Education [MEB], 2019). Academically, gifted students need to have a good general education; they need to be intellectually challenged and therefore motivated; and they need to be independent in their studies, thinking, and learning (Altıntaş & Özdemir, 2015; Lubinski & Benbow, 2006; Willey & Phillips, 2001; Tomlinson & Allan, 2000; Tomlinson, Brimijoin & Narvaez, 2008). Gifted students require challenging activities and content, differentiated lesson plans and programs, active learning processes, a learning environment with adequate physical infrastructure, and legal regulations to meet their needs (Davis, Rimm & Siegle, 2014). One of the strategies used to meet these needs is differentiation.

Changes made to meet students' different readiness levels, interests, and needs are explained by the term "differentiation" in the literature. The curriculum and teaching materials prepared for gifted students should adhere to the principles of differentiation used in gifted education. The main reason why regular curricula are inadequate for gifted students' education is the lack of challenge they provide, necessitating a different approach to their education from mainstream education. Adapting the curriculum to the learner's nature, i.e., differentiation, has long been an accepted approach in the education of gifted individuals (Tomlinson & Jarvis, 2000). At the core of differentiation lies the preparation of an educational program that addresses the needs of individuals in different learning domains by emphasizing their educational requirements and enhancing their learning capacity. For this purpose, teachers can resort to content, process, and product differentiation processes based on students' readiness levels, interests, and learning styles. The curriculum and instructional arrangements should be comprehensive in terms of gifted students' learning styles, interests, and readiness levels. Differentiation can be applied in all or some elements of the curriculum—content, process, and product—based on differences in readiness levels during the planning of the educational process. Similarly, the same practice can be applied based on differences in student interests and learning profiles. Before commencing instruction, it is essential to identify differences in individuals' learning styles, rates, interests, and readiness levels (Heacox, 2002). Various differentiated instructional strategies are observed for gifted individuals. The reason why a standard education and training program cannot be established for gifted individuals is that each of these individuals possesses different talents when their abilities are examined. Therefore, it is crucial to prepare individualized education programs for gifted individuals in a way that enhances their interests and talents (Van Tassel-Baska & Stambaugh, 2005). Enrichment models are generally implemented in every developed country today (Ataman, 1998). Gifted individuals need to conduct in-depth research on subjects they are interested in. This is because these individuals are highly skilled at making connections between topics and understanding the relationships between them. The instructional program implemented in the learning environment should be designed to meet the needs of gifted students while also addressing the needs of other individuals (Walker, Hafenstein & Enslow, 1999). One of the models applied for curriculum differentiation is the Maker Curriculum Differentiation Model. Maker (1982), known for his proposal for differentiated curriculum, has put forth a model bearing his name.

Maker Curriculum Differentiation Model discusses how the instructional program can be

differentiated into four main categories: content, product, process, and learning environment. The general purpose of these sub-dimensions is to ensure that the program is designed within specific guidelines and that the characteristics of gifted and talented individuals are taken into account during the design process. According to Maker (1982), both qualitative and quantitative differentiation of curriculum elements is necessary in the education of gifted students. Maker also argues that differentiated instruction should be provided to gifted students and elaborates on how this instruction can be differentiated into four different sub-dimensions in his work.

The content dimension of the instructional program encompasses the concepts, approaches, theories, ideas, and other types of knowledge intended to be acquired by students. Content can take various forms such as figurative forms like objects, shapes, pictures, and graphics; symbolic forms like letters, numbers, and mathematical symbols; semantic forms like words and ideas, and behavioral forms like information related to emotions, perceptions, and behaviors. When developing the instructional program tailored to the characteristics of gifted students, the content of the program should be enriched to a greater extent than regular instructional programs in terms of abstraction, complexity, and diversity. It should cover the lives of gifted individuals, scientific research methods, and discipline-specific generalizations.

The process dimension of the instructional program encompasses the ways in which the content of the instructional program is taught and the ways in which students learn and use knowledge. Process differentiation includes the learning and thinking types used by students in learning activities, the pace of instruction, students' logical approach styles, reasoning, learning through exploration, research methods, and the variety of instructional methods. In education programs targeting gifted students, particular emphasis is placed on process differentiation. This trend can be attributed to the advanced thinking skills of gifted students and their recognition as the creative adults of the future.

The product dimension of the instructional program should not be considered independently of either the content or process dimensions. This is because the product is a result of both the content and the presentation format of the content, which is the process. Learning outcomes consist of student products such as ideas, problem solutions, applications, reports, photographs, visual or auditory programs, stories, poems, novels, compositions, dances, or drawings. Regardless of the type of product, both content and process play an active role in its formation. Student products can be created through activities planned and managed by teachers or entirely through activities designed, planned, and managed by students themselves. In the education of gifted students, student products should aim to resemble professional products as much as possible. Therefore, products should be developed to solve real-life problems, include an intention to influence an audience, emphasize synthesis rather than imitation, be evaluated using objective criteria, and be designed with consideration for the characteristics of the target audience.

Maker (1982) proposed that learning environments can be used in the differentiation of instructional programs. The learning environment refers to the classroom, school, or other settings where learning opportunities are provided to students. An ideal learning environment is one that is designed to facilitate active participation of students in all types of learning activities. Among learning environments, classrooms are considered the most important, and they should resemble learning laboratories or workshops where both individual and collaborative work takes place. In such an environment, there should be an interaction-based relationship between students and teachers, characterized by both mentorship and mutual learning and guidance. The learning styles and preferred learning environments of gifted students vary greatly. For example, some students prefer quiet environments, while others prefer environments with mild noise or music. Some students prefer individual work, while others prefer group work. Moreover, student preferences may change over time and depending on the type of learning activities.

An ideal learning environment can be described as one that is flexible enough to accommodate a

wide range of individual preferences. By implementing differentiated instruction in the four dimensions mentioned above, the needs of gifted students can be met. However, it is also necessary for instructional materials provided to gifted students to be prepared in a manner suitable for differentiation. Considering Maker's proposed dimensions during the preparation of instructional materials is believed to enhance the effectiveness of teachers' education delivery.

Teachers instructing gifted students should systematically evaluate how well their activities align with student characteristics and how much they enhance students' creative capacities (Sak, 2013). In Turkey, there are deficiencies in both the instructional models used for gifted students and the instructional materials available for use. While some materials have been developed for use in Science and Art Centers (BİLSEM) for gifted students, it is unclear how suitable these materials are for the education of gifted and talented students. There is a curiosity about whether the materials to be implemented in BİLSEM for gifted students meet the necessary criteria. Therefore, it is important to examine the suitability of the content of auxiliary teaching materials for the education of gifted students in accordance with the strategies used. The current lack of theoretical basis for prepared materials, the absence of activities based on differentiation and models for gifted individuals, the failure to reflect gifted education principles in programs, and the lack of monitoring and evaluation of practices related to gifted individuals (Kurnaz, 2014; Sak, 2013) constitute the problem of this research. This study aims to examine the activities in the auxiliary teaching materials prepared for Science and Technology at Science and Art Centers according to the Maker-Banks Differentiated Instruction Assessment Model. In this regard, the following question is addressed.

The alignment of the content, process, and product elements of the Support Education Program Course Material in Science and Technology at BİLSEM with the differentiation criteria of the Maker Banks Evaluation Principles is examined in the research. Based on the main research question, the following questions are addressed:

RQ1: How suitable are the activities in the BİLSEM Support Education Program Course Material for the "Content," "Process," and "Product" elements of the Maker Banks Program Differentiation Criteria?

RQ2: How suitable are the activities in the BİLSEM Support Education Program Course Material for the criteria under the "Content" elements of the Maker Banks Program Differentiation Criteria?

RQ3: How suitable are the activities in the BİLSEM Support Education Program Course Material for the criteria under the "Process" elements of the Maker Banks Program Differentiation Criteria?

RQ4: How suitable are the activities in the BİLSEM Support Education Program Course Material for the criteria under the "Product" elements of the Maker Banks Program Differentiation Criteria?

METHOD

Research Design

The research utilized document analysis as a qualitative research method. Qualitative research aims to explore the meanings behind phenomena and uncover how human experiences can be interpreted and understood, with the researcher playing a participatory role and employing a flexible structure (Merriam, 2009); it is characterized by rich descriptions and employs an inductive research approach (Glesne, 2011). While document analysis has traditionally been perceived as a research method exclusive to disciplines such as anthropology, librarianship, and history, it has also been used as an additional method in social sciences alongside methods like surveys, interviews, and observations (Mogalakwe, 2006). However, recognizing the importance of this method (Kozak, 2017) and its advantages (Yıldırım & Şimşek, 2013), it has increasingly been employed in social sciences. This is because document analysis, while being equally effective as commonly used methods like surveys, in-depth interviews, or participant observations in social sciences, is sometimes more cost-effective

(Mogalakwe, 2006).

Document analysis, also known as documentary research, involves examining existing records and documents to obtain data. It encompasses the processes of finding, reading, note-taking, and evaluating sources with a specific purpose in mind (Karasar, 2005). In other words, document analysis is a series of operations that involve examining and evaluating printed and electronic (computer-based and internet-accessible) materials (Bowen, 2009). This process is also defined as the examination of written materials containing information about the phenomena under investigation (Yıldırım & Şimşek, 2013). Document analysis involves collecting, reviewing, questioning, and analyzing various forms of written texts as a primary source of research data (O'Leary, 2017). Merriam (2009) mentioned the abundance of societal documents that researchers working on educational topics can benefit from, including opinions on education, documents prepared by public institutions or private organizations, and personal records. In the field of education, educational programs, course content, the effectiveness of a given education, and educational practices can be investigated through document analysis. In short, the collection and examination of various written documents, records, productions, or artifacts created by other individuals or institutions regarding the research topic are considered document analysis (Seyidoğlu, 2016). In this research, the BİLSEM Support Education Program Course Material in the field of Science and Technology has been evaluated as a document according to the Maker Banks Evaluation Model Principles.

Research Sample

The activity booklet prepared for students in the Support Education Program from the BİLSEM Science and Technology Field was chosen as the document. The selection of the Science and Technology field as the document was based on the consideration that it offers a concrete application of the Maker-Banks principles and is particularly suitable for differentiation in BİLSEM centers. In selecting the Support Education Program activities, the class level that could best meet the criteria outlined in the Maker Banks Instructional Differentiation Principles was considered. The belief that as the class level progresses, the materials prepared would reach the highest level of instructional stages was one of the factors influencing the selection of this material for examination.

Research Processes

In accordance with the purpose of the research, a total of 31 activities in the field of science and technology were examined in the auxiliary teaching materials prepared for students in the support education program by the Directorate of Special Education and Guidance Services in 2022. The mentioned activities are application proposals or study plans that are given in line with the objectives and requirements of the relevant disciplines for teachers to use in their practices, taking approximately one class hour. The "Curriculum Evaluation Form According to the Maker-Banks Model" was used as the data collection tool. The "Curriculum Evaluation Form According to the Maker-Banks Model" was prepared by taking into account the recommendations and criteria proposed by Maker (1982) in the Maker Curriculum Differentiation Model, which includes differentiation of the curriculum into four main headings: content, product, process, and learning environment. The evaluation form has been used in various studies (Avcı, 2015; Elmas, 2020; İnan, 2023; Kutlu-Abu, 2018). During the research process, the criteria of the relevant model were first examined. Then, three researchers decided which lessons and stages of the Support Education Program materials from BİLSEM Auxiliary Teaching Materials would undergo document analysis. After determining the document to be examined, the review process and how to ensure consistency among the reviewers were established. At this stage, the criteria in the relevant model were discussed individually by the researchers, and a consensus was reached on each criterion.

Data Analysis

The research data were analyzed using descriptive analysis technique. The analysis results were

expressed in terms of frequency and percentage values. The criteria for evaluating the Teaching Program according to the Maker-Banks Model were read and discussed by the evaluators, thus ensuring conceptual agreement. The activities were evaluated by three experts, and inter-rater reliability was calculated. A matrix regarding the conformity of activities to the criteria was prepared and given to the experts. When there was a disagreement among the experts regarding the conformity to the criteria for the same activity, the marking made by the researcher was accepted, but this situation was considered as a divergence of opinion. Reliability = Agreement / (Agreement + Disagreement) was used, and the rate of agreement among the coders was determined to be 87.9%.

Ethic

According to section 40/8 of the Graduate Education and Training Regulation of Necmettin Erbakan University, ethical committee approval is not mandatory for document analysis and similar studies.

FINDINGS

The Maker Instructional Program is built upon four main pillars: content, process, product, and learning environment. When analyzing the activities, three sub-dimensions, namely content, process, and product elements, were included in the evaluation.

In the first research question, the suitability of the activities in the BİLSEM Support Education Program Materials was examined in terms of the "Content," "Process," and "Product" elements of the Maker Banks Program Differentiation Principles. Findings regarding the appropriateness of these sub-dimensions in the activities are presented in Table 1.

Table 1. *Findings regarding the distribution of differentiation elements in activities*

Sample	Number of Reviewed Activities	* Group Average	** Average of Elements	%
Process			19.66	63.42
Content	3 1	15. 09	12	38.70
Product			11.83	38.16

* Group average is the average presence of criteria from the Maker-Banks Instructional Program Differentiation Principles in the examined 31 activities.

** The average of elements is the average presence of each element in the 31 activities.

When Table 1 is examined, it is observed that the activities meet the criteria in the process element by 63.42% and are above the group average. According to Table 1, it can be said that the prepared activity contents are enriched more than regular teaching materials in terms of abstraction, complexity, and diversity, covering the lives of genius individuals, scientific research methods, and discipline-specific generalizations better. However, there are still aspects that need further improvement. It has been concluded that the activities need to be developed in the content (38.70%) and product (38.16%) sub-dimensions, and activities should be created taking into account the contents in these sub-dimensions.

The second question of the research aimed to answer the question: "How suitable are the activities in the Support Education Program Lesson Material of BILSEM for the criteria in the 'Content' sub-dimension of the Maker Banks Program Differentiation Elements?" In the content sub-dimension, 31 activities were examined under the headings of "Abstraction, Complexity, Diversity, Organization, Distinguished Individuals, Methods, Economic Efficiency." The findings related to the second question are presented in Table 2.

Table 2. *Findings regarding the content element*

Sample	Number of Reviewed Activities	Group Average	f	%
Economy	3	15.	28	90.32

Abstraction			13	41.94
Methods			12	38.71
Complexity			11	35.48
Diversity	1	09	8	25.80
Organization			6	19.35
Distinguished Individuals			6	19.35

Upon examining Table 2, it is observed that the criterion of "economy" (90.32%) is present in the activities above the group average, indicating that the activities are suitable. The findings suggest that the content of the activities is designed to be economical in terms of time and resources. When other sub-dimensions are examined, it can be said that the criteria of "abstraction" (41.94%), "methods" (38.71%), and "complexity" (35.48%) are less represented in the activities. It can be stated that the criteria of "diversity" (25.80%), "organization" (19.35%), and "distinguished individuals" (19.35%) are scarcely represented in the activities.

In the third question of the study, the compliance of the activities in the Support Education Program materials of BİLSEM with the criteria of the "Process" sub-dimension, one of the Maker Banks Program Differentiation Elements, was investigated. Within the Process sub-dimension, 31 activities were examined under the headings of "Higher Order Thinking, Open-endedness, Exploratory Learning, Reasoning, Freedom of Choice, Process Diversification, Research Methods, Instructional Pace, Group Interaction." The findings related to the third question of the study are presented in Table 3.

Table 3. *Findings regarding the process element*

Sample	Number of Reviewed Activities	Group Average	f	%
Reasoning			30	96.78
Pace of Instruction			30	96.78
Open-endedness			29	93.55
Exploratory Learning			27	87.10
Higher Order Thinking	3 1	15. 09	25	80.64
Variety in Process			14	45.16
Group Interaction			12	38.70
Freedom of Choice			5	16.13
Research Methods			5	16.13

Upon examining Table 3, it is found that in the 31 activities analyzed, the criteria of "Reasoning" (96.78%), "Pace of Instruction" (96.78%), "Open-endedness" (93.55%), "Exploratory Learning" (87.10%), and "Higher Order Thinking" (80.64%) are present in the activities above the group average, indicating that these criteria were considered when preparing the activities. In other sub-dimensions, it can be noted that the criteria of "Variety in Process" (45.16%) and "Group Interaction" are less represented in the activities. It can be inferred that the criteria of "Freedom of Choice" (16.13%) and "Research Methods" (16.13%) are minimally represented in the activities.

In the fourth question of the research, the suitability of the activities in the BILSEM Support Education Program Materials to the criteria of the "Product" sub-dimension of the Maker Banks Program Differentiation Elements was investigated. Within the Product sub-dimension, 31 activities were examined under the titles of "Real-life Problems, Authentic Audience, Product Diversification, Synthesis Product, Transformations, Product Evaluation." The findings related to the fourth question of the research are presented in Table 4.

Table 4. *Findings regarding the product element*

Sample	Number of Reviewed	Group Average	f	%

Activities				
Real-life Problems			28	90.32
Product Evaluation			25	80.64
Synthesis Product	3	15.	8	25.80
Diversification	1	09	7	22.58
Authentic Audience			2	6.45
Transformations			1	3.23

When Table 4 is examined, it is found that the criteria of "Real-life Problems" (90.32%) and "Product Evaluation" (80.64%) are present in the activities at a level above the group average, indicating that these criteria were considered in the preparation of the activities. In contrast, in the other sub-dimensions, it can be said that the criteria of "Synthesis Product" (25.80%), "Product Diversification" (22.58%), "Authentic Audience" (6.45%), and "Transformations" (3.23%) are present in the activities to a very limited extent.

DISCUSSION, CONCLUSION, RECOMMENDATIONS

The auxiliary teaching materials prepared for Science and Art Centers in the field of Science and Technology do not adequately meet the criteria of content, process, and product in the Maker-Banks Differentiated Instruction Evaluation Model. It has been concluded that the activities fulfill the criteria of economic viability, reasoning, teaching pace, openness, exploratory learning, advanced thinking, real-life problems, and product evaluation at a satisfactory level. However, it is noted that the criteria in other sub-dimensions need improvement. A review of the literature reveals that there are no similar studies examining the auxiliary teaching materials prepared by the Ministry of National Education Special Education and Guidance Services General Directorate and made available to BİLSEM teachers, taking into account a curriculum differentiation model's criteria. Therefore, this study is original. Hence, similar studies examining activities prepared by teachers or researchers and implemented in BİLSEMs will be discussed in this section.

According to the findings, it has been concluded that the content of the activities is designed to be economical in terms of time and resources. However, considering that abstraction is not achieved in the activities, it is necessary to include more abstract concepts when preparing the activities. There is a need for more interdisciplinary connections suitable for the education of gifted students. It has been concluded that in activities prepared for students, more opportunities should be provided for students to observe, classify data and information, interpret research findings, and evaluate the scientific evidence underlying interpretations. It has been found that very little space is given to eminent individuals' lives in the prepared activities. Biographies, autobiographies, letters, and manuscripts of eminent individuals, along with their successes and failures, social and emotional problems, relationships, family lives, professional developments, and milestones in their lives should be included, allowing students to interview creative individuals, observe them, and write biographies about them. More diversity should be included in the content of activities, and topics and disciplines not covered by the standard curriculum should also be included.

According to the findings, it has been concluded that the activities frequently include higher-order thinking skills such as analysis, synthesis, and evaluation; as well as questions and problems that require advanced thinking skills such as creative thinking and critical thinking. The activities also incorporate open-ended questions. It has been found that the activities allow students to engage in reasoning and exploratory learning. Çaylak (2019) aimed to examine science activities conducted in Science and Art Centers in his thesis study. In line with this aim, a total of 80 activity plans prepared and implemented by 3 Physics, 3 Chemistry, and 2 Biology teachers at the high school level were examined. As a result of the research, it was found that the majority of the prepared activities did not go beyond the application stage in Bloom's Taxonomy. In our study, it was demonstrated that the activities frequently include questions and problems that require advanced thinking skills. Therefore, the results of our study are not consistent with the findings of the mentioned study. Genç (2013) aimed to see the

outcomes of interdisciplinary activities in visual arts education for gifted students in his thesis study. In line with this aim, activities with good levels of interest and participation from students were implemented by relating them to other disciplines. It was also concluded that interdisciplinary activities contributing to the development of students' creative thinking and problem-solving skills positively affect students' application skills and that the activity method would be beneficial to be applied in other disciplines as well. In our study, the inclusion of questions requiring advanced thinking skills in the activities was found to be positive. Therefore, it can be said that our study aligns with the mentioned study. Accordingly, when preparing activities, it is necessary to consider the development of students' higher-order thinking skills.

It has been found that teacher presentations in activities have been kept as short as possible and repetitions have been avoided. However, it was concluded that the majority of the activities were not designed to increase group interaction to support peer teaching. Bozkurt et al. (2019) examined the methods and techniques used in mathematics books prepared for use in Science and Art Centers in their study conducted in 2019. For this purpose, the methods and techniques used for each activity in mathematics framework books of DEP (Support Education Program), BYF (Individual Talent Recognition), and ÖYG (Special Talent Development) programs were analyzed. As a result of the research, it was observed that teacher-centered methods and techniques increased as the programs progressed. Teacher-student-centered methods and techniques were used more in the Support program. It was found that student-centered methods and techniques were the least preferred in all groups. According to the research results, it was concluded that the methods and techniques used in activities included in the programs of Science and Art Centers varied, but as the programs progressed, they became more teacher-centered rather than student-centered. In this study, the activity booklet prepared for students in the Support Education Program of BİLSEM Science and Technology Field Auxiliary Course Material was examined. It was concluded that the prepared activities reduced the teacher's influence and were student-centered. Therefore, it can be said that this study is consistent with our study.

The learning process in activities has not been sufficiently diversified with various teaching and learning methods. Direct instruction, film screenings, TV programs, field trips, seminars, workshops, computer-assisted instructions, structured discussions, individual work, group work, exploratory learning, and project-based learning, expert mentoring and observation, field trips, etc., could be included in the teaching program to allow students to choose their learning methods. Additionally, it was found that different options for decision-making by the student were not provided within the activities. Diversification can be achieved by giving students the chance to make choices within the activity. Only a small portion of the activities have focused on enhancing research skills as students progress through the activities. When preparing activities for students, considerations can be made to develop skills such as observation, data and information classification, interpretation of research findings, and evaluation of scientific evidence, which would enhance students' research skills.

The findings suggest that a significant portion of the activities include problems and project topics that personally, nationally, or universally capture students' attention, thus meeting the criterion of real-life problems. It was found that the majority of activities have established criteria for evaluating the products at the end of the activities and have enabled self-assessment by students. However, the focus has not been on products that allow students to reinterpret, detail, develop, combine, or differentiate, resulting in a lack of emphasis on products synthesized through these methods. Additionally, there should be diversity in the types of products students are expected to produce, and students should have the autonomy to decide the type of products they can develop. When designing their products, students should be encouraged to target real audiences such as school administration, municipality, art galleries, publishers, or other students, and have the opportunity to present their products to these audiences.

The recommendations derived from this study are as follows:

- Based on the finding that the instructional materials were not appropriately differentiated in terms of differentiation elements, all instructional materials can be designed to incorporate suitable differentiation elements.

- Considering the conclusion that the instructional materials were not adequately differentiated in terms of content elements, all instructional materials can be appropriately diversified in terms of content elements.

- Since the study suggests that the instructional materials were not sufficiently differentiated in terms of process elements, all instructional materials can be appropriately diversified in terms of process elements.

- Given the conclusion that the instructional materials were not adequately differentiated in terms of product elements, all instructional materials can be appropriately diversified in terms of product elements.

- When preparing activities for gifted students' education, activity characteristics can be designed by considering the criteria in the Maker-Banks Differentiated Instruction Assessment Model.

- Evaluation of compliance with criteria can be conducted not only for the field of Science and Technology but also for other fields.

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Examination of The Academic Status of Geography Education in Turkish Higher Education According to the Opinions of Faculty Members[1]

Yasin Duran[1] 🆔 **Caner Aladağ[2]** 🆔

[1] Ministry of National Education, Konya, Türkiye
yasinduran10@gmail.com

[2] Necmettin Erbakan University, Department of Turkish and Social Sciences Education, Konya, Türkiye
caner5101@gmail.com

Article Info	ABSTRACT
	The aim of this study is to determine the views of faculty members who have studied in the field of geography education on research orientations in the field. The criterion sampling method, one of the purposeful sampling methods, was used to determine the sample of this research, which was carried out in the case study design within the qualitative research tradition. Accordingly, 33 faculty members who completed their doctorate in the field of geography or geography education and have studied geography education constituted the participants of the study. A semi-structured interview form was used to determine the faculty members' views on research orientations in the field. Content analysis was used to analyze the data obtained. According to the findings of the study, 96 code expressions were generated from the opinions of the faculty members about the orientations in the field of geography education. These codes were then organized around three main themes: orientations, problems, and expectations. The main theme of orientations consisted of the sub-themes of study topics, reasons for topic preferences, research orientations, and influential events and phenomena; the main theme of problems consisted of the sub-themes of problems, rich literature, and limited literature; and the main theme of expectations consisted of the sub-themes of the future of the field and researcher profile.

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[1] This study is based on the doctoral dissertation entitled "Geography education in Türkiye in the 100th year of the Republic: a case study", which was completed on 12.12.2023 under the supervision of Author 2.

INTRODUCTION

Geography, as a synthesis science that deals with the mutual interaction of nature and human beings between science and social sciences, is a discipline area that countries should definitely benefit from in order to increase their level of development. Political, socio-economic, and technological changes emerging in the process of globalization necessitate the evaluation of geography and geography education from a new perspective (Artvinli & Kaya, 2010). In order to make an accounting of the point reached in the field of geography and geography education and to reveal the situation for the future, various works have been produced by both public institutions and researchers on various anniversaries of the Turkish Republic. There are studies on the state of geography in Türkiye in this way (Akkan, 1972; Akyol, 1943; Erinç, 1973; Gürsoy, 1974; İzbırak, 1976; Kayan, 2000, 2023; Koçman, 1999; Sekin, 1999a, 1999b; Ünlü, 1999). Apart from such periodical reviews, there are also studies that investigate the historical adventure and organization process of geography in Türkiye (Gümüşçü, 2012; Gümüşçü & Karakaş-Özür, 2016; Tümertekin, 2001).

Examining the related studies in general, it is understood that there are mostly descriptive studies that examine international trends in the field of geography or evaluate the situation in Türkiye. In addition, a study on the innovation orientations of the sub-discipline of human geography based on data and academician experiences (Özgür, 2018) also exists. However, there is no study in the literature that addresses in depth how the current situation and future orientations in the field of geography education are seen from the perspective of academics who have studied in the field.

The aim of this case study is to determine the views of the faculty members who have studied in the field of geography education on research orientations in the field. The fact that there is no study based on synthesizing the views of faculty members in the field of geography education in the literature constitutes an important justification for this research. In addition, analyzing the developments in the field of geography education to date, the level reached, making determinations about the situation we are in today, and seeing the path taken by looking back is also important in terms of making decisions for today and the future.

METHOD

Research Design

This research was designed based on qualitative research methods and techniques because qualitative research is the process of developing field-specific explanations or theories by analyzing the meanings constructed by individuals (Özden & Saban, 2017).

In this study, which aims to examine and interpret the basic characteristics of the views of the faculty members who have studied in the field of geography education in Türkiye regarding the research orientations in the field, the case study method, one of the qualitative research models, was used. According to Yin (1984, p. 23), a case study is an empirical research method in which (1) a phenomenon is observed in its own context, (2) the boundaries between the phenomenon and its context are unclear, and (3) multiple data sources are used. (Cited: Yıldırım & Şimşek, 2021).

Study Group

The criterion sampling method, one of the purposeful sampling methods, was used while forming the study group for the research. The criterion sampling method is the study of all situations that meet predetermined criteria, and these criteria can be determined by the researcher (Yıldırım & Şimşek, 2021). Based on these definitions, in order to determine the participants of this study, the criterion of having a PhD in geography or geography education and having studies related to geography education was determined. Table 1 shows the characteristics of the participants whose opinions were consulted in the study in order to determine the views of academics in the field of geography education.

Table 1. *Characteristics of the study group[1]*

Participant	N
Gender	
Female	4
Male	29
Title	
Professor	19
Associate Professor	12
Dr. Lecturer	2
Faculty	
Education	27
Literature	4
Tourism	1
Human and Social Sciences	1
Doctorate Subject	
Education	20
Field	13
Associate Professorship Area	
Social Sciences Education	24
Human and Economic Geography	5
Physical Geography	4
Total	33

1 This table is based on YÖK (Turkish Higher Education Council) Academic data.

According to Table 1, the participants of this study consisted of 33 faculty members working in 16 different state universities, determined according to the July 2022 YÖK Academic data.

Research Instruments and Processes

The semi-structured interview form was used as a data collection tool to determine the views of academics who contribute to research orientations in the field of geography education. In order to create the conceptual framework and prepare the interview questions, firstly, a literature review was conducted, and a question pool was determined. After determining the questions, a pilot application (Yıldırım & Şimşek, 2021) was conducted for this purpose, with face-to-face interviews with two faculty members who completed their doctorate in the field of geography or geography education. The pilot interviews were analyzed with the members of the thesis monitoring committee in terms of the meaningfulness and clarity of the questions and the satisfactory level of the answers given. Accordingly, the following questions were included in the interview form:

1) What are your study subjects, and what are your reasons for preferring these subjects?

2) What do you think determines research orientations in the field of geography education in Türkiye?

    a. What do you think may be the factors affecting the fact that fewer studies have been conducted in the field of geography education in Türkiye, especially before the 2000s?

    b. What are the subjects—if any—that you think are intensively studied in the field of geography education in Türkiye?

    c. What are the research topics—if any—that you think are not sufficiently studied in the field of geography education in Türkiye?

3) How do you evaluate the current situation of geography education in Türkiye?

    a. What do you think—if any—are the problems in the field of geography education?

    b. What do you think about the future of geography education in Türkiye?

4) In your opinion, how should researchers who want to work in the field of geography education follow a path to contribute to the field?

Initially, 47 faculty members from 21 different state universities who met the criteria were contacted via e-mail and/or telephone, and brief information about the desired interview was given and the form was directed. The participants of the study consisted of 33 faculty members from 16 different state universities who voluntarily completed the interview form and participated voluntarily. During the process, additional questions were asked of the faculty members via email, and communication was continued by taking into account their directions about the study. In addition, face-to-face interviews were conducted with 12 faculty members using the same form. Each form was first purified from personal data, and the faculty members were coded as P1, P2, P3, etc.

Data Analysis

The content analysis method was used to analyze the interview forms. In content analysis, a cyclical process was followed for coding the data conceptually and thematically (Saldana, 2019). Since the data obtained with the forms were collected via email, they were made ready for analysis with minor text corrections in a digital environment. During the editing process, in accordance with ethical rules, the information of the faculty members and the institutions they work for was kept confidential, and the elements that could give an idea about this were eliminated. The process of subjecting the data obtained through the interview form to content analysis was carried out in four stages: (1) coding the data, (2) finding themes, (3) organizing the codes and themes, and (4) defining and interpreting the findings (Yıldırım & Şimşek, 2021). Accordingly, 96 code expressions and three themes with these codes were formed. While determining the themes, the interview form questions prepared according to the purpose of the research were utilized. Then, the codes and themes obtained were tabulated and analyzed.

The reliability and validity of the results of the research are the basic criteria that increase the credibility of the research (Saban, 2008). In qualitative research, reporting the data in detail and explaining how the researcher reached the findings are important elements to ensure validity. In order to ensure reliability in coding, inter-coder agreement is required (Creswell, 2016) and utilized. Reliability for inter-coder consensus is based on Miles and Huberman's (2016, s. 64) formula, which calculates *Reliability = Consensus / (consensus + disagreement)*. In order to determine the consistency of the 96 codes obtained as a result of the analysis of the interview forms and the three themes organized according to these codes, the consensus among the coders was examined. Accordingly, the consensus was based on the acceptance of a second coder, who is an expert in the field of geography education, on the codes used on a randomly selected interview form and the themes and sub-themes created accordingly. In the reliability study specific to this research, the inter-coder consensus was calculated at 0.99.

Ethic

The research was approved by the decision of Necmettin Erbakan University Social and Human Sciences Scientific Research Ethics Committee dated 19 March 2021 and numbered 2021/170.

FINDINGS

According to the general findings obtained in this study, 96 code expressions were generated from the opinions of the faculty members regarding the orientations in the field of geography education. Ten of the ninety-six codes (*habits do not change easily, biodiversity, regional geography, values and ethics education, climate change education, history of cartography, scale development studies, measurement and evaluation, geography in social studies, sustainable development, and education*) were produced by only one faculty member. Apart from the ten statements expressed by a single faculty member, the number of faculty members representing the remaining eighty-six statements varies between two and thirty. In addition, five statements (*geographical skills, textbook analysis, concept teaching and misconceptions, metaphor, teaching methods and techniques*) were stated by the participants in two different sub-themes, and two statements (*GIS (geographic information systems) and environmental education*) in three different sub-themes. As seen in the opinions of the lecturers, these codes emphasize different dimensions of geography education. For example,

the expression of environmental education, which is included in three different sub-themes, was mentioned by some participants as a subject of study, some as a rich area of literature, and some as a limited area of literature. In addition, it is expected that the fields of study of the faculty members and the topics that they see as a limited and/or rich area in the literature are similar. For this reason, it was considered appropriate to state each sub-theme separately and to include it in the table.

The code expressions obtained from the opinions of the faculty members about their orientations in the field of geography education were grouped under three themes by using the interview form questions prepared according to the purpose of the research. These are *"orientations", "problems"* and *"expectations"* (Table 2).

Table 2. *Themes related to the opinions of faculty members on the field of geography education[1]*

Theme	Sub-theme	Code	N
Orientations	Study topics	Geography of disasters (3), Human geography (2), Biodiversity (1), Regional geography (1), GIS (4), Geographical skills (2), Geography curricula (16), Use of technology in geography education (2), Environmental education (7), Values and ethics education (1), Textbook analysis (5), Physical geography (6), History of cartography (1), Concept teaching and misconceptions (3), Cultural geography (6), Metaphor (3), Literacy (3), Teaching methods and techniques (18), Teacher education (2), Measurement and evaluation (1), Geography in social studies (1), Sustainable development and education (1)	22
	Reasons for subject preference	Knowledge transfer (7), Change (4), Need (5), Desire (12), Career planning (7), Previous studies (27), Thesis topic (5), Necessity (8)	8
	Research orientations	Academic promotion criteria (5), Researcher's areas of interest (11), Outgoing researcher (2), Guidance from supervisor (4), Similar to trends in educational sciences (5), Current developments (16), Stakeholder expectations (2), According to theses and articles (6), International trends (11)	9
	Effective events and facts	Low number of field educators (17), Geography is seen only as a field (9), Associate professorship areas (3), Government policies (9), Low number of postgraduate studies (6), A recent discipline (3), Structuring in higher education (13)	7
	Theme Total		**46**
Problems	Problems	Miscommunication within the field (10), Distance between the field and field education (16), Defining the field (6), Habits do not change easily (1), Lack of geography education magazine (2), Less class hours (7), Insufficient number of in-service trainings (2), Studying stereotyped subjects (9), Quota limitation (2), Material problem (9), Lack of methodology (5), Loss of quality (4), Norm staff (10), Disconnected from stakeholders (14), Exam-oriented education system (5), Accepting students with social score (5), Insufficient use of technology (2), Studies far from practice (21), Foreign language insufficiencies (5)	19
	Rich literature	Disaster education (4), Perception, attitude, and opinion (17), Use of tools and materials (2), GIS (4), Environmental education (5), Textbook review (6), Concept teaching and misconceptions (10), Metaphor (5), Examination of curricula (15), Teaching methods and techniques (22)	10
	Limited literature	Alternative measurement tools (4), Field applications (5), GIS (9), Geographical skills (10), Philosophy of geography education (3), Special education in geography education (7), Environmental education (11), Cooperation with different disciplines (8), Climate change education (1), Material design (2), Scale development studies (1), Classroom activities (6), Technology supported applications (2)	13
	Theme Total		**42**
Expectations	The future of the field	If certain criteria are met, it will be in a better position (30), It will be better than today (3), It will be worse than today (5), It is clear that there is a long way to go (6), There will be an unplanned development (3)	5
	Researcher profile	Good command of literature (3), Good command of methodology (16), Good command of foreign language (3)	3
	Theme Total		**8**
	GENERAL TOTAL		**96**

[1] The numbers in brackets indicate the number of faculty members representing the relevant code expression.

Theme-1: Orientations

This theme consists of four sub-themes and a total of 46 code expressions that make up these sub-themes. These are *"study subjects", "subject preference reasons", "research orientations"* and *"effective events and facts"* sub-themes. The codes constituting these sub-themes and the opinions of the lecturers are given, respectively. Table 3 shows the study subjects of the faculty members in the sub-theme of study subjects.

Table 3. *Study subjects' sub-theme*

Nr	Code	f	%	Valid Percentage (%)[1]
1	Teaching methods and techniques	18	2,77	20,22
2	Geography teaching programs	16	2,47	17,98
3	Environmental education	7	1,08	7,87
4	Physical geography	6	0,92	6,74
5	Geography of culture	6	0,92	6,74
6	Textbook review	5	0,77	5,62
7	GIS	4	0,62	4,49
8	Geography of disasters	3	0,46	3,37
9	Concept teaching and misconceptions	3	0,46	3,37
10	Metaphor	3	0,46	3,37
11	Literacy	3	0,46	3,37
12	Human geography	2	0,31	2,25
13	Geographical skills	2	0,31	2,25
14	Use of technology in geography education	2	0,31	2,25
15	Teacher training	2	0,31	2,25
16	Biodiversity	1	0,15	1,12
17	Regional geography	1	0,15	1,12
18	Values and ethics education	1	0,15	1,12
19	History of cartography	1	0,15	1,12
20	Measurement and evaluation	1	0,15	1,12
21	Geography in social studies	1	0,15	1,12
22	Sustainable development and education	1	0,15	1,12
	Total	**89**	**13,71**	**100**[2]

[1] Valid percentage indicates the percentage value within the relevant category.

[2] The numbers in the table may not sum to the total due to rounding.

Faculty members' views on the relationship between geography and culture:

- "Within the scope of cultural geography issues, I also publish in this field within the framework of the relationship between geography and culture, the effects of the environment on culture and the efforts to reveal the cultural richness of Anatolia." (P7)

- "I am working on the use of traditional children's games and proverbs in geography teaching in the subject area of the effect of geography on cultural activities and the use of these factors during geography teaching." (P18)

The statements of the participants emphasize the impact of geography on cultural activities. These statements are intended to examine the effects of geography education on human life and cultural heritage. Geography education can be used in shaping cultural activities and teaching traditional games and proverbs.

Faculty members' views on geography education and teaching methods:

- "The most important reason why I am more interested in curricula, textbooks and geographical skills is to be able to contribute to the level of competence in these subjects and to provide guiding results for improvement suggestions and updates in the process. In addition, I think that curricula and textbooks are the main sources for geographical awareness and knowledge transfer." (P1)

- "As part of my doctoral thesis, I am studying physical geography topics such as climate and soil, as well as topics in the field of geography education on how geography lessons should be taught, how curricula should be examined and how teaching methods and techniques should be applied." (P8)

- The statements of the participants focus on geography education and teaching methods. These statements include topics such as curricula, textbooks, instructional technologies, and the development of geographical skills. They also cover areas of study such as the teaching of geography, the examination of teaching programs and the application of teaching methods and techniques.

Faculty members' views on geography education research and basic orientations:

- "Examination of geography curricula, concept studies in geography teaching, basic orientations in geography education research, perceptions of geography." (P33)

Participants' testimony addressed issues such as the examination of geography curricula, concept studies in geography teaching and the main trends in geography education research.

Evaluating the participant statements related to this sub-theme, it is emphasized that geography education is a multifaceted discipline, and that field and education studies should be carried out together. Based on the views of faculty members, geography education is a dynamic and interactive field that aims to make sense of cultural heritage and enrich educational processes.

Table 4 shows the opinions of the faculty members on the sub-theme of reasons for subject preference.

Table 4. *Subject preference reason's sub-theme*

Nr	Code	f	%	Valid Percentage (%)[1]
1	Previous work	27	4,16	36
2	Request	12	1,85	16
3	Necessity	8	1,23	10,67
4	Knowledge transfer	7	1,08	9,33
5	Career planning	7	1,08	9,33
6	Need	5	0,77	6,67
7	Thesis topic	5	0,77	6,67
8	Change	4	0,62	5,33
	Total	**75**	**11,56**	**100**[2]

[1] Valid percentage indicates the percentage value within the relevant category.
[2] The numbers in the table may not sum to the total due to rounding.

According to According to Table 4, it can be stated that both personal and institutional factors are effective in influencing the thesis topic preferences of the researchers.

Faculty members' views on academic careers and research motivation:

- "... enrolling in the geography department at the undergraduate level and then my desire to research..." (P19)

- "... I started to work in geography education with the warnings and suggestions that if we did not publish in the field of geography education as well as human geography, we would not be able to get staff, especially in the process of restructuring of education faculties after 1997." (P24)

The statements of the participants show their willingness to pursue an academic career and research in the field of geography education. These statements include academic backgrounds and research motivations such as undergraduate education, norm staffing regulations and related obligations, and doctoral thesis topics related to the reasons for faculty members' subject preferences.

Faculty members' views on technological developments and geography education:

- "Since I am interested in technology and geography education, I carry out my studies in this context. Of course, technology continues to turn into a very big medium day by day... The most important reason for this is, of course, to establish a connection between geography education and technological applications and to achieve harmony." (P25)

- "... my reason for working is that there is a need in the field, and the field is open to innovations..." (P28)

The statements of the participants emphasize the impact of technological developments on geography education and the interest in innovations in this field. These statements include the integration of technology into geography education and the effect of the needs and changes in this field on the reasons for subject preference.

Faculty members' views on studies and orientations in the field of geography education:

- "Since the field of geography education constitutes my field of associate professorship, geography education constitutes my main field of study... However, since the program where my staff is located is social studies, some of my studies have naturally shifted there." (P33)

- "In the beginning, I was writing on every subject where I saw a gap. My master's and doctoral theses are about teaching methods. But in recent years, I have focused on skill teaching." (P10)

The statements of the participants include the reasons for their orientation towards the field of geography education. These statements cover topics such as teaching methods, skills teaching, understanding and evaluation of geography, student views, and current trends. Accordingly, the reasons for the subject preference of the faculty members are affected by various dynamics, especially the thesis topic and previous studies.

Evaluating participant views on this sub-theme, it is seen that the factors affecting the reasons for faculty members' subject preference are affected by various factors such as academic appointment and promotion, research motivations, practices in educational processes, and social perceptions. Accordingly, faculty members tend to continue their academic careers in the field of geography education in line with the interests and skills they gained during their undergraduate and/or graduate education. In addition, the desire to include technology in the process of geography education is effective in faculty members' choice of research topics. It is aimed at developing innovative approaches to improve the quality of geography education and contribute to the development of geographical awareness. Another reason for preference is that faculty members work to draw attention to the importance of geography education based on the view that geography does not receive the value it deserves in society.

Table 5 shows the opinions of the faculty members on the sub-theme of research orientations.

Table 5. *Research orientation's sub-theme*

Nr	Code	f	%	Valid Percentage (%)[1]
1	Current developments	16	2,47	25,81
2	Areas of interest of the researcher	11	1,69	17,74
3	International orientations	11	1,69	17,74
4	According to theses and articles	6	0,92	9,68
5	Academic promotion criteria	5	0,77	8,06
6	Similar to orientations in educational sciences	5	0,77	8,06
7	Counsellor guidance	4	0,62	6,45
8	The prolific researcher	2	0,31	3,23
9	Stakeholder expectations	2	0,31	3,23
	Total	**62**	**9,55**	**100**[2]

[1] Valid percentage indicates the percentage value within the relevant category.

[2] The numbers in the table may not sum to the total due to rounding.

According to Table 5, research orientations in the field of geography education are influenced by both personal and institutional factors as well as social and global dynamics.

Faculty members' views on the development of educational research and new approaches:

- "I think a development or change in the field of education can play a driving role here. For example, a change in the curricula or the publication of a textbook can shed light on the study of these issues. Another factor is that similar studies can be integrated into the field of geography by taking more pioneering studies in field education (such as science education) as an example. In particular, academics with good foreign language skills or high contact with abroad are trying to bring new fields of study in Europe or America to our country (Türkiye) by taking them as reference." (P33)

- "I think that research trends are shaped according to the theses and articles produced in the field. I observe that there are changes in research areas after the publications of a few prominent researchers who pioneered the field and brought different perspectives or method-techniques to the field. Especially when there are several publications on a subject, we see that many similar studies are carried out quickly in terms of method and literature." (P1)

The statements of the participants emphasize the development of research in the field of geography education and the impact of popular topics. These statements show that geography education research has gained momentum since the early 2000s, popular and current issues are frequently addressed in research, and new approaches are integrated into the field by influencing other disciplines.

Faculty members' views on academic orientation and career goals:

- "In my opinion, the first determining factor is the curiosity of the researchers. In addition, providing the necessary points for career advancement is also an important reason that cannot be ignored. Another factor can be expressed as academic incentive. Lastly, in my opinion, the prestige that qualified publications can provide can be expressed as an important reason." (P14)

- "Research tendencies are mostly based on academic concerns. Master's or doctoral thesis topics consist of studies that are feasible and do not take much time, where tried methods are selected or methods tested by others are used. This situation restricts new developments or knowledge production. Post-doctoral or associate professorship studies are studies carried out to fulfil academic promotion criteria. It is seen that experimental and long-lasting studies are avoided." (P30)

The statements of the participants indicate that the guidance of academic advisors, researchers' curiosity, career goals and academic incentives are effective in the selection of research topics. These statements explain that academic appointment and promotion criteria have an important role in shaping research orientations.

Evaluating the participants' views on this sub-theme, it is seen that various factors such as academic career goals, developments in the field of educational sciences, current issues, guidance of supervisors and personal interests affect the research orientations of faculty members. Accordingly, faculty members consider factors such as appointment and promotion criteria and academic incentives when choosing research topics to achieve career goals such as academic promotion and gaining prestige. Innovations and changes in the field of educational sciences play a driving role in the process of faculty members' selection of research topics. In addition, popular topics in the field of educational sciences in general are another factor that faculty members consider when choosing their research topics. These topics may change depending on the trends and current events in the field and may affect the interests of researchers.

Table 6 shows the opinions of the faculty members on the sub-theme of effective events and phenomena.

Table 6. *Effective events and phenomena sub-theme*

Nr	Code	f	%	Valid Percentage (%)[1]
1	Low number of field instructors	17	2,62	28,33
2	Structuring in higher education	13	2	21,67
3	Considering geography only as an area	9	1,39	15
4	Government policies	9	1,39	15
5	Low number of postgraduate studies	6	0,92	10
6	Associate Professorship fields	3	0,46	5
7	A recent discipline area	3	0,46	5
	Total	**60**	**9,24**	**100**[2]

[1] Valid percentage indicates the percentage value within the relevant category.

[2] The numbers in the table may not add up to the total due to rounding.

According to Table 6, faculty members generally stated that administrative decisions and the resulting legislative changes were effective on the events and phenomena affecting the field of geography education.

Faculty members' views on restructuring of education faculties and increasing the importance of field education:

- "There are many variables. For example, the educational policies of the country, the incorporation of faculties of education into the body of the Council of Higher Education (YÖK) also affect scientific research in this field. However, at this point, although faculties of education were incorporated into YÖK in 1982, it took years for educational research to become widespread. The restructuring of faculties of education with the 1997 reform is a turning point here. Here, it was an important turning point that habits do not change easily, but when the necessity arose, field education studies started to be emphasized." (P7)

- "Especially in the period before 2000, geography education was a neglected field and the fact that the lecturers working in the geography teaching department did not know the field of geography education very well and did not carry out studies in this field was effective, but afterwards, with the compulsory education studies, the studies in this field moved to another dimension." (P16)

The statements of the participants show that the restructuring of the faculties of education played an important role in the increase of the studies in the field of geography education. In these statements, it is stated that the programs of faculties of education were changed with the Turkish National Education Development Project (MEGP), field education gained attention and a new era started in the field of geography education.

Faculty members' views on the popularization of postgraduate education and its acceptance as an associate professorship field:

- "The reason for the low number of publications before 2000 is that postgraduate studies in the field of geography education are not carried out and geography is seen only as basic branches such as physical and human. Because in Türkiye, geography education master's and doctorate degrees started in the early 2000s and associate professorship degrees in geography education generally started after 2010s." (P1)

- "With the acceptance of the field of geography education as an associate professorship field by YÖK, I think there has been an increase in the number of studies in this field. In the previous periods, there was no deficiency in geography education. Because it was accepted that those who had knowledge could teach it. I also have studies in the field of physical geography; however, being in the field of geography education has directed my studies to this channel. As a result, with the establishment of educational sciences institutes, studying education has become a necessity and the number of studies on geography education has increased." (P4)

The statements of the participants include that geography education master's and doctoral degrees in Türkiye started in the early 2000s and that the acceptance of geography education as an associate professorship field by the Council of Higher Education (YÖK) has led to an increase in the number of studies in this field. In these statements, it is shown that academic career opportunities and the widespread use of postgraduate education have an effect on the increase in the number of studies in the field of geography education.

Faculty members' views on educational policies, access to resources and pure studies:

- "Previously, more pure studies were carried out. Journals publishing in the field of geography education were also few and access to resources was very difficult compared to today. Later, with the faculties of education and institutes of educational sciences, the number of educational studies increased a little bit by necessity." (P8)

- "I think that both the number of universities and the number of academics in those years were effective on this situation." (P14)

- "The fact that geographer academics prefer field studies and do not show sufficient interest and care in geography education and even find geography teaching unimportant..." (P29)

The statements of the participants indicate that the developments in the field of geography education

were affected by variables such as educational policies, difficulty in accessing resources and the prevalence of pure studies, and then the number of geography education studies necessarily increased with the faculties of education and educational sciences institutes. In addition, it is stated that factors such as geographer academicians' preference for field studies and not showing enough interest in geography education, finding the field of geography education insignificant, and the small number of universities and academicians also affect the field of geography education.

Evaluating the participant views on this sub-theme, it is seen that the factors affecting the development of the field of geography education include the restructuring of education faculties, the increase in the importance of field education, the widespread use of postgraduate education in the field, its acceptance as an associate professorship field, the personal tendencies of academicians and educational policies.

Theme-2: Problems

This theme consists of 3 sub-themes and a total of 42 code statements forming these sub-themes. These are *"problems", "rich literature"* and *"limited literature"* sub-themes. The codes constituting these sub-themes and the opinions of the faculty members are given, respectively.

Table 7 shows the opinions of the faculty members on the sub-theme of problems.

Table 7. *Problems' sub-theme*

Nr	Code	f	%	Valid Percentage (%)[1]
1	Studies far from practice	21	3,24	15,56
2	Distance between field and field education	16	2,47	11,85
3	Disconnected from stakeholders	14	2,16	10,37
4	Miscommunication within the field	10	1,54	7,41
5	Norm cadre	10	1,54	7,41
6	Study of stereotyped topics	9	1,39	6,67
7	Material issues	9	1,39	6,67
8	Fewer lesson hours	7	1,08	5,19
9	Defining the area	6	0,92	4,44
10	Lack of methodology	5	0,77	3,7
11	Exam-orientated education system	5	0,77	3,7
12	Admission of students with social score	5	0,77	3,7
13	Foreign language deficiencies	5	0,77	3,7
14	Loss of quality	4	0,62	2,96
15	Lack of geography education journal	2	0,31	1,48
16	Insufficient number of in-service trainings	2	0,31	1,48
17	Quota restriction	2	0,31	1,48
18	Insufficient utilization of technology	2	0,31	1,48
19	Habits do not change easily	1	0,15	0,74
	Total	**135**	**20,80**	**100[2]**

[1] Valid percentage indicates the percentage value within the relevant category.
[2] The numbers in the table may not add up to the total due to rounding.

According to Table 7, the opinions of the faculty members about the problems in the field of geography education can be expressed as problems related to secondary school geography courses, university geography courses, criteria for admitting students to the programs, academic structure, quality of studies, quality of researchers and legislation.

Faculty members' views on academic career and norm staffing problems:

• "The fact that a large part of geography educators have to work in faculties of education, especially in social studies education department programs, and the other part in faculties of science and literature." (P11)

• "Those with a doctorate or associate professorship in geography education may not be able to work in geography teaching departments. Since most of the faculty members work in social studies programs, they have to move away from geography education over time or, at best, they have to work on geography areas within social studies." (P33)

The statements of the participants include problems such as the inability of those who have a doctorate and/or associate professorship in the field of geography education to work in geography teaching departments and, accordingly, the fact that a large part of geography educators have to work in faculties of education, especially in social studies education department programs, and another part in faculties of science and literature, and that faculty members working in the field do not look favorably on geography education studies and do not contribute to these studies. Therefore, these statements draw attention to the academic career and norm staffing problems that affect the quality and quantity of studies in the field of geography education.

Faculty members' views on communication and cooperation problems in the field:

- "I think the biggest problem is the lack of unity and solidarity among geography field education teachers. This situation creates deficiencies in field education and makes geography unowned. In addition, it can be said that the fact that geography is still shown as a rote learning course or that it cannot be removed from this image is an important problem of geography education." (P9)

- "One of the most important problems of geography and geography education is that academics in these fields cannot meet on a common ground. This situation causes the resources in the field not to find the value they deserve. In fact, if a common path is formed, both the importance of geography education and the importance of the resources in the field will be better understood. This situation causes geography education to be perceived as less important and more unnecessary every year. In the last 15 years, the weight of geography in secondary education programs has decreased and the number of questions and its impact in university exams have decreased. It has also led to the removal of the "general geography" course, which is very important for classroom teaching programs. To summarize briefly, the studies produced in the field cannot find the value they deserve due to the disconnections and conflicts between the researchers in the field. This situation causes the importance of geography education to be negatively affected." (P14)

The statements of the participants show that one of the most important problems of the field is the lack of unity and solidarity among academics in this field. For this reason, it is emphasized that in order to increase the efficiency and effectiveness of the studies in the field of geography education, the problems of communication and cooperation within the field should be solved.

Faculty members' views on the problems of conducting innovative and current studies:

- "In general, it is a serious problem that the studies carried out in the academy are published as a continuation or similar to each other. We cannot offer something new specific to the field." (P21)

- "The limited number of studies in accordance with the trends by closely following the current and world developments in the field of geography education, the insufficient number of geography educators in the departments, and the excessive time allocated to courses and education" (P32)

In the statements of the participants, there are problems such as the fact that the studies carried out in general are the continuation or similar publications of each other in the academy and that they cannot offer something new specific to the field. In these statements, it is stated that the necessary conditions should be provided for the studies in the field of geography education to be innovative and up to date.

Academicians' views on education system and teacher training problems:

- "No matter how much effort is made, no matter how much improvement is made in measurement and evaluation techniques, for various reasons, geography education is not in the triangle of interest-cause-effect and information cannot be taught permanently. For example, even in portfolio preparation and project-based education, the desired development cannot be achieved because students present data as copy-paste from internet sources." (P22)

- "I think that the fact that some of the subjects of geography are included in science but taking students with social scores according to the YKS (Turkish University Exams) result causes problems. I think that

students should be admitted to the geography department with at least equal weight scores." (P3)

- In the statements of the participants, there are negative effects on geography teaching departments due to the gradual decline in the place of geography in the education system and the resulting problem of assignment, and the fact that although some subjects of geography are included in science, according to the results of YKS, students are admitted with social score. These statements show that the field of geography education is affected by the decisions regarding the education system and teacher training and development processes.

- Faculty members' views on the lack of value given to geography education by stakeholders:

- "The field of geography education is experiencing a development that is disconnected from stakeholders, unplanned and dependent on individuals." (P26)

The statements of the participants include problems in the field of geography education, especially that geography is related to all kinds of social and science fields that we can think of such as education, planning, medicine, and culture, but this situation cannot be demonstrated. In these statements, it is expressed that the necessary efforts should be made to ensure that the studies in the field of geography education are communicated to stakeholders and valued.

Evaluating the statements of the participants, it is seen that the problems experienced in the field of geography education are largely due to factors such as academic appointment and promotion processes, inadequate communication and cooperation within the discipline, inability to conduct innovative and up-to-date research, teacher training system and stakeholders' perception level of geography education.

Table 8 shows the opinions of the faculty members on the sub-theme of rich literature.

Table 8. *Rich literature sub-theme*

Nr	Code	f	%	Valid Percentage (%)[1]
1	Teaching methods and techniques	22	3,39	24,44
2	Perception, attitude, and opinion	17	2,62	18,89
3	Examination of teaching programs	15	2,31	16,67
4	Concept teaching and misconceptions	10	1,54	11,11
5	Textbook analysis	6	0,92	6,67
6	Environmental education	5	0,77	5,56
7	Metaphor	5	0,77	5,56
8	Disaster training	4	0,62	4,44
9	GIS	4	0,62	4,44
10	Use of tools and materials	2	0,31	2,22
	Total	**90**	**13,87**	**100[2]**

[1] Valid percentage indicates the percentage value within the relevant category.
[2] The numbers in the table may not add up to the total due to rounding.

According to Table 8, based on the opinions of the lecturers, it is seen that most of the subjects intensively studied in the field of geography education are related to teaching processes. This situation poses a problem for the development of the field of geography education because, the field of geography education is not a field limited to teaching processes. In this field, it is also important to follow current developments, to examine the epistemological and ontological dimensions of geography science, to investigate the philosophical and historical foundations of geography science. It is thought that these issues are important to increase the scientific quality and depth of the field of geography education.

The opinions of the lecturers who emphasized the scope and content of the subjects studied in the field of geography education are as follows:

- "Curricula, book reviews, opinions and perceptions of students, teachers or prospective teachers on various geography themes, method-technical applications and their experimental results, and topics such as geographical information systems." (P33)

- "Learning-teaching methods, teaching programs and textbooks constitute an important part of research in the field of education." (P26)

According to the statements of the participants, it is seen that the opinions and perceptions of stakeholders (students, teachers, prospective teachers) have an important place in the studies carried out in the field of geography education.

The opinions of the lecturers who emphasized the strategies, methods and techniques used in the field of geography education are as follows:

- "In fact, we see that certain methods are tried on different subjects rather than a specific subject and that there is a lot of survey type studies." (P30)

- "The effect of teaching, methods, techniques and strategies on academic achievement is widely studied." (P28)

The statements of the participants show that methods, techniques, and strategies are the most important subjects that are considered to have a rich literature used in the field of geography education.

Evaluating the statements of the participants, it is seen that more qualified, original, and contributing research should be carried out in the field of geography education instead of studying similar and screening subjects.

Table 9 shows the opinions of the faculty members on the sub-theme of limited literature.

Table 9. *Limited literature sub-theme*

Nr	Code	f	%	Valid Percentage (%)[1]
1	Environmental education	11	1,69	15,94
2	Geographical skills	10	1,54	14,49
3	GIS	9	1,39	13,04
4	Collaboration with different disciplines	8	1,23	11,59
5	Special education in geography education	7	1,08	10,14
6	Classroom activities	6	0,92	8,7
7	Field applications	5	0,77	7,25
8	Alternative measurement tools	4	0,62	5,8
9	Philosophy of geography education	3	0,46	4,35
10	Material design	2	0,31	2,9
11	Technology supported applications	2	0,31	2,9
12	Climate change training	1	0,15	1,45
13	Scale development studies	1	0,15	1,45
	Total	**69**	**10,63**	**100[2]**

[1] Valid percentage indicates the percentage value within the relevant category.
[2] The numbers in the table may not sum to the total due to rounding.

It is thought that more research on the subjects in Table 9 will contribute to the diversity of subjects in geography education and increase the quality and effectiveness of the field.

The opinions of the faculty members regarding the subject areas in which they stated that there is a limited literature in the field of geography education are as follows:

- "Alternative measurement tools and their use in geography education, technology-supported applications, studies on the philosophy of geography education, quasi-experimental studies revealing the effects of alternative methods and techniques used in geography teaching on academic achievement." (P33)

- "I think that issues related to technology integration in education will become more important in the future. Issues related to the active inclusion of mobile phone applications in lesson processes are among the first areas that come to mind. The use of projectors, interactive whiteboards, AR, and VR are among the topics that I think have not been sufficiently studied. I also think that in-service trainings and studies to provide teachers with the use of web tools are not sufficiently studied. Virtual reality studies will become very, very important for geography education like medical education. Such technologies will provide great convenience

especially in teaching the subjects that are difficult to teach to the students." (P4)

Evaluating the statements of the participants, it is seen that there is a limited literature on alternative assessment and evaluation methods, technology supported geography teaching, geography curricula, metacognitive skills and gifted students, geographical skills, environmental education and practices, field studies. Most of these subjects, which are studied in a limited number in the field of geography education, are also open to innovation. This situation poses a problem in terms of dynamism and subject diversity in the field of geography education because, the field of geography education should not be limited to stereotyped subjects but should also include new approaches and interdisciplinary connections.

Theme-3: Expectations

This theme consists of two sub-themes and a total of 8 code expressions that make up these sub-themes. These are *"the future of the field"* and *"researcher profile"* sub-themes. The codes forming these sub-themes and the opinions of the faculty members are given, respectively.

Table 10 shows the opinions of the faculty members on the sub-theme of the future of the field.

Table 10. *Future of the field sub-theme*

Nr	Code	f	%	Valid Percentage (%)[1]
1	In a better position if certain criteria are met	30	4,62	63,83
2	It is clear that there is a long way to go	6	0,92	12,77
3	It'll be in worse shape than it is today	5	0,77	10,64
4	It'll be in better shape than it was today	3	0,46	6,38
5	There will be an unplanned development	3	0,46	6,38
	Total	**47**	**7,24**	**100**[2]

[1] Valid percentage indicates the percentage value within the relevant category.
[2] The numbers in the table may not sum to the total due to rounding.

The opinions of the faculty members who stated that teaching methods, techniques and approaches will affect the future of the field of geography education are as follows:

- "The question "How can we improve geography education in the current situation/conditions?" needs to be answered with the participation of all stakeholders. Geography education will be better than the current situation by providing learning environments where students are active, activity-based teaching, teaching by doing/experiencing in out-of-class teaching environments and learning to learn strategies are used." (P27)

- "As in the case of teaching geomorphological subjects, geography education is in a constant renewal. As a result, this field is a dynamic field of study. Therefore, I think that new fields of study will emerge in the future and will replace only the studies on the application of teaching principles and methods or the studies on the examination of curricula. I think that especially the developments in the field of educational technologies will create many new study topics for geography education." (P3)

The statements of the participants indicate the role of changing teaching methods and technology in geography education. Accordingly, the importance of developing new educational technologies and methods for geography education is emphasized.

The opinions of the faculty members who stated that academic development and research topics will affect the future of the field of geography education are as follows:

- "My suggestion to young researchers is to carefully examine the trend of studies in the field of geography education. Most of the studies are a repetition of each other. There are still significant deficiencies in skills education and value education. I think there is a need for qualified studies on this subject. In order to produce qualified studies on geography education, a good knowledge of the field is also needed. Since those who do postgraduate education in field education tend to move away from the field, the studies conducted tend to shift to the field of educational sciences. In order to train good geography educators, strong field knowledge and methodological knowledge are needed. Another issue is that the articles of the researchers are on a wide

variety of subjects. Increasing the number of researchers who concentrate on certain subjects as much as possible will also increase the quality." (P10)

- "My most important recommendation for new researchers who want to contribute to the field and develop themselves in this field is to take the challenge and turn to areas where there are fewer studies in the national literature and continue their professional development in these areas. Unfortunately, it does not contribute to oneself and the field to work on the same subjects by taking the easy way out. In addition, following the international literature closely and giving the necessary importance and priority to the subjects in the field of geography can be another recommendation." (P1)

Evaluating the statements of the participants, it is seen that in order to conduct qualified studies in the field of geography education, it is necessary to have good field knowledge and methodological knowledge. In addition, it is emphasized that it is important for researchers who want to contribute to the field of geography education to focus on problem solving instead of descriptive studies.

The opinions of the faculty members who stated that institutional cooperation will affect the future of the field of geography education are as follows:

- "I am hopeful about this issue. I think it would be necessary and useful for Turkish Ministry of National Education (MEB) and universities to act together and carry out universal studies at the international level. But if MEB and universities continue to be disconnected, everyone will continue to ask which geography you are from, and geography and geography education will gradually become ordinary rather than being an important science or subject." (P24)

The statements of the participants emphasize the importance of institutional cooperation in the field of geography education. In addition, by developing the capacity of institutional cooperation in the field of geography education, it may become possible to develop holistic solutions to local, regional, and global problems and to demonstrate the social benefit of geography education.

The general evaluation of the field of geography education and the opinions of the faculty members regarding the expectations for the future are as follows:

- "Geography was once devalued and discredited in the world. However, I can say that it has started to gain value again with the recent disasters, climate changes, and the increase in problems such as war, turmoil, migration and asylum-seeking in the world. I think that geography and geography education will be valued and respected in Türkiye after a while." (P9)

- "Geography is the ancestor of sciences. As long as human life continues in the world, we have to try to recognize and understand the world. This applies to the whole world. Geography will continue to exist as a popular science when geography educators plan their education to meet the needs of people. However, if they continue to teach place names, the need for geography education will disappear thanks to the developing technology." (P2)

Evaluating the statements of the participants, it is seen that they include different perspectives on the future of geography education. While some participants presented a hopeful perspective on the development of geography education, others expressed concern that the field may lose its importance. However, it is seen that the views of the participants generally converge on issues such as renewal of teaching methods and techniques, diversification of research areas and institutional cooperation. Suggestions and expectations for the future of the field focus on the need to make efforts on various issues in order to preserve the value of the field and to be at a higher level than today.

Table 11 shows the opinions of the faculty members on the researcher profile sub-theme.

Table 11. *Researcher profile sub-theme*

Nr	Code	f	%	Valid Percentage (%)[1]
1	Good command of methodology	16	2,47	72,73
2	Mastering the literature	3	0,46	13,64
3	Good command of foreign languages	3	0,46	13,64
	Total	**22**	**3,39**	**100**[2]

[1] Valid percentage indicates the percentage value within the relevant category.
[2] The numbers in the table may not sum to the total due to rounding.

The opinions of the lecturers regarding the knowledge of research methods are as follows:

• "Firstly, they should follow the publications made in countries with developed geography education. Afterwards, they should adapt them to the realities of our country, but they should not take them exactly. In addition, rather than theoretical studies, I suggest that they should focus on practical studies in schools and studies that teachers can easily turn into reality in classrooms." (P15)

• "First of all, I recommend them to do in-depth reading on scientific research methods. The most common mistake is to move away from the field. We encounter geography education studies without geography in them." (P13)

Participant statements emphasize the importance of young researchers to complete their deficiencies in research methods and to use various methods such as action research and long-term studies in research.

The opinions of the lecturers regarding the knowledge of the literature are as follows:

• "The studies should be analyzed well, and problems should be identified to solve the problems. Based on this, new study topics can be determined. Applying scientific research methods and geographical methodology in accordance with the rules and meticulously will increase the validity and reliability of the results. I think that the application of the subjects and methods studied not only in the field of geography education but also in different fields of education in geography education and examining the results will contribute to the development of the field. In addition to all these, I can state that the international context of geography education is an issue that researchers who want to contribute to the field should not overlook." (P3)

• "Young researchers who will work in this field should learn their field very well. First, they will learn the subjects they will teach and then they will study how to teach them. In other words, they will study both education and field. Apart from this, they have to give importance to applied studies and try new methods or new ways of teaching." (P30)

The participant statements in this area focus on the field knowledge of young researchers. Accordingly, young researchers should have in-depth knowledge in their field, learn the subjects they work in very well and increase their level of expertise, and for this purpose, they should have a good command of the relevant literature.

Faculty members' views on foreign language knowledge are as follows:

• "They should definitely improve their foreign languages, increase their foreign connections, and do joint work in projects and publications." (P33)

• "Firstly, foreign studies should be examined, and a trend analysis should be made. The last 10 years of reputable geography education journals in the world should be carefully analyzed." (P16)

According to the statements of the participants, a good command of a foreign language can provide young researchers with the opportunity to both improve their field knowledge and to take part in various tasks in international studies.

DISCUSSION, CONCLUSION, RECOMMENDATIONS

According to the general findings obtained in this study, 96 code expressions were generated from the opinions of the faculty members regarding the orientations in the field of geography education. The code expressions obtained from the opinions of the faculty members about their orientations in the field of geography education were grouped under three themes: *"orientations"*, *"problems"* and *"expectations"* by using the interview form questions prepared according to the purpose of the research. Under the theme of orientations, there were four sub-themes: *"study subjects"*, *"reasons for subject preference"*, *"research orientations"* and *"effective events and phenomena"* and codes expressing them.

In the sub-theme of reasons for topic preferences, the lecturers stated that they were mostly influenced by previous studies and/or determined the study topics according to their wishes. Scientific research starts with a problem, and the aim is to find a solution to this problem. In determining the research question (problem), the situations we encounter in our daily lives, the practices we do, or the findings of previous studies in the literature or various theoretical frameworks can be the sources (Büyüköztürk et al., 2020). In this context, it was determined that the lecturers were determined by previous studies, requests, and needs while determining their subjects.

In the sub-theme of research orientations, faculty members stated that research orientations in the field of geography education are generally formed under the influence of current developments, researchers' interests, and international orientations. In Yavan's (2005, p. 27, 2019, p. 121) study, in which he comparatively analyzed Türkiye's international publication performance in geography (1945–2015) using the Web of Science database (with the last ten years between 2005 and 2015), he stated that the internationalization level of Turkish geography is extremely low; however, a positive process has started in recent years, albeit partially.

In the sub-theme of effective events and phenomena, the faculty members stated that the administrative organization and the legislative changes that developed accordingly were effective on the events and phenomena affecting the field of geography education. They stated that the low number of field educator lecturers affects this discipline the most, and then the structuring in higher education affects the field. In relation to this, issues related to the fact that geography is only seen as two subfields of human and physical geography and that it is a recent discipline area were also mentioned.

The opinions of the faculty members consisted of three sub-themes under the theme of problems, namely *"problems"*, *"rich literature"* and *"limited literature"*. The opinions of the faculty members regarding the problems in the field of geography education can be generally expressed as problems related to secondary school geography courses, university geography courses, criteria for admitting students to the programs, academic structure, quality of studies, quality of researchers, and legislation. Faculty members stated that the most common problems are studies far from practice, the distance between the field and field education, and being disconnected from stakeholders.

Comparing the codes obtained from the opinions of the faculty members regarding the rich literature and the limited literature, it is seen that the topics of GIS and environmental education are included under two sub-themes. This situation shows that the faculty members have different views on these issues. This situation can be interpreted as requiring further discussion and research on the role and importance of geographical information systems and environmental education in geography education.

The Turkish higher education system has undergone a major expansion process in order to meet the demand for higher education. In this process, while the number of students has increased significantly, the increase in the number of teaching staff has remained more limited (Ozer, 2011). Similar problems are also valid in geography departments. The insufficient number of teaching staff also affects the quality of education. Lecturers' course loads increase excessively, they have to teach courses that are not related to their specialization areas, and they cannot find the necessary time for academic research. (Sezer, 2016). The way to meet the need for teaching staff is to train more PhD graduates. The number of PhD graduates in Türkiye is

quite low compared to other OECD (Organization for Economic Co-operation and Development) countries of similar size in terms of population and number of higher education students. (Çetinsaya, 2014). In this context, in order to ensure the transfer of knowledge and experience between different generations in the academic field and to increase productivity, new entrants to academic careers should be encouraged. (Akçiğit & Özcan-Tok, 2020).

It is important that successful students are selected with equal weight scores as the student quotas to be admitted to the undergraduate programs of the department of geography education in faculties of education. (Nişancı, 2002). Despite the more than twenty years that have passed, this expectation of the faculty members regarding the selection of students for the department has not changed, and this situation remains current. It is also known that the problems related to the field have been waiting to be solved for a very long time; because the problems related to the curricula, teachers, measurement and evaluation, course materials, and textbooks in geography teaching in Türkiye have been continuing since the past. (Ilgar, 2006). In this context, there is a need for practical and problem-based studies and developments, as stated in the opinions of the faculty members.

The repeated examination of a study topic in recent studies can be seen as a problem because it should be aimed at adding innovation to the field and creating a new research agenda instead of a problem that has already been studied in the literature. Excessive study of some topics in the field of geography education may harm the diversity of that discipline. Because subjects other than certain subjects are neglected or do not attract enough attention. This situation narrows the scope of that discipline or makes it unidirectional. In this context, the fields of study that faculty members think there is a rich literature on are, firstly, teaching methods and techniques and studies that examine the perceptions, attitudes, and opinions of teachers, prospective teachers, and students at various levels on any subject.

The fact that there are areas in a branch of science where not enough studies are carried out is an expected situation in accordance with the nature of scientific developments. However, the understudy of some subjects in geography education may negatively affect the development of the field of science because the knowledge of understudied subjects remains insufficient, different perspectives cannot be developed, new methods and techniques do not emerge, existing problems cannot be solved, or new problems cannot be identified. For this reason, considering the needs of the country, conducting research in areas where there are fewer studies according to the interests and wishes of the researchers can open new horizons. In their statements, faculty members stated that there is a need for more studies in the fields of environmental education, geographical skills, and GIS in the field of geography education.

Under the theme of expectations, two sub-themes were formed: *"the future of the field"* and *"researcher profile"*. According to the opinions of the faculty members, the most frequently produced code about the future of the field of geography education is related to the fact that it will be in a better position if certain criteria are provided. Based on the opinions of the faculty members, it is understood that the criteria to be provided are practical, problem solving, making students feel its importance, compatibility with the international literature, activity-based teaching, teaching by doing or experiencing in out-of-class teaching environments, and providing learning environments where learning to learn strategies are used. In addition to this, there were also opinions expressing that the field would experience an unplanned development or that it would be in a worse situation than it is today. Therefore, it is possible to create positive and negative scenarios about the future of geography education in Türkiye.

According to the opinions of the faculty members, the characteristics that researchers who want to contribute to the field of geography education should have gathered around three codes. These codes consist of "mastering the methodology", "mastering the literature" and "knowing foreign language well". These code expressions suggest that building a better future requires innovative vision and practices in every field of education. Today, in education, as in other fields, having sustainable competitive power depends on the development and realization of innovation potential (Pehlivanoğlu, 2011). Therefore, young researchers need

to know and understand the basic concepts, theories, methods, and practices of geography and geography education. In this way, they can identify the current situation, problems, and needs of the field, produce new knowledge, and offer solutions. According to the lecturers, it is thought that the presence of researchers who have a good command of methodology will contribute to the field. Geography education benefits from all kinds of methodological designs and techniques, each of which serves a different purpose based on individuals' inquiries and research questions. (Zadrozny et al., 2016). In scientific research, methodology forms the backbone of the research. The aim of the scientific method is to ensure that scientific observations are obtained objectively (Ertekin et al., 2002). In addition, it is a compulsory approach to support and associate the subject area researched in scientific studies with the information in the literature. (Yıldız, 2022). In this way, researchers can gain scientific prestige and increase the social benefit of research. Developments in the field of geography education in our country cannot be separated from the rest of the world. For this reason, it can be stated that the researchers' good level of foreign language skills will make it easier for them to follow the publications abroad. In addition, it is important to cooperate with other disciplines and conduct interdisciplinary studies while conducting research on geography and geography education. In this way, researchers can create a scientific richness in the field, benefit from different perspectives, and enrich the scope of the research. It is thought that these opinions and suggestions of the faculty members can help young researchers develop both themselves and the field of geography education.

In the field of geography education, no study has been identified to determine the orientations and research traditions in the field by using the opinions of faculty members. Therefore, the findings of this study were compared with the findings of one study in human geography and two studies in educational administration. Accordingly, Özgür's (2018) The findings of the study have shown that concepts such as lateness, actor dependency, superficiality, limitation, mediocrity, and inadequacy or deficiency can be used to describe the current state and future of Turkish human geography. However, the research also revealed that there have been some positive changes in Turkish human geography in recent years. In addition, as a result of a study aiming to reveal how academic staff working in the field of educational administration perceive the status of the field as an academic discipline, it was determined that academics think that the field of educational administration has a complex and problematic structure. These problems are related to the characteristics of research and academics, knowledge base, professionalization, and socio-political context. (Örücü, 2006). Similarly, in this study, faculty members expressed common problems such as insufficient foreign language skills, limited academic cooperation and communication opportunities, a low number of faculty members, and a heavy workload. In a study aiming to reveal the philosophical foundations of research in the field of educational administration and the characteristics of the research tradition, four themes and related categories were identified: ontological assumptions, epistemological assumptions, teleological assumptions, and social and individual factors. Among these categories, academic appointment and promotion criteria constitute the core of the research tradition in the field (Demirhan, 2015). Similarly, in this study, faculty members stated that the criteria for promotion and appointment to faculty membership were important factors affecting the field.

To summarize, geography provides people with useful information that applies to every stage of life and confronts them with many facts about the place that are of vital importance. The observation of many of these facts provides useful information that can be used in practical life (Ardel, 1951, p. 195). In this context, it is thought that geography and therefore geography education would maintain their importance if the conditions stated by the lecturers were met because, according to some claims and beliefs, geography is not a huge set of knowledge that has no philosophical basis, is the product and scope of other sciences, includes everything, or is a dependent science that is overshadowed by other sciences and develops on them. Geography is not a dictionary or an encyclopedia that classifies various events, which are the objects of different sciences, according to region, country, and its own criteria instead of alphabetical order and presents them with explanations from other sciences. It is not terminology or a simple inventory (Tanoğlu, 1964). One of the main functions of the science of geography is to investigate the spatial relationships between events analyzed by many different sciences, and this should be done by the discipline of geography. In today's world, where events

are changing very rapidly and rapidly developing conflicts are taking place, geographical analyses that need to be made on a global scale are needed today more than yesterday (Sevgi, 1984).

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Investigation of Communication Skills and Subjective Well-being Levels in Helping Professional Groups[1]

Ayşen Kovan[1] 🆔 **Gülen Uygarer[2]** 🆔

[1] Department of Psychological Counseling and Guidance, Atatürk University, Erzurum, Türkiye
ayseen26@hotmail.com

[2] Department of Psychological Counseling and Guidance, Eastern Mediterranean University, Famagusta, Turkish Republic of Northern Cyprus
gulen.uygarer@emu.edu.tr

Article Info	ABSTRACT
	This study examines the correlation between communication skills and subjective well-being among undergraduate students in the psychological counseling and guidance and nutrition and dietetics programs. The research, which involved 430 university students as professional candidates, investigates the impact of program, gender, grade, perceived parental behaviors, and residence on both subjective well-being and communication skills. The results indicate a significant correlation between effective communication, well-being, and family influences, highlighting their crucial role in personal and professional development. It is worth noting that gender differences in subjective well-being and communication skills levels were identified, with females exhibiting higher scores. These findings have important implications for the design of psychoeducation programs and support measures. The study provides guidance for tailoring interventions to address gender-specific needs and recognizes the influential role of familial factors in cultivating communication and well-being competencies of students in counseling and nutrition-related disciplines.

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[1] This study is derived from a master's thesis on "Investigation of university students' subjective well-being levels with some variables in terms of communication skills" completed by the first author under the supervision of the second author.

[1] Parts of the study were presented as an oral presentation at the 1st International Conference on Cultural Informatics, Communication & Media Studies (CICMS; May 3-4, 2018) and the International Congress of Humanities and Social Sciences (BESOS; November 4-5, 2021).

INTRODUCTION

The development of innovative technology has profoundly affected our day-to-day existence, especially in the area of interpersonal relationships. The way individuals communicate with one another have changed as a result of the increasing use of social media, virtual platforms, and digital communication technologies. Global networking has been made easier by these technologies, as they allow for quick and easy communication over great distances (Green & Guinery, 2023). However, the quality and depth of interpersonal relationships may be compromised by the usage of smartphones and social media (Sbarra et al., 2019). According to Sun and Miller (2023), misusing these technologies can cause an individual to become distanced from interpersonal relationships. Moreover, Lundy and Drouin (2016) contend that interactions in individual can lose their emotional impact, while Kurtzberg and Gibbs (2017) discovered that individuals can become sidetracked by digital connections even while they are physically present. Maintaining good relationships requires finding a balance between digital and face-to-face contact. Furthermore, excessive social media use might lead to weak interpersonal connections (Sutcliffe et al., 2023). Face to face relationships have lost significance in favor of how one presents their life on these types of platforms. In order to witness the effects of technology today, one may say that social interactions and traditional ways of communication have been supplanted by virtual relationships (Kovan, 2017). Sutcliffe et al. (2023) claim that using technology can lead to a decline in interpersonal relationships and emotional intimacy. Recognizing how technological improvements affect interpersonal interactions in two ways is crucial. They provide opportunities for social interaction and communication, but they also put pressure on the depth and quality of connections between individuals (Guerrero et al., 2017). When it comes to using innovative technologies as tools for connection rather than disconnection, it is vital to keep a balanced perspective.

Bytiak et al. (2020) have observed a notable increase in the impact of technologicalization on social structures and individual behavior patterns. While individualization has increased recently, communal types of behavior were more common in the past (Malpas, 2013). Individuals can currently express their interests, views, and lifestyles and personalize themselves thanks to the growing availability of technologies like smartphones and personalized digital platforms. Social media breaks down geographical boundaries by allowing users to connect with like-minded individuals and show their identities in a variety of ways. The usage of technology for individualized requirements is supporting the trend toward uniqueness (Harari et al., 2016). Individuals can obtain content tailored to their tastes through algorithms and personalized recommendation systems.

Communication is a social process that involves the transfer of information between individuals or groups through verbal and non-verbal signals. Communication skills (CS) refer to the ability to effectively and purposefully transmit and receive information, including verbal and non-verbal aspects such as speaking, body language, and active listening (Korkut-Owen & Bugay, 2014; Reith-Hall & Montgomery, 2023). According to Kovan (2017), social success, professional development, and interpersonal relationships are crucial. As mentioned earlier, individuals today are more focused on individuality and subjective well-being (SWB). SWB is a positive psychology concept that highlights the importance of individuality (Diener & Suh, 2003), and it is to an individual's subjective perception of their happiness, satisfaction, and quality of life based on personal experiences, values, and perspectives. It encompasses various factors, including positive and negative affects, and life satisfaction. Measuring and analysing SWB is an important process as it provides insights into an individual's quality of life and mental health, contributing to the development of measures to promote well-being (Diener & Suh, 2003). The analysis of SWB, which includes cognitive and affective components, require a subtle approach. It is intrinsically connected to psychological, cognitive and emotional states. A comprehensive understanding of SWB is an important for developing interventions that foster individuals' well-being. The decisive role of SWB in shaping interpersonal dynamics and cognitive processes is further accentuated by the interplay between SWB and communication processes. It is suggested that an individual's sense of well-being is closely linked to their communication efforts, which can affect the quality and effectiveness of interpersonal interactions (Carmack, 2014). Therefore, exploring the relationship between

SWB and communication processes has the potential to advance frameworks and inform practical strategies that promote mental health and well-being in various contexts. The components of these two concepts, CS and SWB, which are an important acquisition and element of both personal and professional lives of individuals, are shown in Figure 1.
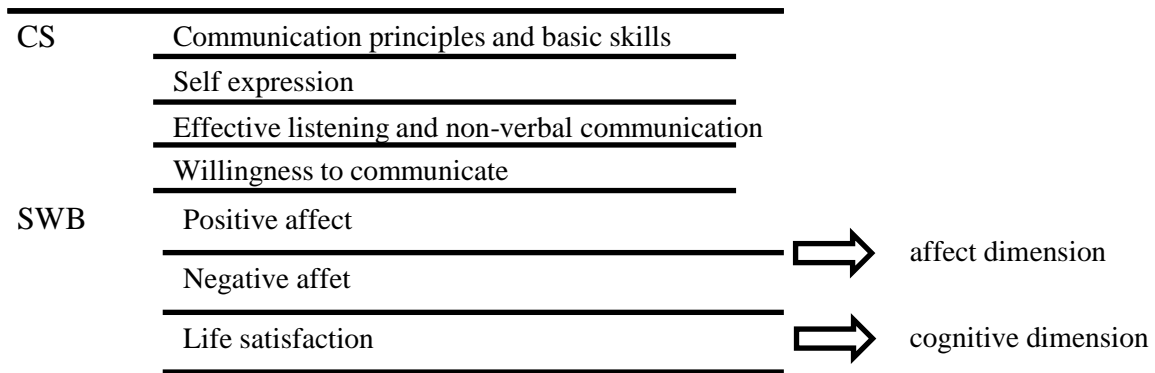

Figure 1. *Components of CS (Korkut-Owen & Bugay, 2014) and SWB (Diener & Suh, 2003)*

The literature supports a positive correlation between CS and SWB (Bae et al., 2021; Tekel & Erus, 2023). For instance, individuals with strong interpersonal CS tend to experience higher levels of life satisfaction (Demirdag, 2021) because effective communication not only ensures the clear expression of needs and desires, but also encourages understanding and empathy between individuals (Cairns et al., 2021). Individuals who can express their thoughts and feelings appropriately while being sensitive to others' communication tend to experience more positive social integration and emotional and psychological resilience (Cerit & Şimşek, 2021; Çiftçi, 2023). Thus, the development of CS not only facilitates the effective transfer of information but also plays an important role in enhancing individual SWB and improving the quality of interpersonal relationships.

Besides, their importance in individual lives, these elements are also valuable in helping professions. Establishing and maintaining healthy communication, understanding clients' well-being, and contributing to their well-being levels are key points in the counselling process (Ratts et al., 2016). Effective communication is crucial for counsellors to understand and help their clients. Addressing the SWB and coping strategies of students can guide helping professionals in setting goals and measures. The aim of this study is to examine the levels of SWB and CS of future candidates in psychological counselling and guidance (PCG) and nutrition and dietetics (ND) programs among undergraduate students at Eastern Mediterrenean University (EMU). In the present study, selected PCG and ND programs because they both address key factors that impact clients' health and well-being. The PCG program aims to promote well-being and develop effective CS by focusing on clients' psychosocial needs (Demirtas-Zorbaz & Ulas, 2015). The ND program aims to provide clients with in-depth knowledge and skills in nutrition and diet. This also enables them to offer professional support in healthy living and nutrition (Lawrence et al., 2016). The sample group chosen for this programs were considered appropriate. Therefore, both programs aim to contribute to the well-being of individuals and assist them from a holistic health perspective. This can broaden the scope of the present study and provide a comprehensive understanding of the SWB and CS of the identified candidates in the helping professions. The present study explores these variables in detail, including program type, gender, grade level, perceived parental behavioral types, and place of residence. The aim of this analysis is to determine the SWB of students and understand the potential effects of these states on different variables. By doing so, that can gain a deeper understanding of students' perceptions of these critical issues and assess the interaction of relevant factors.

METHOD

Research Design

The present study employed a quantitative research methodology, which emphasises drawing conclusions and identifying patterns within a given population. This methodology enables a methodical and organised investigation, allowing for the measurement and quantification of variables. As a result, it provides a more objective and generalised understanding of the research questions at hand (Fryer et al., 2018). The use of a survey as a research design is consistent with the chosen quantitative methodology, and also they are effective in gathering statistical data from a large sample of participants, making them well-suited for quantitative research. This approach also enables the collection of responses to predetermined questions, facilitating standardized data collection and subsequent statistical analysis (Mellinger & Hanson, 2020). Surveys are an effective tool for providing a snapshot of participants' perceptions, attitudes, and behaviors. From the point of view of the present study, they contribute to the aim of comprehensively examining the SWB and CS of PCG and ND programs candidates in relation to various variables, such as program type, gender, grade level, perceived parental behavior types, and place of residence.

Research Sample

This study utilised the relational model and employed purposive sampling to select 430 participants, consisting of 236 3rd and 4th year PCG students (55%) and 194 ND undergraduate students (45%). The reason for using a relational model is to examine possible correlations and differences between PCG and ND undergraduate students in this study. Purposive sampling aims to investigate the characteristics of these groups in more depth by selecting groups of participants with certain characteristics (Cohen et al., 2002). In the present study, undergraduate programs in the group of two different but common purpose helping professions. In this way, by using the relational model and purposive sampling, the correlations and differences between student groups with certain characteristics were examined more effectively. The majority of participants were female (58%) and 3rd year students (57%) from a state university (EMU) in Northern Cyprus. The present study also noted that the majority of students resided in urban areas (85%). The undergraduate students in both programs responded to the perceived behavior type of mother (68%) and father (56%) as tolerant-reassuring.

Research Instruments and Processes

Subjective Well-being Scale

The scale developed by Dost (2005) consists of 46 items and a five-point Likert type (1 = not suitable at all, 5 = completely suitable). The aim of the scale is to determine the level of subjective well-being by determining the cognitive evaluations of individuals about their lives and the frequency and intensity of positive and negative emotions they experience. A higher score indicates a higher level of SWB. The scale was subjected to factor analysis, resulting in a Cronbach's α coefficient of .93. The stability coefficient was calculated through test-retest, with a Pearson product-moment correlation coefficient of .86. In this study, the calculated Cronbach's α was .84.

Communication Skills Scale

The scale, consisting of 25 items and a five-point Likert type (1 = never, 5 = always), was developed by Korkut-Owen and Bugay (2014) to determine the levels of communication satisfaction among students. A higher score on the scale indicates a higher positive level of CS. The internal consistency coefficients of the subscales of the scale, which are communication principles and basic skills, self-expression, active listening and non-verbal communication, and willingness to communicate, were determined as .79 for communication principles and basic skills, .72 for self-expression, .64 for active listening and non-verbal communication, and .71 for willingness to communicate. The internal consistency coefficient of the scale was found to be .88, and the Pearson's product-moment correlation coefficient was .81 as a result of the test-retest. For this study, Cronbach's α was calculated to be .78.

Data Analysis

The application process was conducted in accordance with ethical guidelines, following the necessary permissions obtained from the deanships of the faculties where the scales would be applied. Prior to distribution, the authorized personnel of the relevant units were interviewed, and suitable days and hours were determined. Prior to the application, the students received a brief explanation of the research's aim and the measurements that would be taken. They were also assured that their personal information would be kept confidential. The data was analysed using Pearson correlation, t-test, and multiple variance analyses with IBM SPSS (v.23). The correlation between SWB and CS was examined first, followed by the application of t-tests (gender, program, grade, place of residence), and Kruskal Wallis-h tests (perceived types of parental behavior) to determine significant differences.

Ethic

The Eastern Mediterranean University Scientific Research and Publication Ethics Committee approved the present study with decision number ETK00-2017-0049 (2017/39-22).

RESULTS

Pearson correlation analysis was conducted to establish the correlation between undergraduate students' SWB and CS levels. The results revealed a significant positive correlation between undergraduate students' SWB and CS levels ($r_{pearson}$ = .55, $p < .05$).

Table 1. *Program and correlation between SWB and CS*

Program-SWB	N	M	SD	Df	t	p
PCG	236	165.52	23.81	428	-.16	.87
ND	194	165.89	24.25			
Program-CS	**N**	**M**	**SD**	**Df**	**t**	**p**
PCG	236	94.75	11.71	428	1.90	.06
NS	194	92.54	12.41			

The independent t-test did not find a significant difference in the SWB of students based on their program (t(428) = -.16, $p > .05$). Likewise, there was no significant difference in the levels of CS between the PCG and ND programs (t(428) = 1.90, $p > .05$).

Table 2. *Gender and correlation between SWB and CS*

Gender-SWB	N	M	SD	Df	t	p
Female	249	167.80	23.43	428	2.15	**.03**
Male	181	162.79	24.48			
Gender-CS	**N**	**M**	**SD**	**Df**	**t**	**p**
Female	249	95.31	12.00	428	3.17	**.00**
Male	181	91.61	11.86			

A significant difference was found between the SWB levels of male and female undergraduate students (t(428) = 2.15, $p < .05$), with females (X = 167.80) reporting higher levels of SWB than males (X = 162.79). Similarly, a significant difference was found between gender and CS levels (t(428) = 3.17, $p < .05$), with females (X = 95.31) reporting higher levels of CS than males (X = 91.61).

Table 3. *Grade and correlation between SWB and CS*

Grade-SWB	N	M	SD	Df	t	p
Junior	246	165.78	24.34	428	.09	.93
Senior	184	165.57	23.55			
Grade-CS	**N**	**M**	**SD**	**Df**	**t**	**p**
Junior	246	94.54	12.05	428	1.56	.12
Senior	184	92.70	12.04			

There was no significant difference found between grade and SWB level (t(428) = .09, $p > .05$). Similarly, the results of the t-test conducted to determine whether there was a significant difference between grade and CS levels also showed no significant difference (t(428) = 1.56, $p > .05$).

Table 4. *Perceived mother behavior type (PMBT) and correlation between SWB and CS*

PMBT-SWB	N	RM	SD	X²	p	
Dominant-authoritarian	29	267.74				
Over-tolerant	36	200.44				
Unstable-erratic	11	207.14				
Over-protective	38	198.36	6	9.65	.14	
Tolerant-reassuring	292	211.47				
Inconsistent	9	233.67				
Perfectionist	15	267.80				
PMBT-CS	**N**	**RM**	**SD**	**X²**	**p**	**Difference**
1Dominant-authoritarian	29	148.38				
2Over-tolerant	36	173.71				
3Unstable-erratic	11	218.05				1-5
4Over-protective	38	197.01	6	20.31	**.00**	1-7
5Tolerant-reassuring	292	227.66				
6Inconsistent	9	180.61				
7Perfectionist	15	274.77				

The study found no significant difference between the PMBT and SWB scores of the undergraduate students ($X^2_{(6, 430)}$ = 9.65, $p > .05$), indicating that PMBT does not predict SWB. However, a significant difference was found between PMBT and CS scores ($X^2_{(6, 430)}$ = 20.31, $p < .05$), suggesting that PMBT has an effect on CS. The Kruskal Wallis H-test was used to determine if there was a significant difference between the groups, and multiple comparisons were used to determine the difference between the groups. The analysis revealed significant differences between the dominant-authoritarian (X = 148.38), tolerant-reassuring (X = 227.66), dominant-authoritarian (X = 148.38), and perfectionist (X = 274.77) behavior types.

Table 5. *Perceived father behavior type (PFBT) and correlation between SWB and CS*

PFBT-SWB	N	RM	SD	X²	p	Difference
1Dominant-authoritarian	74	224.16				
2Over-tolerant	30	238.03				
3Unstable-erratic	19	189.84				
4Over-protective	25	273.80	7	15.05	**.03**	7-4
5Tolerant-reassuring	241	205.77				5-4
6Inconsistent	22	251.73				
7Rejector	5	106.20				
8Perfectionist	14	201.71				
PFBT-CS	**N**	**RM**	**SD**	**X²**	**p**	**Difference**
1Dominant-authoritarian	74	184.51				
2Over-tolerant	30	193.98				
3Unstable-erratic	19	180.79				
4Over-protective	25	230.68	7	24.05	**.00**	6-5
5Tolerant-reassuring	241	234.45				6-4
6Inconsistent	22	145.20				6-8
7Rejector	5	131.80				
8Perfectionist	14	259.50				

A significant difference was found between the scores of PFBT and SWB, $X^2_{(7, 430)}$ = 15.05, $p < .05$. Therefore, it can be concluded that PFBT has an impact on the SWB levels of undergraduate students. Furthermore, a Kruskal Wallis H-test was conducted to identify the groups with significant differences, and the differences between the groups were determined through multiple comparisons. The analysis revealed a significant correlation between the rejector group (X = 106.20) and the over-protective group (X = 273.80), as well as between the tolerant-reassuring group (X = 205.77) and the over-protective group (X = 273.80). Additionally, there was a significant difference between the PFBT and CS scores of the students ($X^2_{(7, 430)}$ = 24.05, $p < .05$), indicating that PFBT has an effect on CS. Following this stage, the Kruskal-Wallis H-test was used to analyse the differences between groups and determine which groups exhibited significant differences. The results showed a significant correlation between the inconsistent (X = 145.20) and tolerant-reassuring (X

= 234.45) groups, as well as between the inconsistent (X = 145.20) and over-protective (X = 193.98) groups, and finally between the inconsistent (X = 145.20) and perfectionist (X = 259.50) groups.

Table 6. *Place of residence and correlation between SWB and CS*

Residence-SWB	N	M	SD	Df	t	*p*
Rural	66	156.39	21.77	428	-3.47	.00
Urban	364	167.37	24.00			
Residence-CS	N	M	SD	Df	t	*p*
Rural	66	88.27	11.32	428	-4.08	.00
Urban	364	94.75	11.95			

The comparison of SWB levels with the place where the students live resulted in a significant difference (t(428) = -3.47, *p* < .05). Specifically, students living in the city (X = 167.37) had higher levels of SWB than those living in rural areas (X = 156.39). However, the analysis revealed a significant difference (t(428) = -4.08, *p* < .05) between the place of residence of the students and their CS. Students residing in urban areas (X = 94.75) had higher levels of CS than those residing in rural areas (X = 88.27).

DISCUSSION, CONCLUSION, RECOMMENDATIONS

The aim of the present study was to examine the correlation between CS and SWB among 3rd and 4th grade undergraduate students who are candidates for psychological counselling and dietetics. The analysis examined several variables, such as gender, program, grade, perceived types of parental behavior, and place of residence. The findings were both expected and unexpected. Notably, no significant difference was found between grade and SWB and CS. Students in these two groups of helping professions, who are at the end of their education stages, can reflect on their SWB and CS due to the holistic and comprehensive education system and internships they receive. However, some studies in the literature report no significant correlation between grades and CS (Güldemir, 2023; Şahinoğlu, 2023). The present study indicates that an individual's CS can be influenced by their life experiences, social interactions, and personal development. It is important to note that while grade levels typically consist of a homogeneous student group, individual differences can still impact this correlation (Felder & Brent, 2013). Some studies in the literature report no significant correlation between grade and SWB (Duman, 2016; Turp, 2017), while others have found different results (Steinmayr et al., 2018; 2019). The presence of varying results in the assessment of grade in terms of SWB shows that it is a subjective measure that can be influenced by individuals' personal experiences, social interactions and various external factors. Examining the correlation between grade level and this measure can shed light on factors such as students' adjustment to academic demands, social development, and learning experiences (Steinmayr et al., 2018). In addition, the student population's heterogeneity can encompass personal differences that affect individuals' SWB.

Furthermore, a significant finding is that the presence and involvement of the mother plays a crucial role in the development of an individual, which is supported by the Attachment Theory (Bowlby & Ainsworth, 2013). It is widely acknowledged that primary caregivers have a significant impact on the development and personality of an individual. According to Videon (2005), both mothers and fathers have an equal degree of influence on their children's lives. However, the findings of this study suggest that while the type of mother's behavior perceived by the students had no effect on their SWB, the type of father's behavior perceived by the students made a significant difference to their SWB. This situation can suggest that the fatherly behaviors of the sample group, who grew up in a collectivistic society, had an impact on their subjective well-being. The fathers were active in the background but not as visible in the front (Gürmen & Kılıç, 2022). In summary, the correlation between PMBT and students' SWB may differ from that of PFBT due to various factors. For example, there can be differences in the roles of mother and father figures, and certain behaviors that impact students' SWB can vary between mothers and fathers (Nagy et al., 2023; Satrio et al., 2024). This fragment discusses the potential factors that can influence the effects of perceived parental behavior on children's psychosocial development. Additionally, it is worth noting that cultural and social factors can also contribute to the observed differences. Parental roles in different cultures can create varying norms and expectations for children's behavior (Lansford et al., 2023; Scheibling & Milkie, 2023). The apparent influence of the perceived

type of father's behavior can be attributed to the father figure playing a more influential role on the students.

Ultimately, the researchers concluded that there was no significant difference in the CS of students in the PCG and ND programs. Although both programs emphasise fostering mutual communication, empathy, interpersonal skills, and interaction, as outlined in the works of Ratts et al. (2016) and further supported by Kaya (2013; 2018), it was found that these shared characteristics did not have a significant impact on students' overall communication proficiency. The finding highlights the importance of program-specific knowledge and experiential nuances in promoting effective communication across disciplines. The undergraduate students who in these programs have different levels of knowledge and experience, which influence their initial interaction with the academic content. Furthermore, the development of CS during the program significantly contributes to their professional growth (Zhao et al., 2023). It is important to note that the diverse professional paths taken by students after graduation can greatly enhance their experiences (Ma et al., 2023). This, in turn, can improve their practical application of theoretical knowledge gained during their undergraduate education. The interplay between theoretical grounding and practical experience is crucial in developing CS in specialized academic programs (Yeşilyaprak, 2016). As undergraduate students progress in their professional development, they gain experiences that connect theoretical knowledge with practical application, providing valuable insights into the relationship between academic preparation and professional proficiency.

The present study research provides a comprehensive understanding of the intricate correlations between SWB and CS among undergraduate students enrolled in the PCG and ND programs as helping professional groups. The findings highlight the multifaceted factors that influence CS and SWB among students in these disciplines. The study highlights the importance of effective communication and a nuanced understanding of SWB, especially in counseling-oriented professions. Additionally, it recognizes the significant impact of perceived parental behaviors on both SWB and CS, emphasizing the pervasive role of family influences in shaping the personal and professional development of undergraduate students. These insights have valuable implications for the further development of educational programs and support measures tailored to undergraduate students in PCG and ND programs. It is important to acknowledge the significant influence of gender on SWB and CS levels, with females exhibiting higher scores. Educators and practitioners can tailor interventions to address potential gender-specific needs. Furthermore, the focus on parental behaviors informs the design of interventions that consider familial influences on undergraduate students' psychosocial and SWB and CS. The conclusions drawn from this research can serve as a foundational guide for refining curricula and implementing targeted support measures to enhance the competencies of students pursuing careers in PCG and ND. In addition to this, an exemplary psychoeducational program (Enhancing SWB and Enhancing CS) was developed based on the present study's findings. The program aimed to improve undergraduate students' ability to positively address SWB, CS, and perceived types of parental behavior.

Session 1 (Sessions 1-2): Awareness of SWB
1.1   Introduction and expectations:
Informing participants about the program's goals and its operational process.
Providing an opportunity for participants tos hare their expectations and goals.
1.2   What is SWB?
Definition and components of SWB
Strategies for enhancing SWB in daily life.
1.3   Personal assessment
Providing students with scales to assess their SWB levels.
Discussing assessment results and setting personal goals.
1.4   Practical skills
Deep breathing, mindfulness, and positive thinking exercises.

Session 2 (Sessions 3-4): Fundamentals of CS
2.1   The importance of CS
Daily life impacts of effective communication.
Fundamental elements of good communication.

2.2   Active listening and empathy
Developing active listening skills.
Empathic communication strategies and exmaple situations.
2.3   Open communication
Expression of emotions and skills for open communication.
Positive language usage in communication.
2.4   Role play and group activities
Role-playing and group activities to reinforce communication skills.

Session 3 (Sessions 5-6): Prental behaviors and their effects
3.1   Perceived parental behavior types
Description of parental behavior types.
Sharing and evaluating students' personal experiences.
3.2   Impact of parental behaviors on SWB
Information on how parental behaviors influence students' SWB.
3.3   Change strategies
Strategies to understand and positively change parental behavior.
Techniques for improving SWB through parental communication

Throughout the program, participants can receive regular feedback on SWB and CS. Initial and final assessments can be conducted to evaluate the program's effectiveness, allowing for a comprehensive analysis of its impact. This psychoeducation program proposal can be an important guide for psychological counsellors and nutritionists. It aims to increase participants' SWB and improve their effective CS. The program provides practical strategies that individuals can use to enhance their own well-being and also provides strategies to understand and change the effects of parental behaviour on SWB. It is thought that this implementation proposal can contribute to both the personal development of the participants, especially those in the helping professions, and to become more effective in counselling practices.

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Investigation of Parents' Level of Sociotelism with Their Views on Phubbing (Sociotelism) Behaviours of Their Children

Merve Temel[1]   **Hasan Er[2]**   **Adalet Kandır[3]**

[1] Necmettin Erbakan University, Ahmet Keleşoğlu Faculty of Education, Department of Preschool Education, Konya, Türkiye
mtemel@erbakan.edu.tr

[2] Bursa Uludag University, Yenişehir İbrahim Orhan Myo, Department of child development, Bursa, Türkiye
hasaner@uludag.edu.tr

[2] Gazi University, Gazi Faculty of Education, Department of Preschool Education, Ankara, Türkiye
akandir@gazi.edu.tr

Article Info	ABSTRACT
	The aim of this study is to examine the level of phubbing of parents with children in early childhood and their perspectives on their children's phubbing behaviours. The research was designed using a simultaneous nested model of mixed design, incorporating both quantitative and qualitative research methods. The study group for the research consisted of 183 parents with children in early childhood. The Personal Information Form, the Generic Scale of Phubbing adapted into Turkish by Orhan Göksün (2019), and the Phubbing (Sociotelism) in Early Childhood Questionnaire prepared by the researchers to explore parents' views on the phubbing behaviours of children in early childhood were used as data collection tools in the study. In the analysis of the data obtained from the Phubbing (Sociotelism) in Early Childhood Questionnaire, a weighted mean was calculated for the Likert-type questions, and content analysis was used for the open-ended questions in the questionnaire. When the mean scores obtained from the Generic Scale of Phubbing were examined, it was found that the mean from the nomophobia sub-dimension was relatively higher than the other sub-dimensions. In line with the qualitative findings obtained from the study, it was observed that parents' children mostly used mobile phones in a controlled or regulated manner. Parents stated that the reasons for their children's phone use were primarily loneliness or boredom, and they expressed dissatisfaction with their children's phone use. It was determined that parents mostly had difficulties due to their children's problem behaviours in using phones, had insufficient knowledge about the applications on the phones, had difficulty controlling the content, and felt inadequate in providing alternative activities instead of using phones.

INTRODUCTION

The development of information and communication media in the millennium period has brought about various changes, especially social change (Bungin, 2006). Modern society prefers to carry out various activities on their own using various technologies in order to individualise and disregard social conditions. Phubbing is a culture born from the uncontrolled effects of modernization (Burlian, 2016). This term was first derived by the Macquarie Dictionary to represent the growing problem of misusing smartphones in social situations (Pathak, 2013).

Phubbing is the act of an individual suddenly lowering their gaze and "losing themselves" in their phone in the middle of a social interaction. The word itself is a combination of the words phone and phubbing and means "the act of belittling someone in a social setting by using one's phone instead of talking to the person directly." Individuals may intentionally use their smartphones to avoid or ignore the people around them; however, phubbing itself is a problematic behaviour that harms both the phubbers and the phubbeds (Chotpitayasunondh & Douglas, 2016). Phubbing behaviour itself negatively affects interpersonal relationships (Sun & Sump, 2021). Ahn and Shin (2013) stated that smartphone use during face-to-face communication leads to a feeling of disconnection, which damages the perceived quality and quantity of social relationships.

Nowadays, phubbing can be easily observed in almost every social environment such as cafés, classrooms, meetings, or homes (Chotpitayasunondh & Douglas, 2016). When the literature is examined; it is seen that phubbing is quite common, socially accepted and this situation is gaining power. Phubbing can occur in any social context, including romantic relationships, workplaces, and family; however, to date, little attention has been paid to the possible impact that phubbing by parents may have on children (Pancani, Gerosa, Gui & Riva, 2021).

Phubbing has a negative effect on parent and child relationships as well as on many types of relationships. When parents' interactions with their smartphones are greater than their interactions with their children, children tend to feel lonely, and this is associated with lower levels of relationship satisfaction with their parents (Hong et al., 2019). For this reason, it is essential for parents to exhibit conscious behaviours and collaborate with schools to positively expand the impact of technological tools on children, as well as to mitigate potential issues associated with unmonitored usage (Akkoyunlu & Tuğrul, 2002).

When the existing studies are examined, it is seen that phubbing behaviour has been examined within various relationships. In these studies, the relationship between parents and adolescents (Stocdale, Coyne, Padilla-Walker, 2018; Wang, Qiao, & Wang, 2023; Wu, Zhang, Yang, Zhu, Xiang & Wu, 2022; Xu & Xie, 2023), romantic relationships (Abbasi, 2018; Carnelley, Vowels, Stanton, Millings & Hart, 2023; Krasnova, Abramova, Notter & Baumann, 2016; McDaniel & Drouin, 2019; Thomas, Carnelley & Hart, 2022), the relationship between parents and primary school students (Hu, Wang, Lin & Zhang, 2023), the relationship between employers and employees (Roberts & David, 2017; Yousaf, Rasheed, Kaur, Islam & Dhir, 2022). In line with this information, it is noteworthy that in studies conducted, the phenomenon of phubbing behaviour has not been examined in the relationship between parents and children in early childhood. Therefore, it is thought that this study will be useful in meeting the need for this subject by contributing to the field in terms of its originality and will form the basis for new research on this subject.

The study aims to examine the level of sociotelism of parents and their views on their children's phubbing (sociotelism) behaviours. In line with this aim, the research problem consists of the question, "What are the opinions of parents about their level of sociotelism and their children's phubbing (sociotelism) behaviours?" The sub-problems of the research problem are as follows:

a. What are the parents' total scores on the Generic Scale of Phubbing?

b. What are the parental views on the phubbing (sociotelism) behaviours of children in early childhood?

METHOD

In this part of the research, information about the research model, study group, data collection tools, data collection and data analysis are given.

Research Design

In the study, both quantitative and qualitative data were used to examine the phubbed (sociotelist) status of parents and their views on their children's phubbing (sociotelism) behaviours. The data collected through the "Generic Scale of Phubbing" constitute the quantitative dimension of the study. The data related to the qualitative dimension of the research were obtained using the "Phubbing (Sociotelism) Questionnaire in Early Childhood." As a result of using the data obtained through the relational screening model in accordance with the quantitative research method and the interview technique in accordance with the qualitative research method, the research was designed within the simultaneous nested model of the mixed design. In this model, both quantitative and qualitative data are collected and analysed simultaneously; however, emphasis is typically placed on either quantitative or qualitative data. In this model, as one type of data is nested within another, less importance is given to the nested data type. Data integration is typically performed at the data analysis stage. This model is beneficial when seeking a comprehensive perspective on the studied subject and conducting research involving different groups or levels within a study (Creswell, 2013; Terrell, 2012). In this study, quantitative and qualitative data were combined in the data analysis part, with an emphasis on qualitative data.

Research Sample/Study Group/Participants

The study group for the research consisted of 183 parents with children in early childhood. The study group was determined using the snowball sampling technique. Snowball sampling is used when it is difficult to access the units that make up the universe or when information about the universe is incomplete (Patton, 2005). This technique focuses on individuals and critical situations where rich data can be obtained, and the study group is reached by following these individuals and critical situations. Accordingly, one or more individuals related to the subject of the study are selected as reference points, and other individuals are reached through this person (Creswell, 2013). The data collection phase of the research concludes when data saturation is achieved through the researcher's continued sequential exploration (Kerlinger & Lee, 1999). In the study, the data collection tool was delivered to individuals known to have children in early childhood through a Google Form and filled out online. Then, the parents were asked to deliver the form to other parents they knew. Firstly, another parent was contacted with the help of the already contacted parents, and then another parent was contacted in the same way. In addition, the data collection tool was also sent to the teachers who were known to be preschool teachers, and they were asked to forward it to their parents and fellow teachers. Thus, the study group was enlarged in the form of a snowball effect. Explanations about the research were included in the Google Form, and the consent form was presented to the participants by adding the option of voluntary participation in the research. The demographic information of the study group is as follows:

Table 1. *Demographic information about the parents who participated in the study*

Gender of Parent	f	%	Age of Parent	f	%	Parent's Level of Education	f	%
Woman	163	89.1	20-29	43	23.5	Primary-Secondary School	12	6.6
Male	20	10.9	30-39	108	59.0	High School	21	11.5
			40 and above	32	17.5	Associate degree	16	8.7
						Licence	94	51.4

					Postgraduate	40	21.9
Total	183	100	**Total**	183	100	**Total**	183	100

When Table 1 is analysed, 89.1% of the parents who participated in the study were female and 10.9% were male. It was observed that most of the parents (59%) were between the ages of 30 and 39 and mostly had undergraduate (51.4%) and graduate (21.9%) education levels.

Table 2. *Demographic information about the children of the parents participating in the study*

Child's Age	f	%	Duration of Child's Attendance to Preschool Education	f	%
3 years old	25	13.7	Not started yet	47	25.7
4 years old	22	12.0	1 year	51	27.9
5 years old	52	28.4	2 years	57	31.1
6 years old	26	14.2	3 years and over	28	15.3
7 years old	18	9.8			
8 years old	40	21.9			
Number of siblings of the child	**f**	**%**			
Only child	51	27.9			
2 brothers	85	46.4			
3 or more siblings	47	25.7			
Total	183	100	**Total**	183	100

When Table 2 is analysed, it can be stated that the children of the parents participating in the study are mostly 5 years old (28.4%) and generally have two siblings (46.4%). In addition, it was observed that the number of children who received one year of preschool education and two years of preschool education were distributed at close rates.

Research Instruments and Processes (Data Collection Instruments and Processes)

As data collection tools in the study, the Personal Information Form prepared by the researchers, the Generic Scale of Phubbing, developed by Chotpitayasunondh and Douglas (2018), adapted into Turkish by Orhan Göksün in 2019, and the Phubbing in Early Childhood (Sociotelism) Questionnaire prepared by the researchers were used. Before preparing the questions of the Phubbing (Sociotelism) Questionnaire in Early Childhood, a literature review was conducted. Based on the information obtained from this literature review, a draft version of the questionnaire has been prepared. The questionnaire was submitted to the opinions of three experts from the field of preschool education and two experts from the field of computer and instructional technology education for content validity. A pre-application of the questionnaire was conducted with five parents to test the comprehensibility of the questions and their suitability for the purpose. Based on the feedback from the expert opinions and the pre-application, it was observed that the questionnaire items were appropriate and comprehensible for the intended purpose and were accepted as a valid data collection tool. The data collection tools used in the study were transferred to Google Forms. Parents with preschool children, participating voluntarily, were initially informed about Phubbing (Sociotelism). The data collection tools were delivered to the parents online through Google Form between August 13 and September 4, 2023, and they were asked to complete the form submission. The data collection tools that were filled in completely were taken into consideration.

Personal Information Form

In this form prepared by the researchers, information about the child's gender, age, number of siblings, duration of preschool education, age, and education level of the parents were included.

Generic Scale of Phubbing (GSP)

The Generic Scale of Phubbing developed by Chotpitayasunondh and Douglas (2018) was adapted

into Turkish by Orhan Göksün in 2019, and its validity and reliability were carried out. The scale is a 7-point Likert type (1= Never, 2= Rarely, 3= Occasionally, 4= Sometimes, 5= Frequently, 6= Usually, 7= Always) and consists of 15 items and 4 factors. These factors are "nomophobia," "personal conflict," "self-isolation," and "problem awareness." The GSP scale is evaluated on a total score. There is no reverse scored item on the scale. Scores that can be obtained from the scale vary between 15 and 105. The scale gives the total score of sociotelism level. The total score is obtained by summing the Likert values of the participant's responses. When the items of the scale are examined, it is stated that all of them are negative items within the framework of social norms and general acceptance, and from this point of view, a high score on the scale indicates negative behaviours. Cronbach's alpha coefficient of the scale was found to be .78. In this study, the Cronbach's alpha coefficient of the GSP scale was found to be .80.

Phubbing (Sociotelism) Questionnaire in Early Childhood

The questionnaire used in the study included 10 Likert-type questions and 3 open-ended questions. Parents were asked to rate the Likert-type questions (1=strongly disagree; 5=strongly agree) according to their own views. Although more than one question is used in studies using Likert-type questions, the researcher does not aim to make a general inference by using the average values of these questions. The questions are handled one by one, independently of each other (Turan, Şimşek & Aslan, 2015). The open-ended questions in the questionnaire offer parents the opportunity to write their personal opinions about Likert-type questions. In the study, firstly, the draft form of the Phubbing (Sociotelism) Questionnaire in Early Childhood was prepared and submitted to three experts from the field of preschool education for content validity. A pre-application of the questionnaire was conducted with five parents to test the comprehensibility of the questions and their suitability for the purpose. The questionnaire questions were finalised in line with the feedback received from the expert opinions and the pre-application. Then, the questionnaire was randomly delivered to parents with preschool children via Google Form and filled out online.

Data Analysis

SPSS 22, a package statistical programme developed for the social sciences, was used to analyse the data. Basic statistical operations such as frequency and percentage were performed with the data collected from the Personal Information Form. The data obtained from the generic scale of phubbing by parents were analysed according to homogeneity and normality assumptions. Since the data were homogeneous and normally distributed, parametric analyses were performed. Descriptive statistical values such as mean and standard deviation for parents' generic phubbing levels were presented. In addition, an ANOVA was conducted to determine whether the generic phubbing levels of the parents showed significant differences according to their age, education level, and number of children. The significance level of the data was analysed at the $p<.05$ level. In the analysis of the data obtained from the early childhood phubbing (sociotelism) questionnaire prepared by the researchers, a weighted mean was calculated for Likert-type questions, and content analysis was performed for open-ended questions.

FINDINGS/ RESULTS/ DISCUSSION

In this section, the data obtained from the research was analysed, and the findings related to the research questions were presented.

Table 3. *Parents' total scores from the generic scale of phubbing*

Sub Dimension	n	X̄	Median	Ss	Min.	Max
Nomophobia	183	15.12	14.00	6.84	4.00	28.00
Personal Conflict	183	7.08	6.00	4.33	4.00	28.00
Self Isolation	183	7.43	6.00	4.03	4.00	28.00
Problem Awareness	183	7.98	6.00	4.60	3.00	21.00

When Table 3 is analysed, it can be stated that the lowest and highest scores obtained by the parents from the nomophobia, personal conflict, and self-isolation sub-dimensions of the generic scale of phubbing

are 4 and 28 points, respectively, and the lowest and highest scores obtained from the problem awareness sub-dimension are 3 and 21 points, respectively. When the average scores obtained from the test were analysed, it was seen that the average obtained from the nomophobia sub-dimension (15.12) was relatively higher than the other sub-dimensions (personal conflict, self-isolation, and problem awareness).

In addition to the scale and questionnaire form, the opinions of 183 parents were obtained through a semi-structured form prepared to examine the views of the parents in depth. The data obtained were analysed by content analysis. The opinions obtained from the parents were supported and interpreted with quotations. Parents' views on their children's phone use were modelled as shown in the figure below.
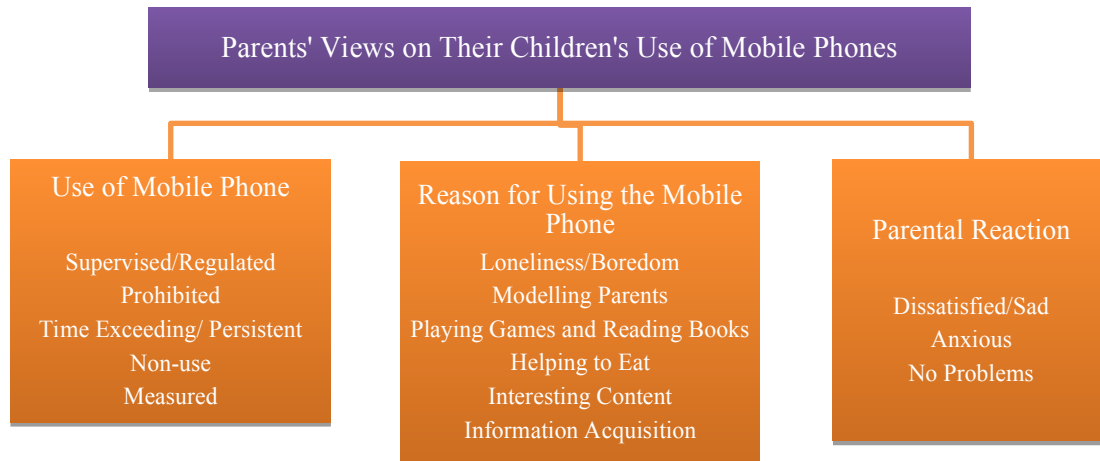

Figure 1. *Modelling of parents' views on their children's mobile phone usage*

In Figure 1, it can be stated that the opinions of the parents are divided into three themes and fourteen categories. The frequency values for the themes and categories that emerged as a result of the content analysis are shown in the table below.

Table 4. *Parents' views on their children's mobile phone usage*

Themes	Categories	*f*
Use of Mobile Phone	Supervised / Regulated	38
	Prohibited	31
	Exceeding Time / Persistent	29
	Non-use	21
	Measured	15
Reason for Using Mobile Phone	Loneliness / Boredom	12
	Modelling Parents	8
	Playing Games and Reading Books	7
	Helping Eating	5
	Attractiveness of Content	5
	Information Request	2
Parental Reaction	Dissatisfied / Upset	13
	Concerned	11
	No Problems	5

When the findings in Table 4 are analysed, the opinions of the parents about their children's mobile phone use are grouped under three themes: use of mobile phones, reason for phone use, and parental reaction. The opinions obtained from the parents were categorised under fourteen headings related to these themes.

Some of the opinions expressed by the parents on the theme of "use of mobile phone" are as follows:

P151: We adjusted the content on the phone according to his age. We disabled applications that are difficult to control, such as Google, YouTube, Play Store. Therefore, he only plays the educational games we have determined. We have no time limitations.

The phone is not indispensable for our child.

P164: I don't want him to use the phone too much. I gave it to him for a while. I realised that when he uses it for a long time, he cannot control his emotions easily. Both content and duration should be controlled and limited.

P51: We have not given any phone calls for a few months; we are in a very good situation.

P101: There are very negative aspects; he wants to watch it all the time; he sees the phone as a playmate; whereas he is happier when he plays with his friends, but he thinks he is happier when he plays with the phone.

P142: I find it appropriate to use mobile phones and tablets to the extent required by the age.

P162: I get very nervous that he won't be able to quit if he starts, so I never give him the phone.

In line with the views of the parents, it was observed that they generally assumed a restrictive, limiting, and prohibitive role in their children's use of mobile phones. It can be stated that children, on the other hand, exhibit an attitude that opposes the restrictive attitude of the parents and seeks opportunities to access the prohibited or restricted phone. According to parents' views, some children do not go to extremes with using mobile phones. There are also children who do not find the mobile phone interesting and do not use it at all.

When the related literature is examined, it is seen that most parents impose restrictions on their children's use of technological devices in terms of time and content (Aral & Doğan Keskin, 2018; Bentley, Turner & Jago, 2016; Çelik, 2021). As a result of overly permissive and permissive attitudes in which parents do not provide sufficient control over their children's use of technology; tablet devices and mobile phones, which are important entertainment tools for children, can easily be used for purposes other than their intended purpose (Çakır, 2013). The risks of using mobile phones and tablets without appropriate time and, content and family guidance have been similarly emphasised in different studies (Ateş & Durmuşoğlu-Saltalı, 2019; Cordes & Miller, 2000). The time children spend with smartphones is quite high today. Children who are introduced to smartphones in infancy can turn it into an addiction with the misuse of technology. Spending a long time in front of the screen may cause them to tend not to do even their daily responsibilities without smartphones (Işıkoğlu-Erdoğan, 2019; Urfa, 2020).

Some of the opinions of the parents in the 'reason for using mobile phones' theme are given below.

P91: I have no brother, no father; what should I do, mum?

P135: When we are out or when we are visiting, sometimes I just give it to him to eat because he eats more easily at home. When I say it is over, he leaves it immediately.

P117: He was very addicted at the age of 3, but I think it is completely related to a lack of interest. Children are generally more inclined to play at this age; however, when they cannot find the attention and playmates they want, they turn the phone into a tool to relieve boredom. It is a very disturbing situation.

According to parents, the reasons why their children turn to mobile phones vary. Loneliness of children due to a lack of friends or siblings is one of the most frequently mentioned reasons by parents. The fact that parents have limited time to take care of their children or that they are role models for excessive mobile phone use as parents and that the content is interesting is another reason for children to use the mobile phone. Some of the parents stated that they used their mobile phones as a tool to feed their children. In addition, it was stated that children use their mobile phones to meet their needs for playing games, reading books, and to obtain information.

Kabali et al. (2015) and Kılıç et al. (2019) stated that the most common reason for parents to allow their children to use mobile devices is to keep their children busy while they are doing daily chores or housework. When families have limited options, it is easier for them to abandon their children to the screen (Işıkoğlu-Erdoğan, 2019). Parents first use TV and then tools such as computers and smartphones to keep their children busy. This situation may cause children to see it as a fun tool with which they communicate over time; however, the time spent on the screen can lead to a breakdown in family communication (Güngör, 2015). As in many aspects of life, children accept their parents as role models in terms of phone use. In this case, Ateş and Durmuşoğlu-Saltalı (2019) stated that in terms of preventing children from using mobile phones for increasing periods of time, it may be useful for parents to reduce the time of use of these devices and to review their attitudes towards these technological devices in order to eliminate unwanted consequences.

From past to present, the game and the game tools used in the game, i.e., toys, also change in parallel with technological developments. In this context, in the current century, game tools and playgrounds are also affected by change and take their place in children's lives (İnan & Dervent, 2016). Digital games can have a positive effect on children's developmental areas and academic development. Being able to follow the commands given in digital games shows that digital games support hand-eye coordination and motor skills (Lin & Hou, 2015). In addition, it is stated that digital games support children's problem-solving, reasoning, analysing and decision-making skills (Kim & Smith, 2015), as well as strategy and prediction competencies (Toran, Ulusoy, Aydın, Deveci & Akbulut, 2016). One of the most important criticisms of digital games is that they are perceived only as a means of entertainment and spending time; however, research shows that this criticism has lost its validity, and digital games that attract people are now accepted as primary learning tools (Björk-Willén & Aronsson, 2014; Çetin, 2013). For this reason, children can also use mobile phones as a means of obtaining information.

Some of the views of the parents on the theme of 'parental reaction' are quoted below.

P66: It is an issue that needs to be fought as a society. Since he is young, he can be convinced somehow for now, but I have serious concerns for the future.

P43: I cannot keep track of the content he watches, and I am afraid that he may watch harmful things.

P28: My child does not have a phone, but he has a tablet. We set a daily limit of 1 hour, but this limit was exceeded, especially during the summer holidays. He has no siblings or peers in the close neighbourhood. As soon as the activities we do together are over, or as soon as he comes home, he grabs his tablet. He finishes his daily homework very quickly and switches to the tablet, thinking that he has fulfilled his responsibility. I am very disturbed by this situation.

According to the research data, it can be stated that parents are anxious and unhappy about the fact that their children may be negatively affected by the harmful content of the mobile phone. It can be said that the reason for the concern of parents about their children being harmed is that they do not have sufficient knowledge and equipment on this subject. Parents of children aged 6 and above should set consistent limits on the time spent using media and media types and ensure that they do not replace adequate sleep, physical activity, or other healthy behaviours. Otherwise, the emergence of problems such as addiction in children can be observed. In the study conducted by Toran et al. (2016), a mother's response: "... He sometimes forgets to eat, sometimes even forgets to go to the toilet..." reveals the seriousness of the situation. In order to protect children from the negative effects of the content they watch, parents, as well as content producers and educators have great responsibilities. Cognitive functions such as impulse control, self-regulation, mental flexibility, and the ability to understand the thoughts and feelings of others are negatively affected in children who are alone in front of the screen. Children's imagination, language development and information processing skills may also lag behind developmentally (Mustafaoğlu, Zirek, Yasacı & Özdinçler, 2018).

In addition to this situation, Saltuk and Erciyes (2020) stated that mothers felt uneasy about their children's use of smartphones, but most of the time they unconditionally allowed their children to use smartphones unconditionally and for long periods of time, especially when guests came, when they went to visit or on a long journey, or when they saw other children or adults spending time with their phones or tablets when their children were grumpy. In this context, it is important to raise awareness and educate both children and families about the digital world in general. In addition to the information to be given to children within the family, it is important to provide lessons, trainings, and seminars in schools and to make arrangements to ensure that children use the digital world correctly and effectively from an early age and to be trained to protect themselves from risks before their families (Akbaş & Dursun, 2020).

The opinions of the parents regarding their suggestions for their children to spend less time on the mobile phone were modelled as follows:
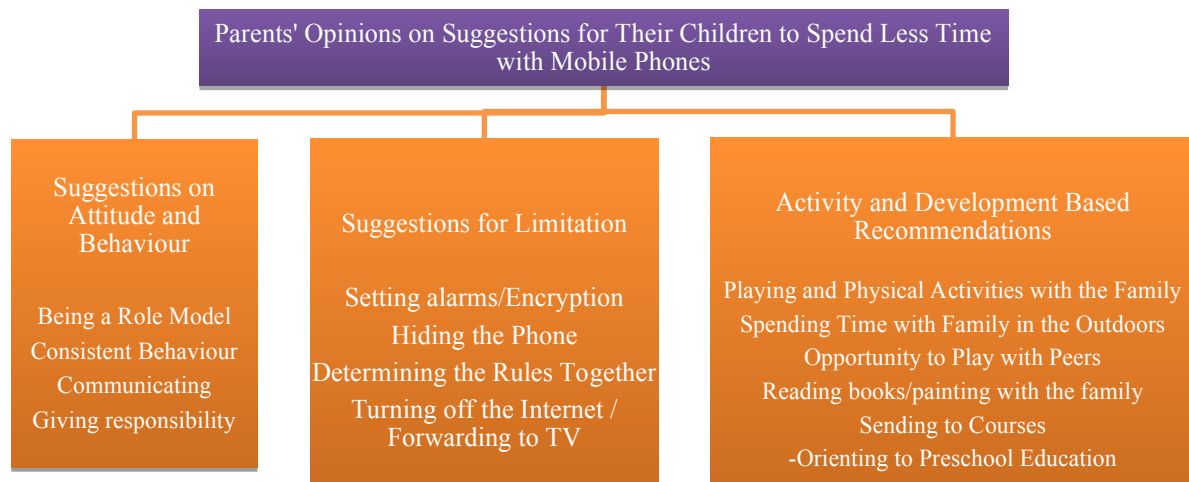

Figure 2. *Modelling of parents' views on suggestions for their children to spend less time on the mobile phone*

In Figure 2, it can be stated that parents' opinions on their suggestions about their children spending less time on the mobile phone are divided into three themes and sixteen categories. The frequency values related to the themes and categories that emerged as a result of the analysis are shown in the table below:

Table 5. *Parents' opinions on suggestions for their children to spend less time on the mobile phone*

Themes	Categories	f
Suggestions on Attitudes and Behaviours	Being a Role Model	26
	Consistent Behaviour	14
	Making Contact	13
	Giving responsibility	7
Limitation Suggestions for	Set Alarm / Set Password	9
	Keeping the Phone	4
	Setting the Rules Together	4
	Switching off the Internet / Forwarding to TV	4
Activity and Development Based Recommendations	Family Play and Physical Activities	75
	Spending Time with the Family Outdoors	50
	Opportunity to Play with Peers	30
	Reading books/painting with the family	18
	Sending to Courses	5
	Orienting to Preschool Education	4

When the findings in Table 5 are examined, the opinions of the parents regarding their suggestions for their children to spend less time on the mobile phone are grouped under three themes: suggestions regarding attitudes and behaviours, suggestions for limitations, and suggestions based on activity and development. The opinions obtained from the parents were categorised under sixteen headings related to these themes.

Some of the opinions expressed by the parents in the theme of "suggestions regarding attitudes and behaviours" are as follows:

P29: In order not to set a bad example for my son, I try not to be busy with the phone when I am with him.

P73: I removed attention-grabbing applications (such as YouTube, Instagram, and games) from my phone and had a conversation about the fact that the phone is a communication tool and should be used for this purpose.

In the theme of suggestions for attitudes and behaviours, it was observed that parents showed a persuasive attitude by talking to their children to make them spend less time on the mobile phone. In addition, parents stated that they tried to be role models by implementing what they wanted their children to do first themselves and that they gave various responsibilities to their children at home.

Since children take their parents as role models, the time the parent spends in front of the screen affects the time the child spends in front of the screen (Kırlıoğlu, Kayaalp & Arslan, 2023). Children imitate and watch them. For this reason, parents need to educate themselves both in terms of behaviour and the use of control (Gezgin, 2023).

Some of the opinions of the parents under the theme of "suggestions for limitation" are quoted below:

P4: I set an alarm, and I am determined when it is over.

P123: I set a password and a time limit.

P57: He watches cartoons on TV for a limited time on a single channel.

P5: I leave the phone where he/she cannot see it.

P137: I switch off the internet and put the phone away.

P70: Parents should set a limited time. Let them talk to their children and make decisions together.

It is seen that parents try to manage the time by setting alarms to limit their children's mobile phone use, to put passwords on their phones, to keep their internet off, to hide their phones where children cannot see them, and to allow them to watch a single channel on TV for a certain period of time in order to divert their attention.

In a study conducted by Şahin and Öztürk (2018), it was concluded in interviews with parents with children between the ages of 2-16 that parents tried to set rules for their children regarding the use of smart devices. At this point in setting rules, the most frequently expressed issue was determined as imposing time restrictions. In a study conducted in Japan, it was stated that children of families who did not set rules for the use of technological devices interacted more with technological devices (Arumugam, Said & Farid, 2021). As a result of the study conducted by Topbaş (2022), it was determined that most of the parents set at least one rule for their children about the use of technological devices and that about half of the parents always or frequently apply these rules. The results obtained from these studies coincide with the results obtained in this study. In order to set effective rules, parents should discuss these rules with their children and make joint decisions with them (Topbaş, 2022). Parents should try to provide justification for limitations and consequences to help their children understand their determination to protect them (Goh, Bay & Chen, 2015).

Some of the opinions of the parents about their children spending less time on the mobile phone under the theme of "activity and development-based suggestions" are quoted below.

P10: We spend time with garden flowers (care, watering, etc.). We do activities such as cycling, shopping trips, etc.

P7: We let him play with his peers and go out on the street.

P133: There are materials at home where they can produce many activities. I do not hesitate to spend money on materials where they can explore their creativity. I don't think that the materials will be wasted. Thus, he does not feel the lack of the phone.

P29: I take him to various summer courses. My aim here is not only to support his healthy development, but also to help him get a hobby and stay away from the tablet or phone.

In the activity and development-based suggestions theme, it can be stated that parents mostly suggested spending time outdoors with the family in order for children to spend less time on the phone. In addition, suggestions such as playing games with peers where children can find opportunities for socialisation, taking part in reading and art activities with the family, playing games with the family and engaging in fun physical activities outdoors, and attending courses and schools were presented by parents as a solution to reduce the time children spend on the phone.

The views of the parents on which issue they need the most support regarding their children's mobile phone use were modelled as follows:
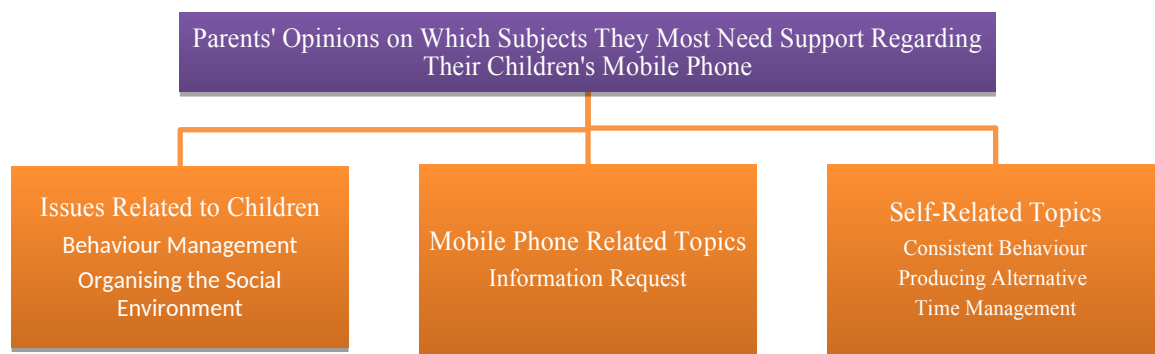

Figure 3. *Modelling of parents' opinions on which subjects they most need support regarding their children's mobile phone use*

In Figure 3, it can be stated that the opinions of the parents on which issue they need the most support regarding their children's use of mobile phones are divided into three themes and six categories. The frequency values for the themes and categories that emerged as a result of the analysis are shown in the table below.

Table 6. *Parents' opinions on which subject they mostly need support regarding their children's mobile phone use*

Themes	Categories	*f*
Issues Related to Children	Behaviour Management	22
	Organising the Social Environment	7
Telephone Related Topics	Information Request	23
Self-Related Topics	Consistent Behaviour	12
	Producing Alternative Activities	6
	Time Management	4

When the data in Table 6 were analysed, the opinions of the parents on which issues they needed the most support regarding their children's phone use were analysed under three themes: issues related to their children, their phones and themselves. The opinions obtained from the parents were divided into six categories. Some of the views expressed by parents on the theme of "issues related to their children" are as follows:

P96: When he wants to play with the phone, although I always direct him to games in which he shows interest and curiosity, sometimes this does not work; he can insist too much and cry.

P102: The most difficult thing for me is his stubbornness and extreme spoiltness, thinking that he can get everything by crying and finally making him do it.

P180: Actually, I know the drawbacks of monitoring, but we have problems at the point of

implementation, especially if we don't give it to him; he somehow takes it from people like grandparents or aunts and uncles, so we had a lot of trouble not giving it to him. If we are in a crowded place or if I have a job to do, he insists on us a lot at such times; he cries and shouts when I don't give it to him; he never lets me go, and there were times when I couldn't stand it and gave it to him.

P132: The thing I have the most difficulty with is that there are children in the neighbourhood who play on the phone so much that I cannot explain to my own child that playing on the phone is very harmful... The child questions other children because their parents allow them to do so...

Problem behaviours such as children being stubborn with their parents about spending time on the phone and trying to fulfil their requests by crying were among the most difficult situations that parents had the most difficulty with regarding children's phone use. Therefore, it can be stated that parents need support in behaviour management. Cengiz Saltuk and Erciyes (2020) stated that although parents think that they should restrict their children's use of technological tools, they cannot resist their children's requests and allow them to use these tools. In addition, it was stated that parents had difficulties limiting their children's use of mobile phones due to the attempts of other individuals around them to violate this limit and seeing their children's peers interested in mobile phones. Therefore, parents need support in organising the social environment.

The opinions of the parents on the theme of "mobile phone-related issues" are quoted and shared below:

P46: I think it is impossible to raise a child without a phone or tablet at this age. I think that the content should be given close attention. I think that information about the content should be increased in games. Even things that seem harmless can be very harmful to their infrastructure.

P156: If we could restrict everything that would harm them when they have the phone in their hands with an application possibility, or if the phones could be turned to this feature only when they take it in their hands with a nice programme...

P164: It bothers me that I cannot control what you watch all the time. I want more educational applications. I want there to be no in-game adverts.

Parents expressed that they wanted to have more information on phone-related issues such as phone use, applications on the phone, and the content of these applications. Şahin and Öztürk (2018) emphasise that the first point that families should be aware of is the applications installed on smart devices and the permissions given for their use. Studies show that children create artistic and scientific products using technological devices such as computers, tablets, and smartphones when given the opportunity and guidance. When the right guidance is not provided, it is known that children are exposed to excessive and harmful applications that do not allow or negatively affect their development (Yücelyiğit & Aral, 2020).

Some of the opinions expressed by the parents under the theme of "issues related to themselves" about the need for support regarding their children's use of mobile phones are quoted below:

P9: Having limited time to spend time with children while working...

P59: I set limits, but I cannot enforce them.

P111: I think I find it difficult to find another activity to replace the phone.

When the issues that parents need support regarding their children's use of mobile phones are analysed, it can be stated that the issues related to parents themselves include acting consistently, producing alternative activities, and time management. Yıldız, Öztora, and Dağdeviren (2022) concluded in their study that parents behave inconsistently in terms of restriction, and this may make it difficult for children to establish a relationship with these devices within healthy limits.

CONCLUSION, RECOMMENDATIONS

According to the results of the study, the levels of sociotelism of parents who have children in early childhood do not differ significantly according to the age of the parents and the number of children they have. On the other hand, parents' levels of sociotelism differed significantly in favour of parents with postgraduate education levels in the problem awareness sub-dimension and total score according to the education level variable. In line with the qualitative data obtained in the study, parents' views on their children's use of the mobile phone, parents' suggestions for their children to spend less time on the telephone, and parents' views on which issue they need the most support regarding their children's use of the telephone were discussed. In line with the opinions of the parents, it was observed that their children's phone use was controlled/ruled, that they mostly used the phones for loneliness or boredom, and that the parents were not satisfied with this situation and were upset. The parents who participated in the study stated that being a role model, setting an alarm, putting a password on the phone, playing games with their children, and engaging in physical activities would be useful for their children to spend less time on the phone. In addition to all these, it was found that parents most needed support in managing their children's behaviours, obtaining information about the phone, and being consistent with the decisions they made regarding their children's phone use.

The suggestions presented in line with these results are as follows:

- Since it is seen that parents need more information on the use of mobile phones, parents can be brought together with experts in pre-school education institutions on issues such as mobile phones, technology, etc. and training can be provided.
- Since it is seen that parents need support in managing their children's behaviour and behaving consistently, seminars on parental mediation can be organised for parents by experts in the field.
- Since parents are important role models for children, seminars on digital literacy can be organised for parents.
- The level of sociotelism of parents can be analysed in terms of different variables, such as gender and education level.

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Examination of University Students Emotion Regulation Skills in Terms of Attachment Styles and Self-Compassion[1]

Özgür Kır[1] (iD) Zeliha Traş[2] (iD) Şahin Kesici[3] (iD)

[1] Meydan Secondary School, Batman, Türkiye
ozgur9558@gmail.com

[2] Necmettin Erbakan University / Ahmet Keleşoğlu Faculty of Education, Department of Guidance and Psychological Counseling, Konya, Türkiye
ztras@erbakan.edu.tr

[3] Necmettin Erbakan University / Ahmet Keleşoğlu Faculty of Education, Department of Guidance and Psychological Counseling, Konya, Türkiye
kesicisahin@erbakan.edu.tr

Article Info	ABSTRACT
	In this study, it was aimed to examine the emotion regulation skills of university students in terms of attachment styles and self-compassion. The participants of the study were determined using the appropriate sampling method. The participants consisted of a total of 414 university students, 230 (55.6%) of whom were female and 184 (44.4%) of whom were male. In order to collect the data, "Personal Information Form", "Emotion Regulation Scale (DBL)", "Experiences in Close Relationships II (CRI II)" and "Self-Compassion Scale" were used. SPSS 26.0 package program was used to analyze the data. In this analysis, Pearson product-moment correlation, multiple linear regression analysis and independent groups t-test methods were used. The findings of the study showed that emotion regulation skills have a positive and significant relationship with attachment styles and self-compassion. As a result of the regression analysis, it was concluded that the avoidant attachment sub-dimension of attachment styles and the consciousness sub-dimension of self-compassion significantly predicted the re-evaluation sub-dimension of emotion regulation skills. It was concluded that the consciousness and overidentification sub-dimensions of attachment styles and self-compassion significantly predicted the concealment sub-dimension of emotion regulation skills. It was determined that emotion regulation skills did not show a significant difference according to gender.

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INTRODUCTION

All people have emotions. Emotions have a very important place in individuals' lives, survival, communicating with others, continuing communication, and deciding who or what is important to them (Southam-Gerow, 2014). Although emotions are mostly beneficial, negative emotions have bad consequences. The concept of emotion regulation emerged in order to reduce the bad consequences of emotions and to maintain and increase positive emotions (Bozkurt-Yükçü, 2017). Emotion regulation is the process that involves what emotions individuals have, when they have these emotions, how they experience emotions and how they express them externally. These processes can be automatic or controlled, conscious or unconscious (Gross, 1998). The main psychological functions of emotion regulation include satisfying hedonic needs, supporting goal pursuits, and maintaining the global personality system (Koole, 2009). During emotion regulation, people can reduce, increase or maintain their positive and negative emotions. Accordingly, emotion regulation generally includes changes in emotional reactions (Gross, 1999). Emotion regulation response systems are not innate; they are normally acquired early in life (Dodge and Garber, 1991). Emotion regulation continues throughout people's lives, starting from infancy. This process essentially begins with the mother-infant relationship (Gross, 2001). At this point, it can be said that attachment styles affect the emotion regulation process.

Attachment styles are formed according to the nature of the relationship that the individual forms with the person who takes care of him/her in early childhood. Attachment styles established in the early periods of life form the basis of individuals' social relationships and different behaviors in later periods (Küçük, 2020). Developmental research has shown that caregivers have a fundamental role in regulating children's emotional states (Southam-Gerow & Kendall, 2002). Since a newborn baby does not have emotion regulation skills, he/she looks for emotional support from the person providing care when he/she experiences any problems (Zimmermann, 2004). When a person's attachment figures are not safely available and supportive, seeking closeness fails to relieve the distress that occurs. As a result, negative self-models are formed and the possibility of experiencing maladjustment and emotional problems increases (Mikulincer & Shaver, 2012). Studies have shown that people with anxious attachment have difficulty managing their emotions and can react negatively to events instantly (Carnelley et al., 2007; Gentzler et al., 2010). However, those with insecure attachment experience negative emotions more. It has been determined that these people use less constructive emotion regulation skills (Cabral et al., 2012; McCarthy, 2001; Mikulincer & Shaver, 2012). From this perspective, it can be said that attachment styles are related to emotion regulation skills.

Another concept that is thought to be related to attachment styles is self-compassion. Self-compassion; Rather than criticizing oneself harshly in situations of failure and pain, individuals accept the experience as a part of life, approach painful thoughts and feelings with awareness, and act kindly and compassionately towards themselves (Neff, 2003b). Relationships with the environment and early childhood experiences are important in the development process of self-compassion (Neff & McGehe, 2009). Individuals who receive compassion from their parents during childhood can show compassion to both themselves and the people around them when they grow up. Conversely, it is observed that individuals who do not receive affection from their parents during childhood have low self-compassion levels in adulthood (Neff, 2003a). Therefore, it is thought that attachment styles affect the level of self-compassion. Studies show that securely attached people have high self-compassion levels (Joeng et al., 2017; Pepping et al., 2015). The results of the study conducted by Neff and Beretvas (2013) showed that individuals with high self-compassion were securely attached.

Individuals with a high level of self-compassion are aware of the problems they experience and are aware of their own shortcomings. Despite the problems and shortcomings they have, they approach themselves with understanding and compassion rather than adopting a cruel, harsh and critical attitude towards themselves. As a result, self-compassion plays a protective role when individuals encounter

adverse events in their lives. This helps them achieve positive emotions by enabling them to overcome events more easily (Leary et al., 2007). However, self-compassion transforms individuals' feeling bad about their inadequacies or failures, that is, negative self-affect, into positive self-affect (feeling compassion and understanding towards oneself) (Neff, 2003b). Therefore, it can be said that self-compassion plays an effective and important role in emotion regulation. Self-compassion has a helpful effect in coping with difficulties encountered in the emotion regulation process (Vatan, 2019). In their study, Gün et al. (2020) found that there were significant relationships between emotion regulation and self-compassion. Because of what was stated above, it was thought that emotion regulation skills, attachment styles and self-compassion might be interrelated concepts. Based on this idea, the purpose of the study was determined to examine the relationship between the level of emotion regulation skills of university students and their attachment styles and self-compassion.

METHOD

In this section; Information was given about the research model, study group, scales used and how the collected data were analyzed.

Research Design

The study aimed to determine the relationship between the participants' scores from the emotional regulation skills scale and their scores from the attachment styles and self-compassion scale. Therefore, the descriptive (relational scanning) method, one of the quantitative research methods, was used in the research (Sönmez & Alacapınar, 2018).

Study Group

This study was conducted with 414 participants determined by non-random convenience sampling method. 230 (55.6%) of the participants were female students and 184 (44.4%) were male students. The age range of the study group varies between 18-26; The average age is 20.21.

Research Instruments and Processes

The scales used to collect data are introduced in this section.

Personal Information Form

It was created to obtain demographic information such as age and gender from participants.

Emotion Regulation Scale

This scale, which consists of 10 items, was developed by John and Gross (2003). The scale has two subscales: reappraisal and concealment and has a Likert structure. Eldeleklioğlu and Eroğlu (2015) conducted the Turkish validity and reliability study of the scale. Cronbach's alpha values for the scale's reappraisal and concealment were found to be .78 and .73, respectively. This result shows that the scale is suitable for use in studies. The finding values (.72-.78) obtained from the reliability analysis conducted for this research are within the reliable range.

Experiences in Close Relationships Inventory II

Fraley et al. (2000) developed this scale, for which Sümer et al. (2005) conducted a Turkish validity and reliability study. The scale, developed to detect individuals' feelings and thoughts about their romantic relationships, has two sub-dimensions. These are anxiety and avoidance respectively. The scale, consisting of 36 items, has a Likert structure. The scale contains reverse coded items. As a result of the studies, it was revealed that the Cronbach's alpha coefficient was .90 for the anxiety dimension and .86 for the avoidance dimension. The finding values (.84) obtained from the reliability analysis conducted for this research are within the reliable range.

Self-Compassion Scale

Neff (2003b) developed this scale, which was adapted into Turkish by Akın, Akın and Abacı (2007). The scale has six subscales and 26 items. The scale has a five-point Likert structure. The internal consistency Cronbach's alpha coefficient of the scale was calculated as .72 for awareness of sharing, .72 for self-judgment, .80 for isolation, .77 for self-compassion, .74 for overidentification and .74 for consciousness, respectively. The finding values (.72-.76) obtained from the reliability analysis conducted for this research are within the reliable range.

Data Analysis

The data collected in the research was collected using the appropriate sampling method, which is not random. The collected data were evaluated with the SPSS 26 package program. Accordingly, Pearson correlation was used to calculate the relationship between university students' emotion regulation skills, attachment styles scores and self-compassion scores. Regression analysis was performed to calculate the effect of the scores obtained from the attachment styles and self-compassion scales on the scores received by university students from the emotional regulation skills scale. The relationship between gender and emotion regulation skills scores was calculated by independent samples t test.

Ethic

The necessary ethics committee permissions for the research were obtained from the Konya Necmettin Erbakan University Social and Human Sciences Ethics Committee with the decision numbered 5.21.83.

FINDINGS

Simple correlation method was used to determine the relationship between emotion regulation skills, attachment styles and self-compassion. Descriptive results obtained from the correlation analysis are shown in Table 1.

Table 1. *Relationships between participant's from the scales*

	1	2	3	4	5	6	7	8	9	10
1.Reassesment	-									
2.Hiding	.594**	-								
3.Anxious Attachment	.485**	.539**	-							
4.Avoidant Attachment	.618**	.523**	.805**	-						
5.Self-Kindness	.525**	.358**	.488**	.595**	-					
6.Self-Judgment	.224**	.423**	.611**	.471**	.278**	-				
7.Sharing	.513**	.385**	.536**	.596**	.666**	.357**	-			
8.Isolation	.227**	.361**	.588**	.431**	.285**	.722**	.322*	-		
9.Mindfulness	.547**	391**	.441**	.540**	.703**	.280**	.644**	.284**	-	
10.Over-identification	.272**	.443**	.592**	.485**	.292**	.708**	.380**	.668**	.307**	-

*p<.05, **p<.01, ***p<.001*

When the results of Table 1 are examined, it can be seen that the reappraisal sub-dimension of emotion regulation skills has a positive, moderately significant correlation with the anxiety (r=.485, p<.01) and avoidance (r=.618, p<.01) sub-dimensions of attachment styles. It has been found that there is a relationship. The reappraisal sub-dimension of emotion regulation skills is related to self-compassion, self-kindness (r=.525, p<.01), sharing (r=.513, p<.01) and mindfulness (r=.547, p<.01). positive moderate level with its sub-dimensions, self-judgment (r=.224, p<.01), isolation (r=.227,

p<.01) and over-identification (r=.272, p<.01). A positive, low-level significant relationship was found.

It was determined that the concealment sub-dimension of emotion regulation skills had a moderate positive relationship with the anxiety (r=.539, p<.01) and avoidance (r=.523, p<.01) sub-dimensions of attachment styles. Self-compassion, the concealment sub-dimension of emotion regulation skills, is related to self-kindness (r=.358, p<.01), self-judgment (r=.423, p<.01), sharing (r=.385, p<.01). A positive, low-level significant relationship was found with the sub-dimensions of , isolation (r=.361, p<.01), minfulness (r=.391, p<.01) and over-identification (r=.443, p<.01).

The effects of attachment styles and self-compassion on the reappraisal sub-dimension of emotion regulation skills were calculated by regression analysis. The results of the calculation are given in Table 2.

Table 1. *Regression analysis results regarding attachment styles and self-compassion predicting the reappraisal sub-dimension of emotion regulation skills*

Model	B	S.H.	β	t	p
Still	4.419	1.377	-	3.208	.001**
Self-kindness	.110	.101	.063	1.091	.276
Self-Judgment	-.156	.092	-.102	-1.695	.091
Sharing	.179	.109	.090	1.649	.100
Isolation	-.033	.110	-.017	-.301	.764
Mindfulness	.526	.125	.231	4.210	.000***
Over-identification	.018	.110	.009	.168	.867
Anxious Attachment	.006	.027	.017	.233	.816
Avoidant Attachment	.177	.028	.440	.6,422	.000***
R=.679, R²=.451, F$_{(43-370)}$=8.654, p<.001					

**p<.01 ***p<.001

In Table 2, it was examined according to regression analysis whether attachment styles and self-compassion predicted the level of reappraisal subdimension of emotion regulation skills. As a result of this analysis, it was revealed that the regression model created was significant (F(43-370)=8.65, p<.001). It is seen that attachment styles and self-compassion explain 45% of the variance in the reappraisal sub-dimension of emotion regulation skills (R2 = .451). When looking at the regression coefficient (β), the relative importance of the predictive variables on the reappraisal sub-dimension of emotion regulation skills is; avoidant attachment, mindfulness, sharing, self-kindness, anxious attachment, over-identification, isolation and self-judgment. When the regression coefficients were examined, it was seen that the mindfulness sub-dimension of self-compassion (β=.526, t=4.210, p<.001) and the avoidant attachment sub-dimension of attachment styles (β=.177, t=6.422, p<.001) had a significant effect on re-evaluation. It seems that its prediction is significant. Self-kindness (β=.110, t=.1.091, p>.05), self-judgment (β=-.156, t=-1.695, p>.05), sharing (β=.179, t= 1.649, p>.05), isolation (β=-.033, t=-.301, p>.05), over-identification (β=.018, t=.168, p>.05) and anxious attachment (β=.006, t=.816, p>.05) does not seem to have a significant effect.

The effects of attachment styles and self-compassion on the concealment sub-dimension of emotion regulation skills were calculated by regression analysis. The results of the calculation are given in Table 3.

Table 3. *Regression analysis results regarding attachment styles and self-compassion predicting the hiding sub-dimension of emotion regulation skills*

Model	B	S.H.	β	t	p
Still	1.975	1.083	-	1.823	.069
Self-kindness	-.022	.079	-.018	-.279	.781
Self-judgment	.110	.072	.101	1.529	.127
Sharing	.001	.085	.001	.012	.990

Isolation	-.078	.087	-.056	-.896	.371
Mindfulness	.247	.098	.151	2.515	.012*
Over-identification	.213	.086	.152	2.475	.014*
Anxious Attachment	.058	.021	.216	2.760	.006**
Avoidant Attachment	.052	.022	.181	2.408	.016*

R=.595, R^2=.341, $F_{(27-696)}$=8.688, p<.001

*p<.05 **p<.01

In Table 3, it was examined according to regression analysis whether attachment styles and self-compassion predicted the level of hiding sub-dimension of emotion regulation skills. As a result of this analysis, it was revealed that the regression model created was significant ($F_{(27-696)}$=8.69, p<.001). It is seen that attachment styles and self-compassion explain 34% of the variance in the hiding sub-dimension of emotion regulation skills (R^2 = .341). When looking at the regression coefficient (β), the relative importance of the predictive variables on the hiding sub-dimension of emotion regulation skills is; anxious attachment, avoidant attachment, over-identification, mindfulness, self-judgment, sharing, self-compassion and isolation. When the regression coefficients are examined, it is seen that self-compassion is associated with consciousness (β=.247, t=2.515, p>.05) and over-identification (β=.213, t=2.475, p>.05) sub-dimensions; It is seen that the anxiety (β=.058, t=2.760, p>.05) and avoidant attachment (β=.052, t=2.408, p>.05) sub-dimensions of attachment styles are significant in predicting concealment. Self-compassion is related to self-kindness (β=-.022, t=-.279, p>.05), self-judgment (β=.110, t=1.529, p>.05), sharing (β=. 001, t=.012, p>.05), isolation (β=-.078, t=-.896, p>.05) sub-dimensions are not significant in predicting concealment.

Within the scope of the study, independent groups t-test was conducted to determine whether emotional regulation skills scores differed significantly according to gender. The results of the test are shown in Table 4.

Table 4. *Independent groups T-test result on whether participants' levels of emotion regulation skills differ according to gender*

Sub-Dimensions	Gender	N	x̄	SS	t	p
Reassesment	Female	230	26.83	6.98	-.097	.923
	Male	184	26.89	6.86	-.097	.923
Hiding	Female	230	16.50	4.80	-.610	.542
	Male	184	16.80	5.16	-.605	.545

Independent samples t-test was used to analyze whether the reappraisal and concealment sub-dimensions of emotion regulation skills differed significantly according to gender. As a result of the analysis; It was concluded that the levels of reassesment (t=-097, p>.05) and hiding (t=-610, p>.05) of emotion regulation skills did not differ according to gender.

DISCUSSION

In this section of the research, the results of the findings are included. The results are discussed respectively in the light of the relevant literature. In addition, in order to enrich the discussion, the results of studies showing similarities with the subject of the study are also included.

As a result of the findings obtained in the study, when the relationships between the variables were examined, it was determined that there was a positive, moderately significant relationship between the reassesment and hiding sub-dimensions of emotion regulation skills and the anxious and avoidant sub-dimensions of attachment styles. When the relevant literature was examined, it was seen that there were studies revealing the relationship between emotion regulation skills and attachment styles (Roque, 2013; Uyar, 2019; Uğur, 2020; Vatan & Oruçlular Kahya, 2018; Zimmermann et al., 2001). The findings of the research are parallel to the relevant literature. For example, in the study conducted by Yönet-Demirhan (2021), there is a positive significant relationship between emotion regulation skills and sub-dimensions of attachment styles. Likewise, in the research conducted by Öner and Ascı (2020)

with athletes, it was determined that there was a significant relationship between emotion regulation skills and attachment styles. The result of another study by Henschel et al. (2020) revealed that anxiously attached individuals have higher emotion regulation difficulties than secure and avoidant individuals. The basis of attachment is the emotion regulation relationship that occurs simultaneously between the mother and the baby (Schore, 2000). Accordingly, it can be stated that attachment styles have very important effects on the emotional development of the baby. Based on this, it can be said that the attachment styles formed between mother and baby have an impact on individuals' emotion regulation skills.

Another finding of the research was that there was a significant positive relationship between emotion regulation skills and self-compassion. Accordingly, the reassesment sub-dimension of emotion regulation skills and the self-compassion, self-kindness, sharing and mindfulness sub-dimensions are at a positive moderate level; It was revealed that there was a positive, low-level significant relationship with the sub-dimensions of self-judgment, isolation and over-identification. It was determined that the hiding sub-dimension of emotion regulation skills had a low positive relationship with all sub-dimensions of self-compassion. When the relevant literature is examined, studies show that there is a positive relationship between emotion regulation and self-compassion (Diedrich et al., 2016; Neff, 2003b; Vatan, 2019). In the study conducted by Gün et al. (2020) with students living in dormitories, the scores received by the participants from the emotional regulation and self-compassion scales were positively significant. Accordingly, it appears that the findings obtained with the relevant literature are consistent.

According to the results of the regression analysis conducted with the reassesment sub-dimension of attachment styles and emotion regulation skills, it was concluded that avoidant attachment, which is the sub-dimension of attachment styles, predicts the reassesment sub-dimension of emotion regulation skills. Attachment styles play a role in whether the child's emotion regulation skills are weak or strong, through the open and free expression of emotions or not (Yüksel, 2014). Children with an avoidant attachment style do not report or deny the difficulties they experience in order to reduce the possibility of rejection. This allows maintaining appropriate proximity to the attachment figure without causing discomfort. These children downplay their emotions as an escape from their attachment needs (Howe et al., 1999). However, individuals with an avoidant attachment style prefer to keep their emotions separate from their thoughts and actions. This situation provides them with a safe space (Mikulincer and Shaver, 2012). Accordingly, it can be said that individuals with an avoidant attachment style regulate their emotions by re-evaluating themselves in order to maintain closeness to the attachment figure by keeping themselves in a safe space. When the regression analysis results between attachment styles and the hiding sub-dimension of emotion regulation skills were examined within the scope of the study, it was determined that the anxiety and avoidance sub-dimensions of attachment styles predicted the hiding sub-dimension of emotion regulation skills. There are many studies in the relevant literature that support the findings of the research (Aydemir, 2020; Hwang, 2006; Kısmetoğlu, 2019; Yıldız, 2014). In their study, Mikulincer et al. (2003) stated that the attachment style that occurs when the child encounters a threat or seeks closeness from the primary caregiver and, as a result, the caregiver is not accessible, is related to negative emotion regulation. It is stated that children with an insecure attachment style are not considered worthy of sharing their feelings by their parents, are criticized and are not respected. This makes it difficult for children to regulate their emotions. As a result of these conditions, differences in emotion regulation occur between children with a secure attachment style and children with an insecure attachment style (Thompson & Meyer, 2007). In their study, Karabacak and Demir (2017) revealed that anxious and avoidant attachment had a positive and significant relationship with suppression, the dysfunctional sub-dimension of emotion regulation skills. In summary, it can be said that the findings of the research are consistent with the relevant literature and that individuals with insecure attachment style use the hiding skill, which is the negative sub-dimension of emotion regulation skills, in order to regulate their emotions.

According to the regression analysis conducted between emotion regulation and self-compassion in the study, it was concluded that the mindfulness sub-dimension of self-compassion significantly predicts emotion regulation skills. Mindfulness constitutes one of the basic parts of self-compassion (Neff, 2003a). Mindfulness enables the person to find a way to become aware of the moments in which he/she suffers and the situations in which he/she criticizes oneself (Germer, 2009). It also involves keeping one's difficult and distressing thoughts and feelings in balance, not getting carried away by them, and not overly identifying with them (Marlatt and Kristeller, 1999). Allen and Leary (2010) stated that the mindfulness feature of self-compassion can be defined as a harmonious emotion regulation strategy. Based on this, it can be said that the person consciously regulates his/her emotions in order to be kind and compassionate towards oneself. Another finding of the study was that the over-identification sub-dimension of self-compassion significantly predicted the hiding sub-dimension of emotion regulation skills. Self-compassion has the effect of providing powerful motivation for a person's growth and development. Being sensitive to oneself; It enables him/her to stop performing self-destructive behaviors and to encourage oneself to perform the behaviors he/she needs in order to get to a better position, even if it is difficult (Neff, 2003a). Self-compassion has a structure consisting of three components. These three components are divided into two different parts: positive and negative. Awareness is one of the three components that make up self-compassion. The negative side of mindfulness is the over-identification part of self-compassion (Neff, 2003b). Over-identification is when individuals define themselves by integrating with their emotions (e.g., I am a helpless person), overly identify with the situations experienced, and think that painful and difficult experiences are permanent rather than temporary (Costa et al., 2016). Over-identification lags behind awareness (Neff and Tirch, 2013). Awareness is the ability to look at thoughts without suppressing or judging them (Neff, Kirkpatrick, & Rude, 2007). According to Neff (2003a), awareness; It is the individual's ability to be aware of his/her own feelings and thoughts in the face of a painful experience and to handle them in a balanced way while maintaining his/her composure. As a result of their research, Feldman et al. (2007) found that as the level of mindfulness, one of the sub-dimensions of self-compassion, decreases, the scores of maladaptive emotion regulation strategies such as suppression, rumination and avoidance increase. In this regard, it can be stated that individuals who use the over-identification dimension of self-compassion in order to be kind to themselves use the hiding skill, which is the dysfunctional sub-dimension of emotion regulation skills, in order to regulate their emotions when they encounter a difficult event due to their low level of awareness.

Finally, when the findings of emotion regulation skills by gender were examined, it was concluded that the level of emotion regulation skills did not differ according to gender. Accordingly, no difference was detected between the scores of boys on the emotional regulation skills scale and the scores of girls on the emotional regulation skills scale. In this case, when the relevant literature was examined, in the study conducted by Güler (2022) with students studying at the faculty of sports sciences, it was concluded that emotion regulation skills did not show a significant difference between girls and boys. In a study conducted by Carlson and Wang (2007) with preschool children, it was concluded that emotion regulation did not differ in girls and boys. In Young et al.'s (2022) study with adolescents, it was found that emotion regulation skills did not differ significantly in terms of gender. Individuals develop different emotional regulation skills due to their different learning experiences and temperaments. There are individual differences in the use of developed emotion regulation skills (Gross and Thompson 2007). According to these results, it can be said that the reason why the level of emotions do not differ between boys and girls is the characterictics of the individual.

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The Effect of Career Anxiety on High School Students' Career Decision Making[1]

Süleyman Barbaros Yalçın[1]   **Ecenur Koyuncu[2]**

[1] Necmettin Erbakan University, Departman of Psychological Counseling and Guidance Konya, Türkiye
barbarosyalcin@erbakan.edu.tr

[2] Çumra Vocational Training Centre, Konya, Türkiye
ecenurkyuncu@gmail.com

Article Info	ABSTRACT
	This study aimed to examine the effect of career anxiety on high school students' career decision-making. The study group of the research consists of a total of 449 students, 146 boys (32.5%) and 303 girls (67%), who continue their education in different high schools in Konya center and districts. Research data was obtained using the "Personal Information Form" prepared by the researchers, the "Career Anxiety Scale" developed by Çetin-Gündüz and Nalbantoğlu-Yılmaz (2016) and the "Vocational Decision Making Inventory" developed by Çakır (2004). A relational screening model based on a descriptive method was used in the research. In the analysis of the data, parametric statistical techniques such as t test, one-way analysis of variance (ANOVA), Tukey test, correlation and regression analysis techniques were used according to the normality test. According to the research findings, there is a significant relationship between both career anxiety regarding family influence and career anxiety regarding career choice and all sub-dimensions of career decision-making. In addition, there is a low level positive relationship between students' career concerns related to family influence and the sub-dimensions of internal conflicts, not knowing oneself well enough, lack of profession and field knowledge, and irrational beliefs about career choice, and a moderate positive relationship between the students' career concerns and the external conflicts sub-dimension. It was found that there was a relationship.

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INTRODUCTION

With globalization in today's world, rapid developments and changes in issues such as technology, economy and education affect the lives of individuals in different ways. One of the important areas affected by this change process is career choice. Choosing a profession is of great importance in terms of giving meaning to individuals' lives, determining the path they will follow and constituting a significant portion of their time.

Profession is defined as an important tool that forms an important part of an individual's life, enables him to perform his vital roles, and determines his quality of life and social prestige (Coşgun, 2019; Turan & Kayıkçı, 2019). For this reason, career choice constitutes a critical process that determines an individual's vital career planning and should be emphasized. If the individual's career planning is not made in accordance with his/her life preferences, it is likely to arise by disturbing the individual in later periods and will directly affect his/her life career (Özmerkez, 2012).

The adolescence period, which coincides with high school age, constitutes a decisive period in terms of individuals' identity acquisition, as well as the formation of their professional identity and decision on the profession they will have in the future (Aydın, 2019; Gülbahçe, 2009). It is also important for the individual to plan his life and determine his living standards (Şeker & Kaya, 2019). During the high school years, when the individual carries out environmental research on professions, discovers his talents and interests, and finally decides on a profession, the adolescent tries to fulfill a critical developmental task such as choosing a profession (Rowland, 2004).

Career development during adolescence is related to many aspects of the adolescent's development process, such as cognitive development, identity development, educational goals and objectives (Staf, Messersmith & Schulenberg, 2009). In this process, which is a transition period according to Ginzberg's development theory, interests, abilities and values are realized and the responsibilities that will come with choosing a profession begin to be realized. In this period, which corresponds to the research phase of Super's (1983) developmental periods, the developmental task expected from the adolescent is to choose a profession by discovering the characteristics of the profession with his own interests and abilities. If students cannot fulfill their professional development duties during this period, it becomes difficult for them to make correct and rational decisions (Aydın-Orhan & Ültanır, 2014).

During the career selection period, it is observed that individuals experience difficulties in self-discovery, researching professions, determining suitable professions for themselves and deciding on a profession (Öksüz & Karalar, 2016; Çarkıt, 2022). During the career development process, while students are still deciding on their professional orientation and trying to dream and create ideals about the profession; Family expectations, frequently changing education system, curriculum changes, changes in the university entrance exam, academic success, interest, ability and desire to make a decision appropriate to personal characteristics and employment opportunities can lead to negative emotions in the decision-making processes (Çetin-Gündüz & Nalbantoğlu, 2016; Koçakoğlu & Yalçın, 2023). Anxiety constitutes one of these negative emotions.

Making a career decision can become a worrying situation for adolescents in this complex period they live in. Anxiety is the emotional response of an individual to environmental and psychological events. The individual may feel anxiety about situations or dangers that are likely to occur but that he sees as harmful (Günay, 2022). Career anxiety, as an extension of difficulties experienced in the process of career decision-making and career indecision, is defined as the worry of making a mistake in choosing a career, the fear of failure in academic field and career choice, and the fear of being unemployed as a result (Vignoli, 2015). Career anxiety emerges as a type of anxiety that can be observed physically, psychologically and cognitively at different levels and frequencies, resulting from the person's responsibility for developing the career process that creates his goals, meaning and

satisfaction (Pisarik, Rowell & Thompson, 2017).

When the literature is examined, it is seen that studies on career anxiety are generally conducted with university students, but there are also studies on adolescents. With their study, Agun, Işılay-Üçok and Aydın-Küçük (2021) revealed the factors and combat methods that cause career anxiety experienced by employees who are in the period of establishing and maintaining their careers. In another study, 11th and 12th grade students' career concerns regarding family influence and career choice were examined and it was determined that general career concerns and career concerns regarding family influence were low, and career concerns regarding career choice were moderate (Göncü-Akbaş & Okutan, 2020). . In their study on examining the relationship between high school students' career anxiety and five-factor personality traits, Kayadibi and Kırdök (2020) concluded that neuroticism and agreeable personality traits explained career anxiety by 19%. In a qualitative study examining the career concerns of sports high school students, as a result of the analysis made on four themes as Family, School, Environment and Education System, it was found that students with low career anxiety wanted to improve themselves in other areas, while students with high career anxiety saw their schools as inadequate in terms of self-improvement and It has been determined that they think they may have employment problems (Çalı & Doğar, 2021).

This research aims to examine the effect of career anxiety on high school students' career decision-making. For this purpose, whether there is a significant difference between demographic variables such as students' gender, school types, and grade levels and their vocational decision-making and career concerns, the relationship between career anxiety and vocational decision-making, and the predictive power of career anxiety in vocational decision-making were determined as sub-objectives. It is thought that this study is important in terms of contributing to the literature by trying to determine the effectiveness of career anxiety among the factors affecting the career choice of high school students, investigating the career concerns of students, revealing the relationship between the concepts and conducting the study with adolescents.

METHOD

Research Model

In this study, which aims to reveal the effect of career anxiety on high school students' career decision-making, a relational screening model based on a descriptive method was used. In the relational screening model, it is aimed to determine the existence or degree of change between two or more variables. Thanks to this model, it is tried to determine if there is a change, how it happened and whether the variables change together (Karasar, 2023).

Research Study Group

The research group consists of 449 students who continue their education in different high schools in Konya center and districts. Information about the demographic characteristics of the study group is given in Table 1.

Table 1. *Findings regarding the demographic characteristics of the study group of the research*

Variable		f	%
1. Gender	Female	303	67.5
	Male	146	32.5
2. School type	Science High School	26	5,8
	Anatolian High School	77	17,1
	Vocational High School	107	23,8
	Imam Hatip High School	239	53,2
3. Grade level	9th grade	160	35,6
	10th grade	108	24,1
	11th grade	97	21,6
	12th grade	84	18,7
4. Economical situation	Low	36	8,0
	Middle	380	84,6

High	33	7,3
Total	449	100

When Table 1 is examined, the distribution of the study group by gender consists of a total of 449 students, 303 (67.5%) of which are female and 146 (32.5%) are male. According to school type, it was seen that science high school consisted of 26 (5.8%) students, anatolian high school consisted of 77 (17.1%), vocational high school consisted of 107 (23.8%) and religious high school consisted of 239 (53.2%) students. According to the grade levels of the students, the distribution is as follows: 9th Grade 160 (35.6%), 10th Grade 108 (24.1%), 11th Grade 97 (21.6%) and 12th Grade 87 (18.7%). When the distribution according to socioeconomic levels was examined, it was determined that there were 36 (8.0%) people in low economic status, 380 (84.6%) people in medium economic status and 33 (7.3%) people in high economic status.

Researh Instruments and Processes

Vocational Decision Inventory, Career Anxiety Scale and Personal Information Form prepared by the researcher were used to collect data in the study. The prepared measurement tools were applied face to face to high school students.

Vocational Decision Inventory: The scale was developed by Çakır (2004) in order to identify high school students who are in vocational indecision, with a multi-dimensional approach, taking into account the 5 most common characteristics before the decision-making stage. The scale consisting of 30 items is a 5-point Likert type. The scale has 5 sub-dimensions: internal conflicts, not knowing oneself sufficiently, lack of profession and field knowledge, irrational beliefs regarding career choice, and external conflicts. The researcher found the Cronbach Alpha coefficient of the scale to be .85, and in this study, the Cronbach Alpha value of the scale was found to be .94.

Career Anxiety Scale: The scale, which aims to determine the career anxiety experienced by high school students during their professional development process, was developed by Çetin-Gündüz and Nalbantoğlu-Yılmaz (2016). The scale consisting of 14 items was prepared as a 5-point Likert type. It has two sub-dimensions: career anxiety regarding family influence and career anxiety regarding career choice. A minimum of 14 and a maximum of 70 points can be obtained from the scale. High scores indicate high career anxiety. Fit indices obtained as a result of confirmatory factor analysis of the scale

χ^2 /sd=2.518, RMSEA=0.067, CFI=0.95, NFI=0.92, NNFI=0.94, SRMR=0.055, GFI=0.92, AGFI=0.90. In addition, the researchers found the reliability of concerns about family influence to be .742 and the reliability of concerns about career choice to be .797 (Çetin-Gündüz and Nalbantoğlu-Yılmaz, 2016). In the study group data used for this research, the Cronbach Alpha value of the scale was found to be .90.

Personal Information Form: The personal information form prepared by the researchers contains demographic information about high school students (gender, grade level, school type, mother's education level, father's education level, socioeconomic status, future occupation and career planning and the influence of family and teachers in this planning). It consists of questions about your thoughts about.

Processes

In the second semester of the 2021-2022 academic year, data was collected from students who continued their education in different types of high schools in Konya and its districts, with voluntary participation. The data collection process was carried out by the second researcher, taking approximately 15 minutes, by giving information about the purpose of the research and the importance of honest and sincere answers in terms of affecting the result.

Data Analysis

SPSS 25 program was used to analyze the data. In Table 2 below, the findings obtained as a result of the analyzes regarding the normality of the distribution are given.

Table 2. *Findings regarding the mean, standard deviation, skewness and kurtosis values of the scores obtained from the career anxiety and career decision-making scales*

	n	X	Ss	Skewness	Kurtosis
Career anxiety due to family influence	449	10,44	4,82	.794	.013
Career anxiety regarding career choice	449	26,74	9,20	-.038	-.638
Career decision making	449	78,89	26,24	.044	-.602

When Table 2 is examined, the students' career anxiety score average regarding family influence was found to be 10.44, their career anxiety score average regarding career choice was 26.74, and their career decision making average score average was found to be 78.89. It is seen that skewness and kurtosis values are between -1 and +1 and the data in the distribution show a normal distribution (Hair vd, 2013) As a result of the normality test, T Test, One-Way Analysis of Variance (ANOVA), Tukey Test, Correlation and Regression Analysis techniques were used in independent groups from parametric tests.

Ethic

Permissions were obtained from the researchers for the "Career Anxiety Scale" developed by Çetin-Gündüz and Nalbantoğlu-Yılmaz (2016) and the "Professional Decision Making Inventory" developed by Çakır (2004), which were planned to be used before the research, and required approval from Necmettin Erbakan University Social and Humanities Ethics Committee. permission has been taken.

Ethics Committee Name: Necmettin Erbakan University Social and Humanities Ethics Committee

Approval Date: 11.02.2022

Approval Document Number: 2022/60

FINDINGS

Table 3 includes the findings obtained as a result of the t test conducted to determine the professional decision-making levels of students according to the gender variable.

Table 3. *T-test results regarding students' career decision-making and career anxiety according to their gender*

Variables	Sub-Dimensions	Gender	N	X	ss	Levene Test (F; p)	t	p	Cohen's Impact Value
Vocational Decision Making	Internal Conflicts	Female	303	22.86	9.19	3.988 p<.05	3.666	.000**	.036183
		Male	146	19.69	8.28				
	Self Enough non-recognition	Female	303	20.31	7.21	.642 p>.05	2.973	.003*	.030138
		Male	146	18.19	6.89				
	Lack of vocational and Domain Knowledge	Female	303	20.56	7.02	.182 p>.05	3.897	.000**	.039126
		Male	146	17.80	7.09				
	Regarding Career Selection Irrational Beliefs	Female	303	8.70	3.64	5.131 p<.05	-2.442	.015*	.252035
		Male	146	9.69	4.23				
	External Conflicts	Female	303	8.46	3.81	1.110; p>.05	-2.737	.006*	.271422
		Male	146	9.54	4.12				

Career Anxiety	Family Influence	Female	303	10.56	4.80	.004 p>.05	.808	.470	-
		Male	146	10.21	4.88				
	Career choice	Female	303	28.75	8.35	2.470 p>.05	7.036	.000**	.069155
		Male	146	22.58	9.49				

Not. **p<.05; **p<.01

The mean scores of all sub-dimensions of career decision-making of students studying in high school differ significantly according to the gender variable (p <.05). Female students' sub-dimension mean scores of career decision making, internal conflicts, not knowing themselves well enough, and lack of professional and field knowledge are significantly higher than male students' sub-dimension mean scores. In the irrational beliefs and external conflicts sub-dimensions of career decision-making, the mean scores of male students are significantly higher than the mean scores of female students. According to the Cohen's d value, which was calculated to reveal the magnitude of the effect of students' gender on the sub-dimensions of career decision-making, it can be said that the effect level of each sub-dimension is moderate.

It was found that the career choice dimension of students' career concerns (t=7.036; p=.000<.05) differed statistically significantly according to the gender variable, and the career anxiety score averages of female students regarding career choice were significantly higher than the male students' average scores. According to the Cohen's d value calculated to determine the effect of students' gender on their career concerns, it can be said that the effect level of the career choice dimension is low. It was found that the family influence sub-dimension of career anxiety did not show a significant difference according to the gender variable.

Table 4 shows the findings obtained as a result of ANOVA regarding the differentiation of students' career concerns according to the school type variable.

Table 4. *Anova test results regarding students' career concerns according to school types*

Career Anxiety	School Type	N	X	ss	Levene Test (F; p)	F	p	Groups Between Difference
School type	A. Science High School	26	12.03	4.84	.972; p>.05	.968	.408	
	B. Anatolian High School	80	10.46	5.20				
	C. Vocational High School	107	10.42	4.78				
	D Imam Hatip High School	239	10.34	4.73				
Family Influence	A. Science High School	26	28.53	8.89	3.521; p<.05	7.008	.000**	C>D
	B. Anatolian High School	80	26.06	10.38				
	C. Vocational high School	107	23.59	9.53				
	D Imam Hatip High School	239	28.23	8.28				

Not. **p<.05; **p<.01

When Table 4 is examined, it is seen that students' career concerns regarding career choice (F = 3.521; p <.05) differ significantly according to the school type variable. As a result of the Tukey test conducted to determine the source of the difference between groups, it was determined that there was a significant difference between vocational high school and religious high school students. According to this result, it can be said that Imam Hatip High School students have higher career concerns regarding career choice. It was found that there was no significant difference in students' career concerns regarding family influence according to school types.

Table 5 shows the findings obtained as a result of ANOVA regarding the differentiation of students' professional decision-making levels according to the school type variable.

Table 5. *Anova test results regarding students' career decision-making according to school types*

Vocational Decision Making	School Type	N	X	ss	Levene Test (F; p)	F	p	Groups Between Difference
Internal Conflicts	A. Science High School	26	24.76	8.62	1.475; p>.05	12,489	.071	
	B. Anatolian High School	80	21.27	9.30				
	C. Vocational high School	107	20.31	8.13				
	D Imam Hatip High School	239	22.39	9.26				
Self Enough non-recognition	A. Science High School	26	20.38	7.95	.932; p>.05	8,836	.154	
	B. Anatolian High School	80	18.53	7.26				
	C. Vocational high School	107	18.85	6.79				
	D Imam Hatip High School	239	20.26	7.19				
Lack of vocational and Domain Knowledge	A. Science High School	26	20.65	7.18	.708; p>.05	15,187	.008*	C>D
	B. Anatolian High School	80	18.91	7.78				
	C. Vocational high School	107	17.93	6.79				
	D Imam Hatip High School	239	20.59	6.95				
Regarding Career Selection Irrational Beliefs	A. Science High School	26	9.15	4.14	1.271; p>.05	6,630	.000**	B>C C>D
	B. Anatolian High School	80	8.20	3.68				
	C. Vocational high School	107	10.39	4.21				
	D Imam Hatip High School	239	8.67	3.59				
External Conflicts	A. Science High School	26	8.69	3.29	1.308; p>.05	7,490	.001*	B>C C>D
	B. Anatolian High School	80	8.54	3.93				
	C. Vocational high School	107	10.14	4.03				
	D Imam Hatip High School	239	8.31	3.85				

Not. **p<.05; **p<.01

When Table 5 is examined, students' mean scores on the sub-dimension of vocational decision-making and lack of professional and field knowledge according to school types; science high school students, 20.59 for religious high school students, 18.91 for anatolian high school students, and 17.93 for vocational high school students. As a result of pairwise comparisons (Tukey) made to determine the source of differentiation, it was found that the mean scores of Imam Hatip students on lack of professional and field knowledge were significantly higher than the scores of vocational high school students (p <.05). According to the students' school types, the irrational beliefs about career choice sub-dimension average scores are; It was determined that science high school students' score was 9.15, Anatolian high school students' score was 8.20, vocational high school students' score was 10.39, and religious high school students' score was 8.67. In terms of the source of differentiation, it was found that the irrational belief score averages of vocational high school students regarding career choice were significantly higher than the Imam Hatip and Anatolian high school students' average scores (p <.01). As a result of pairwise comparisons made according to students' external conflicts, it was similarly found that the external conflict average scores of vocational high school students were significantly higher than the average scores of imam hatip and anatolian high school students (p <.05). It was observed that students' internal conflicts and not knowing themselves well sub-dimensions did not

differ significantly according to school type.

The findings obtained as a result of the ANOVA test regarding the differentiation level of students' career concerns according to the grade level variable are given in Table 6 below.

Table 6. *ANOVA test results regarding students' career concerns according to their grade levels*

Career Anxiety	Grade Level	N	X	ss	Levene Test (F; p)	F	p	Groups Between Difference
Family Influence	A. 9th grade	160	9.84	4.24	4.851; p<.05	,660	.000**	A>B B>D C>D
	B. 10th grade	108	12.0	4.98				
	C. 11th grade	97	11.2	5.52				
	D. 12th grade	87	8.81	4.15				
Vocational choice	A. 9th grade	160	25.8	8.84	1.579; p>.05	49,512	.095	
	B. 10th grade	108	28.6	8.36				
	C. 11th grade	97	26.7	10.21				
	D. 12th grade	87	26.2	9.44				

Not. **p<.05; **p<.01

When Table 6 was examined, when the career concerns of high school students were examined according to their grade levels, it was determined that there was a significant difference between career anxiety regarding family influence and grade level. When we look at the subscale mean scores, it is 9.84 for 9th grade students, 12.02 for 10th grade students, 11.29 for 11th grade students and 8.81 for 12th grade students. As a result of pairwise comparisons made to determine the source of differentiation, it can be said that the career anxiety score averages of 10th grade students regarding family influence are higher than other grade levels. It was found that career anxiety regarding career choice did not show a significant difference according to grade level.

Table 7 shows the findings obtained as a result of ANOVA regarding the differentiation of students' professional decision-making levels according to the grade level variable.

Table 7. *Anova test results regarding students' career decisions according to their grade levels*

Mesleki Karar Verme	Grade Level	N	X	ss	Levene Test (F; p)	p	Groups Between Difference
Internal Conflicts	9th grade	160	22.53	8.94	.400; p>.05	.164	
	10th grade	108	22.37	8.69			
	11th grade	97	21.78	8.94			
	12th grade	87	19.96	9.51			
Self Enough non-recognition	9th grade	160	19.71	6.78	.976; p>.05	.071	
	10th grade	108	20.89	7.14			
	11th grade	97	19.38	7.61			
	12th grade	87	18.19	7.25			
Lack of vocational and Domain Knowledge	9th grade	160	20.13	6.82	1.339; p>.05	.085	
	10th grade	108	20.58	6.77			
	11th grade	97	19.22	7.69			
	12th grade	87	18.17	7.43			
Regarding vocational Selection Irrational Beliefs	9th grade	160	8.97	3.60	3.042; p<.05	.000**	A>D B>D C>D
	10th grade	108	9.25	3.94			
	11th grade	97	10.06	4.37			
	12th grade	87	7.66	3.24			

	9th grade	160	8.81	4.05		
	10th grade	108	9.06	3.72		A>D
External Conflicts	11th grade	97	9.85	4.23	2.513;	B>D
	12th grade	87	7.32	3.21	p>.05	C>D

Not. **p<.05; **p<.01

According to Table 7, when the significant differentiation between the sub-dimensions of career decision-making and grade levels is examined, it is seen that there is no significant difference in the sub-dimensions of internal conflicts, not knowing oneself sufficiently and lack of profession and field knowledge. It can be said that there is a significant difference in the sub-dimensions of irrational beliefs and external conflicts regarding career choice according to grade level, and this differentiation is in favor of 12th grade students.

The findings regarding the correlation results, which were conducted to determine the relationship between students' career decision-making and career concerns, are given in table 8 below.

Table 8. *Findings regarding the correlation between students' career decision-making and career concerns*

		Internal Conflicts	Self Enough non-recognition	Lack of vocational and Domain Knowledge	Regarding vocational Selection Irrational Beliefs	External Conflicts
Family Influence	r	.261**	.259**	.335**	.279**	.509**
Vocational choice	r	.552**	.533**	.517**	.392**	.325**

Not. **p<.05; **p<.01

When Table 8 is examined, there is a low positive relationship between high school students' career concerns regarding family influence and the sub-dimensions of internal conflicts, not knowing oneself well, lack of profession and field knowledge, and irrational beliefs about career choice, and a medium relationship between the sub-dimensions of external conflicts and external conflicts. It was found that there was a positive relationship at the level of It was determined that career anxiety regarding career choice had a moderate positive relationship with internal conflicts, not knowing oneself well, lack of profession and field knowledge, and a low positive relationship with the sub-dimensions of irrational beliefs and external conflicts regarding career choice.

Table 9 presents the findings obtained as a result of the regression analysis conducted to determine the degree to which students' career concerns predict the internal conflicts sub-dimension of career decision-making.

Table 9. *Regression analysis results regarding students' career anxiety predicting the internal conflicts sub-dimension of career decision-making*

Independent Variable	ß	t	p	F	Model (p)	r²	VIF	Durbin-Watson
Family Influence	.024	.557	.578	103.727	.000**	.313	1.225	1.902
Vocational choice	.551	12.763	.000					

Dependent Variable: Internal Conflicts

Not. **p<.05; **p<.01

The multiple regression analysis performed to determine the predictive value of students' career concerns on the sub-dimension of internal conflicts in career decision-making was found to be

statistically significant (F: 103.727; p<.05). While the career choice sub-dimension of high school students' career concerns significantly predicts the internal conflicts sub-dimension of their career decision-making (p<.05), the family influence sub-dimension of career concerns does not have a significant prediction (p>.05). The career choice sub-dimension of students' career concerns explains 31% of the variability in the internal conflicts sub-dimension of career decision-making.

Before testing the predictive power of students' career concerns in the internal conflicts dimension of career decision-making with regression analysis, the relationship between multicollinearity and error terms among the dimensions of career anxiety was examined. According to the obtained Durbin-Watson and VIF values, it is understood that there is no correlation and multicollinearity between the error terms.

Table 10 presents the findings obtained as a result of the regression analysis conducted to determine the level of students' career concerns predicting the self-awareness dimension of career decision-making.

Table 10. *Regression analysis results regarding students' career concerns predicting the self-awareness sub-dimension of career decision-making*

Independent Variable	ß	t	p	F	Model (p)	r²	VIF	Durbin-Watson
Family Influence	.043	.962	.336					
Vocational choice	.503	11.309	.000	84.644	.000**	.271	1.225	1.827

Dependent Variable: Not Knowing Yourself Enough

Not. **p<.05; **p<.01

Multiple regression analysis performed to determine the predictive value of students' career concerns on the sub-dimension of not knowing oneself sufficiently in career decision-making was found to be statistically significant (F: 84.644; p<.05). Students' career concerns regarding career choice explain 27% of the variability in the dimension of not knowing oneself sufficiently. However, career concerns regarding family influence do not have a significant predictive effect on the dimension of not knowing oneself sufficiently (p>.05).

Table 11 shows the findings obtained as a result of the regression analysis conducted to determine the extent to which students' career concerns predict the dimension of lack of professional and field knowledge in career decision-making.

Table 11. *Regression analysis results regarding students' career anxiety predicting the lack of professional and field knowledge sub-dimension of career decision-making*

Independent Variable	ß	t	p	F	Model (p)	r²	VIF	Durbin-Watson
Family Influence	.139	3.137	.002					
				88.413	.000**	.279	1.225	1.780
Vocational choice	.457	10.328	.000					

Dependent Variable: Lack of Profession and Field Knowledge

Not. **p<.05; **p<.01

According to Table 11, the multiple regression analysis performed to determine the predictive value of students' career concerns on the sub-dimension of lack of professional and field knowledge in career decision-making was found to be statistically significant (F: 88.413; p<.05). It was found that career anxiety regarding family influence and career anxiety regarding career choice explained 27% of

the variability in the dimension of lack of profession and field knowledge of career decision-making.

Table 12 presents the findings obtained as a result of the regression analysis conducted to determine the level of students' career concerns predicting the irrational beliefs regarding career choice sub-dimension of career decision-making.

Table 12. *Regression analysis results regarding students' career anxiety predicting the irrational beliefs about career choice sub-dimension of career decision-making*

Independent Variable	ß	t	p	F	Model (p)	r^2	VIF	Durbin-Watson
Family Influence	.135	2.844	.005	45.594	.000**	.165	1.225	1.645
Vocational Choice	.334	7.015	.000					

Dependent Variable: *Irrational Beliefs About Career Choice*
Not. **p<.05; **p<.01

When Table 12 is examined, the analysis conducted to determine the predictive value of students' career concerns in the sub-dimension of irrational beliefs regarding career choice was found to be statistically significant (F: 45.594; p<.05). Family influence and career choice sub-dimensions of career anxiety explain 16% of the change in the irrational beliefs about career choice sub-dimension of career decision-making.

Table 13 presents the findings obtained as a result of the regression analysis conducted to determine the extent to which students' career concerns predict the external conflicts dimension of professional decision-making.

Table 13. *Regression analysis results on the prediction of students' career anxiety and sub-relationships of the external course of career decision-making*

Independent Variable	ß	t	p	F	Model (p)	r^2	VIF	Durbin-Watson
Family Influence	.452	10.155	.000	84.137	.000**	.269	1.225	1.699
Vocational choice	.131	2.936	.003					

Dependent Variable: External Conflicts
Not. **p<.05; **p<.01

When Table 13 is examined, as a result of the regression analysis conducted to determine the predictor of high school students' areer concerns in the external conflicts dimension, it was found that the family influence and career choice sub-dimensions of career anxiety were a significant predictor of the external conflicts sub-dimension of career decision making and explained 26%.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

In this study, the effect of career anxiety on high school students' career decision-making was examined. The research results were discussed and interpreted in the light of the relevant literature and suggestions regarding the results were developed.

Looking at the results, it was determined that the career concerns of high school students regarding career choice differed significantly according to the gender variable and that female students' career concerns regarding career choice were higher. In his study on the role of family support and hope in predicting adolescents' career anxiety, Şama (2020) concluded that female students' career concerns

regarding career choice are higher than male students' professional career concerns, supporting the results of this study. When the literature was examined, it was seen that similar results were reached in studies on this subject (Çarkıt, 2022; Daniels et all., 2011; Okutan & Akbaş, 2019). In addition, in a study conducted by Akbaş (2019) on the career concerns of high school students, it was concluded that the career anxiety levels of the students did not differ significantly in the family influence sub-dimension, but there was a significant difference according to gender in the career choice sub-dimension, and the anxiety of female students was higher. This situation can be explained by the fact that women's anxiety levels are generally higher than men's anxiety levels (Karakas, Arkar, 2012; Kuzu, Ergöl, 2019) and gender roles.

Students' mean scores on all sub-dimensions of career decision-making differ significantly according to their gender variable. The mean scores of female students on the sub-dimensions of career decision-making, internal conflicts, not knowing oneself sufficiently, and lack of professional and field knowledge are significantly higher than the mean scores of male students. In the irrational beliefs and external conflicts sub-dimensions of career decision-making, the mean scores of male students are significantly higher than the mean scores of female students. It is thought that this difference may be caused by the fact that female students are more responsible and have higher levels of awareness. In his research on the relationships between career indecision and career decision-making self-efficacy and locus of control, Özkaynak (2012) found that the career indecision levels of male students were significantly higher than the career indecision levels of female students.

According to the results of this research, it has been determined that students' career concerns regarding career choice vary significantly according to the school type variable, and the career concerns of Imam Hatip students are higher than students in other school types. Supporting this research result, Akbaş and Okutan (2020) concluded in their study that career concerns regarding career choice differ significantly according to the school type variable. However, they determined that the career concerns of Anatolian high school students were higher than the career concerns of students studying in other types of schools regarding career choice. Şama (2020) found in his study that vocational high school students have higher career anxiety. According to the students' school types, it was found that the mean score of Imam Hatip students on the lack of vocational and field knowledge in the sub-dimension of vocational decision making and lack of vocational and field knowledge was significantly higher than the scores of vocational high school students. In the irrational beliefs and external conflicts sub-dimensions regarding students' school types, the irrational belief score averages of vocational high school students regarding career choice are significantly higher than the score averages of imam hatip and anatolian high school students, and similarly, the external conflict score averages of vocational high school students are higher than imam hatip students' average scores. and it was found to be significantly higher than the average scores of anatolian high school students. It was observed that students' internal conflicts and not knowing themselves well sub-dimensions did not differ significantly according to school type. In another study, when examined according to school type, the career indecision of students attending vocational and technical high schools was found to be higher than the career indecision of students attending general high school (Özmerkez, 2012). The research results can be explained by the fact that the study group has different life and socio-economic levels and is at different class levels.

It was observed that students' career concerns showed significant differences in the family influence dimension according to the grade level variable, and the career anxiety score averages of 10th grade students regarding family influence were higher than other grade levels. Students making their field choices at this grade level and their families participating in the process may cause adolescents' career concerns regarding family influence to be higher in the 10th grade. Şama (2020) found in his study that, unlike the results of this study, adolescents' career concerns regarding family influence did not differ significantly, but their career concerns regarding career choice differed significantly. In his

study, Çalı (2021) concluded that students' career concerns did not differ according to the grade level variable. Other studies have also shown that there is no difference in career anxiety level according to grade level (Akbaş, 2019; Nalbantoğlu-Yılmaz & Çetin-Gündüz, 2018). When the significant differentiation between the sub-dimensions of career decision-making and grade levels was examined, it was seen that there was no significant difference in the sub-dimensions of internal conflicts, not knowing oneself sufficiently and lack of profession and field knowledge. It can be said that there is a significant difference in the sub-dimensions of irrational beliefs and external conflicts regarding career choice according to grade level, and this differentiation is in favor of 12th grade students. It is thought that this situation may be due to the fact that students at other grade levels may be further away from making a decision regarding career choice, 12th grade students may be more advanced, causing them to have a more critical approach to professional issues, and their professional decisions may be clearer.

There is a low level positive relationship between high school students' career concerns related to family influence and the sub-dimensions of internal conflicts, not knowing oneself sufficiently, lack of profession and field knowledge, and irrational beliefs about career choice, and a moderate positive relationship between the sub-dimensions of professional decision-making and external conflicts. It was found that there was a relationship. It was determined that career anxiety regarding career choice had a moderate positive relationship with internal conflicts, not knowing oneself well, lack of profession and field knowledge, and a low positive relationship with the sub-dimensions of irrational beliefs and external conflicts regarding career choice. It is important for students to make professional decisions and the influence of their parents and environment in the decision process, to adequately recognize their own interests, abilities and values, and to have accurate information about the profession (Barkale Şahin, Yalçın & Hamarta, 2023). In this process, it is thought that having accurate information will help students get rid of irrational beliefs about the profession, act more determinedly and experience less anxiety. It can be said that reducing career anxiety will also reduce the difficulty of career decision-making.

When the regression results of the study are examined, the career choice sub-dimension of students' career concerns explains 31% of the variability in the internal conflicts sub-dimension of career decision-making. Students' career concerns regarding career choice explain 27% of the variability in the dimension of not knowing oneself sufficiently in career decision-making. However, career concerns regarding family influence do not have a significant predictive effect on the sub-dimensions of internal conflicts and not knowing oneself sufficiently. In addition, high school students' career anxiety regarding family influence and career anxiety regarding career choice account for 27% of the variability in the lack of profession and field knowledge dimension of professional decision-making, 16% of the variation in the irrational beliefs regarding career choice sub-dimension of professional decision-making, and It was observed that the external conflicts sub-dimension of decision-making explained 26%. It is seen that the anxiety experienced by students regarding career choice predicts all sub-dimensions of professional decision-making (internal conflicts, not knowing oneself sufficiently, lack of profession and field knowledge, irrational beliefs and external conflicts). When the literature was examined, no such detailed study was found that addressed professional decision-making with its sub-dimensions.

Recommendations

1. According to the findings, creating a career guidance program regarding career selection to reduce female students' career concerns,

2. Conducting informative studies within the scope of vocational guidance by including students as well as families who are influential in career choice,

3. Increasing the number of studies to be carried out within the scope of career psychological counseling, which considers all educational, personal and vocational guidance services for high school

students,

4. Conducting more research on students' career decisions and career concerns by including different types of high schools,

5. Increasing vocational group guidance activities by school psychological counselors in order to reduce students' internal conflicts, help them know themselves better, correct their false beliefs by ensuring that they have accurate information about professions, and reduce their external conflicts.

6. Considering that career anxiety predicts vocational decision-making, it is recommended to conduct studies related to different concepts that may affect vocational decision-making.

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Turkish Adaptation of the Test of Narrative Language for Use in Preschools

Bayram Kara[1] 🆔   **Ramazan Arı[2]** 🆔

[1] School of Foreign Languages, Selcuk University, Konya, Türkiye
bayramkara@selcuk.edu.tr

[2] Department of Phycology, Faculty of Social Sciences and Humanities, Konya Food and Agriculture University, Türkiye
ramazan.ari@gidatarim.edu.tr

Article Info	ABSTRACT
	The purpose of this research is to adapt the Test of Narrative Language (TNL) to Turkish culture and to test its validity-reliability for Turkish children aged 60-72 months. The research was designed in general survey model. The sample included 240 five-year-old children attending a preschool in Konya city center. The TNL developed by Gillam and Peterson in 2004 was used to measure children's narrative skills within the scope of expressive and receptive language skills. The test includes six tasks in three formats (no picture, sequence pictures, and single picture) and two subtests (comprehension and narration). Content and construct validity analyses were performed to test the validity. Internal consistency, test-retest, split-half tests, and inter-rater consistency coefficients were calculated to determine its reliability. The results showed the Turkish adaptation of the TNL is a valid and reliable instrument to measure the narrative skills of 5-year-old Turkish children..

INTRODUCTION

Considered the golden age of development, the preschool period is a highly critical stage in terms of children's language development. Children's language skills therefore need to be supported through various activities and a rich stimulating environment. Accurate and valid assessment of the language in preschool children is essential for early identification of children with special educational needs, the design of the intervention and the evaluation of the outcomes of these interventions (Dale & Henderson, 1987). One important component of language development is the oral narration skills. The ability to tell stories, which is considered within the scope of narrative skills, plays a major role in the interpersonal communication as it is a part of routine life, social interactions, and academic activities, and is therefore seen as a very important skill for children's language development (Duinmeijer, de Jong, & Scheper, 2012). In typically developing children, this skill starts from preschool period and continues throughout the school years. Looking at the Preschool Education Program of the Ministry of National Education (MoNE) considering language development characteristics, it is seen that 48-60-month-old children can form sentences with 4-5 words, use conjunctions, answer questions such as why-how-who, respond to questions about short simple stories and talk about personal experiences. 60-72-month-old children can form sequential and compound sentences with six or more words, use past, present and future tenses, ask and answer questions such as "who, what, when, where, why and how", use conjunctions like "because, later", retell the stories just read aloud, and tell meaningful stories by establishing relationships between pictures, objects or events (MEB, 2013).

Narrative abilities are an important aspect and indicator of language development in young children. The concept of story involves a series of events, usually involving goal-oriented behaviors, sequenced according to time. Narration, in other words storytelling, is broadly defined as the oral/written presentation of events that are related in terms of cause and effect, or the oral/written transfer of a life experience in a specific time sequence (Peterson, 1990). Children begin to develop their language skills from the birth by interacting with other language users whose language skills have matured to a certain level, and by the ages of 3 to 4 years, they are capable of telling stories (Stadler & Ward, 2005). These narrative abilities then gradually develop over time. Typically developing children can comprehend and retell stories by the age of six (Merritt & Liles, 1987). Storytelling requires more complex language and a higher level of thinking than is required for everyday conversations. In order to describe an event to a listener who does not share it, the storyteller must choose explicit vocabulary, use clear pronoun references and descriptive language, and describe in a logical order the events that constitute a story (Petersen et al., 2010).

Children's narrative language abilities can be measured in a variety of ways and the most commonly used ones are personal story production and story retelling with or without picture cues. Personal story production usually involves asking the child to create/tell a story based on a picture or their life experiences. Because of its reliance on personal experiences and its common use in young children's everyday language, story generation is inherently a good indicator of the natural form of spoken language (Hudson & Shapiro, 1991). Story retelling, in the broadest sense, is the retelling of a story in the child's own words and expressions. The child listens to a story with or without picture support and is asked to retell the story. Morrow (1986) defines story retellings as post-listening or post-reading recollections in which the reader or listener recounts what they remember in oral or written form. Children's retelling of the story reveals not only what they remember but also how much they understand (Boudreau, 2008). Story retelling helps children to organize the various details of the story and to sequence the story events. Getting children to retell stories read by their parents or teachers is a widely used strategy that supports story comprehension and expressive vocabulary (Gambrell & Dromsky, 2000). In order to understand a story, children need to be aware of what is important in the story and use this knowledge to make the story understandable. Awareness of the elements that make up the story, i.e. the overall structure of the story, has a positive impact on the development of various

literacy skills. Mandler and Johnson (1977) found that children of all ages use their knowledge of story structure to help them remember important details in a story. Knowledge of story structure matters when children interpreting and constructing their stories (Golden, 1984). As stated by Bower (1976), children who are not aware of story structure tell stories in which some story elements are missing, misordered, and lack harmony or coherence. Morrow (1986) concluded that when preschool children are encouraged to tell stories read to them, their comprehension and use of verbal language skills improve. Mages (2008) argues that children's ability to tell stories is related to academic literacy. Davies (2007) reported that storytelling improves children's listening and speaking skills and promotes language and imagination development.

In conclusion, storytelling and comprehension are seen as two important indicators of children's language development. It is important to evaluate children's storytelling skills and support them when necessary, as it forms the basis for their academic success. It helps them establish a healthy communication with the people around them, thus playing a major role in their social development. The TNL tests the narrative language abilities of children through stories. A problem that arises here is that there is no measurement tool in Turkey that can evaluate and measure children's expressive and receptive language on the basis of storytelling skills, both in terms of how well they understand the stories just read to them and how well they can create original or personal stories. Since the current measurement tools are based on measuring children's expressive and receptive language skills through concepts, words and phrases, the lack of a story-based measurement tool is considered a problem. In addition to assessing children's narrative abilities, the TNL has important areas of use such as identifying children with developmental language disorders, determining whether there is a discrepancy between the levels of receptive and expressive language development, and evaluating the effectiveness of an educational program implemented to support language development in children. Therefore, the results of this research are considered significant as they will increase the diversity of existing measurement tools and introduce a measurement tool that can be used by educators and researchers to evaluate children's oral language development.

The main purpose of this study is to develop a Turkish version of the TNL and establish its validity and reliability for 60-72-month-old Turkish children. In particular, the study seeks to address the following research questions:

1. Is the Turkish version of the TNL a valid assessment tool for 60-72-month-old children?

   1.1. Does the Turkish version of the TNL meet the content validity criteria for 60-72-month-old children?

   1.2. Does the Turkish version of the TNL meet the construct validity criteria for 60-72-month-old children?

2. Is the Turkish version of the TNL a reliable assessment tool for 60-72-month-old children?

   2.1. Do the results of the internal consistency analysis calculated for the Turkish version of the TNL show that the test is a reliable tool?

   2.2. Do the results of the test-retest reliability analysis calculated for the Turkish version of the TNL indicate that the test is a reliable tool?

   2.3. Do the results of the Split-half reliability analysis calculated for the Turkish version of the TNL show that the test is a reliable tool?

   2.4. Do the results of the interrater reliability analysis for the Turkish version of the TNL indicate that the test is a reliable tool?

METHOD

Research Design

This research was done to develop a Turkish version of the TNL and establish its validity and reliability for 60-72-month-old Turkish children. Given that, it was conducted based on a general survey design. Such designs attempt to describe a present or past situation in their existing condition (Karasar, 2013).

Participants

The sample of the study included 240 five-year-old children with normal development, attending preschools in Konya city-center. Simple random sampling method was used for the selection of the participants. In determining the sample size for the validity and reliability of the TNL, expert opinions stating that approximately three times the number of five-year-old children (n=83) included in the original version of the test would be sufficient were taken into consideration and the study was conducted with 240 children. In order to eliminate bias in the study, children were randomly selected and the sample eventually included typically developing preschoolers with parental consent. Those who did not want to participate in the study were left out and the data belonging to children who failed to complete the test and could not fulfil the instructions properly (n=5) were excluded from the analyses.

Table 1. *Distributions by age and gender*

Variable		60-66 Months		67-72 Months		Total	
		n	%	n	%	n	%
Age		127	53	113	47	240	100
		n	%	n	%		
	Girls	57	24	52	21.5	109	45.5
Gender	Boys	70	29	61	25.5	131	54.5
	Total	127	53	113	47	240	100

Research Instruments and Processes

The research data was collected using the Test of Narrative Language (TNL) developed by Gillam and Peterson (2004) to measure the narrative skills of children.

Test of Narrative Language (TNL)

The TNL (Gillam & Peterson, 2004) is an instrument developed to assess the narrative comprehension and production in children (n=1059) from the ages of 5 years-0 months to 11 years-11 months through three types of stories; a script, a personal narrative and a fictional narrative. The test consists of six tasks organized into three different formats (no pictures, sequenced pictures and single picture) and two subtests (comprehension and oral narration). The test is administered to children individually and the administration time for each child varies between 15 and 25 minutes depending on the child's performance.

Comprehension skills are measured by the child's responses to the questions posed after the oral presentation of the stories. The comprehension subtest includes three tasks. In the first task (Task No. 1), no picture support is provided. The child listens to a short story and then answers the questions asked by the examiner. In the second task (Task No. 3), the child is presented with 5 pictures appropriate to the flow of events in a story. The child is asked to look at the pictures while listening to the story. Afterwards, questions are asked to measure the extent to which the child understands the story. The child is allowed to look at the pictures while answering the questions. In the third task (Task No. 5), the child is presented with a single picture related to a story. Again, the child is asked to look at the picture while listening and answers the story questions asked by the examiner.

The questions consist of literal ones, which are answered by directly accessing the information in the text, and inferential ones, which require interpreting the information explicitly given in the text through existing knowledge and establishing new associations between the ideas in the text. The questions aim to measure children's ability to understand words and sentences, as well as their ability to make connections between the main ideas of the theme or topic addressed in the story. Children are asked questions about specific information presented in each of the stories (e.g. the name of the characters, the events and the problem in the story) and are given one point for each correct answer.

Task 1 is characterized by the fact that after the story is read aloud by the examiner, the child is asked to propose a solution for the complex situation presented ("What do you think they should do now?"). This question aims to obtain information about the child's ability to propose a coherent solution to the problem in the story. The comprehension subtests can be scored simultaneously or later by listening to the recordings.

The oral narration includes the tasks of retelling the story read aloud without picture support (Task 2), creating a personal story based on 5 pictures depicting the main events (Task 4), and creating a personal story by looking at a single picture presented (Task 6). The retelling task (Task 2) asks the child to retell the story presented in Task 1. The child's performance is measured by looking at how much of the basic information (e.g., the setting, names of characters, conjugations of verbs) that has been predetermined to be scored in the story and giving one point for each correct answer. In Tasks 4 and 6, performance is measured based on the story elements produced by the child. This includes both macrostructure (setting, characters, story elements - problem situation, actions and events, temporal relationship, cause and effect, closure, coherence and creativity) and microstructure (vocabulary and grammar - identification of objects, use of pronouns, conjugation of verbs, grammatical structure of sentences).

There is no time limit for the 6 tasks in the test, but the time required to administer the test ranges from 15 to 25 minutes. Questions in the story production tasks are scored from 0 to 2 (e.g., 0 = three or more grammatical errors; 1 = one or two grammatical errors; or 2 = no grammatical errors). Oral narration tests are not scored instantly, but are scored after the child's stories, which are recorded with a voice recorder, are converted into written format. When scoring, the child's exact words should be taken into account, not what the child means or what the examiner infers from the child's words. The recordings of children's responses need to be listened to over and over again until it is ensured that all items have been scored correctly.

Data Analysis

Before the data collection process, the manual was examined in detail by the researcher in case of any possible problems that might be encountered. After reviewing the model practice and scoring sections of the manual, the test was administered and scored by the researcher to three children. In this way, competence was gained in using the test in an error-free manner. The teachers of the children and the administrators of the kindergartens were interviewed to inform them about the purpose and procedure of the study and the materials to be used, and appropriate days and times for the testing were determined.

Before testing the children, the researcher was introduced to the class by the teacher and briefly informed the children about the activity to be carried out in order for the children to gain familiarity with the researcher. The test then was administered to each child individually in a well-lit, quiet and distraction-free room. In order to increase the motivation of the children and prepare them for the activity, short conversations of approximately 5 minutes were held with children before starting the test. The booklet with colorful pictures of the stories included in the test was positioned in a way that the child could easily see them. The instructions and questions were directed in a tone of voice that the child could easily hear, and each stage of the test, which included six tasks, was recorded with a voice

recorder. The testing time varied between 15 and 25 minutes depending on the child's performance. At the end of the test, the child was taken back to the classroom and the testing procedure continued with another child. Since the test was conducted individually and each test lasted around 20 minutes on average, no scoring was done during the implementation to save time and do a better assessment.

Research data were collected from a total of 240 children from five kindergartens in Konya. Then these data in audio format were uploaded to the computer. Children's responses to the questions measuring how much they understood the stories in the test were scored by listening to the recordings directly. The stories they told as a part of story generation tasks were transcribed by listening to them at least two or three times, and the texts obtained were analyzed in detail and scored in accordance with the criteria specified in the manual.

The adaptation process of the TNL into Turkish started with the translation of the original stories and test items into Turkish by four experts working in the field of English Language Teaching. Then, a fifth expert, also working in the field of English Language Teaching, translated the original stories and test items back into English using the "back translation technique" and compared them with the original stories and test items. It was seen that there was a unity of expression and meaning between the Turkish and the original stories and test items. Eight academicians working in the field of child development and education were asked to evaluate the suitability of the test in terms of ambiguity, accuracy and the suitability of the story illustrations for five-year-old children and Turkish culture, and to make suggestions if necessary. Based on the expert opinions, it was accepted that the TNL had content validity. Then, the test was administered to 5-year-old children (n=15). With this small preliminary study, it was seen that the stories and test items in the test were properly understood by the children.

Validity and reliability analysis of the data was carried out using the SPSS 22.0 program. For the validity, the collected data were tested according to two validity criteria; content validity and construct validity. In order to ensure content validity, the evaluations and opinions of academicians working in the relevant field were requested. Exploratory factor analysis technique was used to test the construct validity of the test. The Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett Sphericity Test were used to assess whether the data were suitable for factor analysis. Maximum Likelihood Confirmatory Factor Analyses were conducted to see whether the TNL had a fit index and eight different data fit indices were calculated: Chi-Square (X2), Degrees of Freedom (Sd), Ratio of Chi-Square to Degrees of Freedom (X2/Sd), Root Mean Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI) and Non-Normed Fit Index (NNFI).

To determine the reliability of the TNL, the collected data were tested based on four reliability measures: internal consistency, test-retest, split-test reliability and inter-rater consistency. Cronbach's alpha coefficients were used for internal consistency. Test-retest correlation coefficients were examined using the Sperman-Brown formula. In testing the split-half and inter-rater consistency reliability, correlation coefficients for all tasks were calculated using the Spearman-Brown formula.

Ethic

The author(s) confirm(s) that ethical approval was obtained from Selçuk University (Approval Date: 29 /09 /2021, 2021/1587)

RESULTS

Content and Construct Validity for the Turkish Version of the TNL

Content validity shows whether the test items are appropriate for the purpose of measurement and whether they represent the area to be measured (Karasar, 2013). Seeking expert opinion is one of the most commonly used methods to test content validity in research (Özgüven, 2011). Accordingly, for the content validity of the current research, eight experts working in the field of child development and

education were requested to evaluate the appropriateness of the Turkish version of the stories, test items, instructions and pictures for five-year-old children. Experts unanimously stated that the test items were suitable for the purpose and offered several suggestions. In addition, the test was finalized by making the necessary corrections in terms of language and expression and cultural differences, and the content validity of the test was established.

Construct validity indicates whether the items developed to evaluate a certain behavior can measure it or to what degree they can measure it accurately. Exploratory factor analysis was used to examine the construct validity of the test. The suitability of the data for exploratory factor analysis was tested with the Kaiser Meyer-Olkin (KMO) coefficient and Bartlett Sphericity Test. The KMO coefficient tests the suitability and adequacy of the sample size for factor analysis. When the KMO coefficient approaches 1, it means that the data are suited for analysis. The KMO coefficient value for the test was calculated as ,972 and the results of the Bartlett Sphericity (X2=4,654; p<.01) and Chi-Square tests were found significant. In line with the results, it was observed that the data were adequate for factor analysis. In order to reveal the structures called factors or components, factor analysis was performed based on Principal Component Analysis. After the analysis, it was found that there were 6 factors greater than 1. The total explained variance ratio was 71.961%. In the original version of the test, it was stated that there were two factors and six tasks related to these factors (Gillam & Pearson, 2004). Table 2 presents the results of the exploratory factor analysis of the test items.

Table 2. *Results of exploratory factor analysis*

Factor 1		Factor 2		Factor 3		Factor 4		Factor 5		Factor 6	
2,853		2,426		1,817		1,596		1,460		1,419	
Item no	Factor loadings after rotation	Item no	Factor loadings after rotation	Item no	Factor loadings after rotation	Item no	Factor loadings after rotation	Item no	Factor loadings after rotation	Item no	Factor loadings after rotation
23	,970	28	,883	92	,673			78	,471		
26	,968	60	,883	86	,670			68	,470		
64	,966	89	,881	13	,657			59	,470		
27	,966	49	,875	35	,630			9	,462		
58	,965	51	,868	3	,630			70	,460		
31	,962	82	,853	72	,616			42	,458		
17	,959	32	,845	2	,614			84	,456		
56	,956	91	,836	69	,608			94	,454		
25	,956	66	,836	79	,605			44	,452		
15	,949	90	,832	85	,604			41	,451		
21	,948	40	,828	55	,604			77	,449		
37	,948	97	,812	74	,597			73	,444		
12	,945	75	,810	52	,597			67	,433		
53	,944	62	,809	83	,587			87	,430		
57	,941	47	,789	71	,585			6	,426		
50	,941	30	,788	96	,577			65	,420		
24	,934	61	,787	38	,555			7	,384		
33	,930	34	,744	80	,543			43	,382		
36	,928	29	,736	88	,522			11	,358		
19	,923	16	,729	8	,511			45	,345		
18	,911	20	,720	93	,502			39	,339		
48	,905	14	,709	46	,501			5	,311		
63	,901	54	,700	95	,479			4	,307		
81	,884	22	,686	10	,472			76	,260		
								1	,251		

The data in Table 2 show that the factor loads of the test items vary between .21 and .97. Büyüköztürk (2013) suggests that items with factor loading of .30 and higher discriminate individuals well, items between .20-.30 can be removed from the test if deemed necessary or the item should be

adjusted, and items with factor loading lower than .20 should be removed from the test. Based on these results, it can be concluded that all items in the test have high discrimination. No items were removed from the test and the test consisted of 97 items in total.

Confirmatory factor analysis was conducted to verify the factorial structure of the test. In scale development, confirmatory factor analysis is performed to test the accuracy of the factor structures determined after exploratory factor analysis. "Maximum Likelihood Confirmatory Factor Analysis" was used to test the fit index of the Test and eight different data fit indices were calculated; Chi-Square (X2), Degree of Freedom (df), Ratio of Chi-Square to Degree of Freedom (X2/df), Root Mean Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), and Non-Normed Fit Index (NNFI) (Şimşek, 2007). Table 3 shows the results of the Confirmatory Factor Analysis of the Test.

Table 3. *Results of confirmatory factor analysis*

Fit Index	X^2	df	X^2/df	RMSEA	GFI	AGFI	CFI	NNFI
	1572,36	1021	1,540	0,021	0,96	0,89	0,97	0,97

As seen in Table 3, the results of the analyses for the eight data fit indices are as follows: Chi-Square (X2) value 1572.36, Degree of Freedom (df) 1021, Ratio of Chi-Square to Degree of Freedom (X2/df) 1.540, Root Mean Square Error of Approximation (RMSEA) 0.021, Goodness of Fit Index (GFI) 0. 96, Adjusted Goodness Fit Index (AGFI) 0.89, Comparative Fit Index (CFI) 0.97 and Non-Normed Fit Index (NNFI) 0.97.

Table 4. *Results of the t-test regarding age factor*

	n	X	ss	t	df	p
60-66 months	127	43.03	9.35	-18.740	198	.000
67-72 months	113	65.94	6.10			

Table 4 shows that the mean TNL scores of the children differed according to their age in months and the mean scores increased with age. The analysis revealed a statistically significant difference between the mean scores at the 0.05 level (t=-18.740, p<.05). It is seen that the mean scores of the children aged 67-72 months (X=65.94) are higher than the mean scores of the children aged 60-66 months (X=43.03).

Results Regarding Reliability

Büyüköztürk (2020), defines reliability as the consistency of the answers given to the items of a data collection tool and shows the degree of stability of the measurement results. A reliable measurement tool is expected to yield the same or similar results when administered repeatedly under the same conditions. Reliability is related to the degree to which the data collection tool accurately measures the characteristic it is intended to measure. For reliability in the study, the data were analyzed in terms of internal consistency, two-half test, test-retest and inter-rater reliability.

Internal Consistency

The Cronbach's Alpha formula was used to determine the internal consistency reliability of the test. This is because there is a triple scoring system in the test. Reliability coefficients related to Cronbach Alpha formula calculated for test tasks are given in Table 5.

Table 5. *Cronbach alpha reliability coefficients for test tasks*

Tasks	Cronbach's Alpha Coefficients	Total
Task 1	.76	
Task 2	.79	
Task 3	.73	.78
Task 4	.78	
Task 5	.78	
Task 6	.87	

As seen in Table 5, the Cronbach's Alpha coefficients for the tasks one to six of the test were calculated as follows; .76, .79, .73, .78, .78 and .87 respectively. Büyüköztürk (2020) suggests that a Cronbach Alpha coefficient of .70 or higher calculated for a psychological test can generally be considered sufficient for the reliability of test scores. The values varying between .73 and .87 and the coefficient of .78 for all items can be seen as an evidence that the test is reliable.

Test-retest Reliability

Test-retest reliability is explained by the correlation between the scores obtained by administering a test to the same group twice at certain intervals. It can be suggested that an average of four weeks between two administrations is generally appropriate (Büyüköztürk, 2020). The test was administered to 20 children four weeks later by the researcher for test-retest reliability, and the correlation coefficients for the tasks are presented in Table 6.

Table 6. Test-retest correlation coefficients for the tasks

Tasks	r
Task 1	.83
Task 2	.84
Task 3	.84
Task 4	.86
Task 5	.86
Task 6	.87

As shown in Table 6, the correlation coefficients for the tasks one through six of the test were calculated as .83, .84, .84, .84, .86, .86 and .87, respectively. Spearman Brown's formula was used in the calculation since the test-retest data were not normally distributed. The results confirm the test-retest reliability of the Turkish version of the test.

Split-half Test Reliability

The split-half test reliability is calculated using the Spearman Brown formula based on the relationship between the two halves of the test by dividing the test items into two equal halves as odd-even, first half-last half or randomly (Büyüköztürk, 2020). In order to calculate the split-half test reliability, the test items in each task were divided into two halves and the correlation coefficient was calculated for each task using the Spearman Brown formula. The reliability coefficients are given in Table 7.

Table 7. Split-half test reliability coefficients for the test tasks

Tasks	r
Task 1	.74
Task 2	.76
Task 3	.74
Task 4	.77
Task 5	.81
Task 6	.83

As can be seen in Table 5, the correlation coefficients for the tasks one to six were found as follows; .74, .76, .74, .77, .81 and .83 respectively. The results seem to ensure the split-half reliability of the Turkish version of the TNL.

Inter-rater Reliability

Raters are the people who score or evaluate a particular phenomenon. If the raters give similar scores in their measurements, the results are deemed reliable. Leahy et al. (1993) suggest that the degree of agreement between the raters should be at least .80 in the evaluations made using the measurement tool. In the study, an associate professor in the field of child development and education was accepted as the second rater and re-administered the test to 10 randomly selected children. The consistency in scoring between the researcher (first rater) and the second rater was analyzed using the

Spearman Brown formula for each task of the test. The results can be seen in Table 8.

Table 8. Inter-rater reliability coefficients for the test tasks

Tasks	r
Task 1	.82
Task 2	.84
Task 3	.88
Task 4	.87
Task 5	.88
Task 6	.90

The results in Table 8 indicate that all reliability coefficients were above the accepted level of .80. The data set remained consistent between the raters, confirming the inter-rater reliability of the test.

DISCUSSION, CONCLUSION, RECOMMENDATIONS

Test Structure

When we take a look at the structure of the TNL, we see that it contains some basic core elements that can shed light on the oral narrative skills of both typically developing children and children with developmental language disorders. The first point that needs to be emphasized is that the test structure includes tasks to access both the comprehension and the oral narration of the stories. In other words, it has a structure that measures children's receptive and expressive language skills together and can reveal possible inconsistencies between these language skills. This is because children need to develop receptive (comprehension) and expressive (expressive) language skills in order to become individuals with effective communication skills (McIntyre, 2005). Therefore, it can be used in combination with other formal and informal language assessment tools to provide data and perspectives for the diagnosis and intervention of language development problems in children. Another aspect is that the test can provide access to information about macro and micro structures in storytelling that require the use of cognitive and linguistic skills. Justice et al. (2006) suggest that in the evaluation of children's narratives through stories, it is important to consider and analyze these two structures together because they provide information about the language proficiency that children use in their narratives. Similarly, Meier (2020) reports that examining both micro and macro-structural components of language together contributes more to the complete understanding of young children's language development than evaluating one or the other alone.

In addition, the test includes a combination of tasks commonly used to measure children's spoken language skills. Three of the six tasks aim to measure children's receptive language skills, i.e. comprehension skills. One of these tasks measures children's comprehension of stories read aloud to them without pictures and the other two tasks measure their comprehension when stories are supported with a single or multiple pictures. As is known, the most frequently used assessment practice for this purpose is to ask children questions about a story they have listened to with or without picture support and to measure the extent to which they understand the story based on their responses. Indeed, researchers suggest that children's oral narratives can be used effectively to find out about children's comprehension of the story (Morrow, 1990; van Kraayenoord & Paris, 1996). In addition, it is seen as a type of language facilitation strategy that supports children's understanding and use of language structures and academic content in texts when adults direct questions about the story and ask children to answer them (Milburn et al., 2014).

In order to measure expressive language skills, the test includes narrative formats with and without pictures. Pictures are of great importance because they reinforce the text and present significant clues to ensure comprehension and support imagination (Snaith, 2007). In the picture format, apart from the task of creating a story based on sequential pictures, there are also tasks of creating a story based on a single picture. Mills (2015) argues that picture-assisted narratives tend to show less complex structures with shorter terms in general compared to non-picture narratives, which points to the

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necessity of including different formats and tasks in the assessment process when it comes to assessing children's narrative skills in an effective and healthy way. Children's oral narratives based on wordless picture books reveal children's language and thinking skills more comprehensively compared to standardized tests that lack the ability to measure communicative features or assess skill areas in a limited way (Heilmann, Miller, & Nockerts, 2010).

Considering the type and content of the stories in the TNL, we see that in addition to the characters and events that can be encountered in real life, there are also stories with fantastic elements and unusual events. This has advantages for children's language development process and it therefore would be useful to use both of these types when evaluating children's language skills. Gamble and Yates (2008) believe that children need access to different and varied texts to improve their knowledge and skills in language. Imaginative elements in fictional stories attract children's attention more, motivate them more about the story, stimulate their imagination, which in turn encourages them to understand the story better (Weisberg et al., 2015). In other words, supernatural events in stories are not something that children can see every day, so they can lead children to learn more by increasing their interest. On the other hand, it has been found that children are much more likely to transfer the information in stories with real-world events and characters to their own lives than in stories with unrealistic elements (Walker et al., 2012). Richert et al. (2009) reported that children are better able to comprehend the cause-effect relationships and solutions in stories and transfer them to real life more easily when the character of the story is based on real life rather than a fantasy. Based on this information, we can think that the TNL has an approach to measure children's story performances more accurately by using stories that include both unreal and real-life characters and events and by maintaining a balance between the two genres.

Turkish Translation and Cultural Adaptation

One of the main problems related to translation is the idioms and complex contexts specific to the culture in which the language was born. Since the literal translation of the items affects test validity and reliability, it is important to ensure the cultural adaptation of the test items as well as the linguistic adaptation and to carry out the translation by taking into account the differences between cultures (Seçer, 2015). When we look at the process of translation and cultural adaptation of the TNL into Turkish, the fact that there were fewer complex grammatical structures, idiomatic expressions and culture-specific items in the original form contributed to a healthier translation from the source language to the target language, as there was no loss of content, information and meaning.

It is recommended to make at least two translations of the tests from the original language (source language) to the target language (Beaton et al., 2001; Seçer, 2015). Based on this, the translation of the TNL from the source language, English, into the target language, Turkish, was carried out separately by four academics working in the field of English language education, and then the four Turkish forms produced were compared and synthesized by the translators to finalize the test. The translators were thoroughly informed about the content and purpose of the test and the population it would be administered to, as this increases the quality of the translation and the consistency of the language used in the translated document and the original form (Kalfoss, 2019). The original and translated versions of the test were then reviewed, ensuring equivalence of words (semantic equivalence), idioms and colloquialisms (idiomatic equivalence), and concepts (conceptual equivalence) between the two versions.

In the next stage, the test was back-translated from Turkish to English. Tyupa (2011) argues that back translation is one of the most popular methods for assessing translation quality in international and cross-cultural social research. Back translation, as the name suggests, is a process in which the translated text is re-translated into the source language by a translator who has not seen the original text. This process allows for a general review of the translation quality, as well as the identification of

potential problems that may arise from poor quality translation and adaptation (Hambleton, 2017). If any discrepancies are found between the back-translated text and the original text, this is taken as an indicator of translation errors in the target language version. During the back-translation process, translators should have no prior knowledge of the test and should not see the source or another language version before or during the back-translation (Wild et al., 2005). This ensures a completely objective back translation. In light of this information, the final Turkish version of the test was back-translated into English by another academic working in the field of English language teaching who had no knowledge of the test. Then, the semantic equivalence between the source and target forms was evaluated, and possible confusions, ambiguities and errors that may arise from language structures were reviewed. As a result, the stories and test items in both the original and translated versions were found to have unity in terms of expressions and semantics.

Validity

Validity is the degree to which a measurement tool can accurately measure a trait or behavior that it aims to measure independently without confusing it with any other trait (Başol, 2019; Büyüköztürk, 2020). Erkuş (2003) defines validity as the degree to which a measurement tool serves the purpose for which it was developed. Validity is traditionally divided into three categories: content, criterion, and construct validity (Brown 1996; Crocker & Algina, 2000; Baykul 2021). The importance of utilizing different types of validity rather than a single one is emphasized when ensuring the validity of measurement tools (Demir, 2017). In this study, content and construct validity were conducted for the validity of the TNL; criterion-related validity could not be realized due to the lack of a parallel or similar measurement tool with a similar structure and content in the Turkish literature. Actually, Saad et al. (1999) suggest that three validity criteria - content, criterion, and construct validity - are generally used to provide validity support and that these three general methods generally overlap and that one or more of them may be appropriate to ensure validity depending on the situation.

Content validity is related to the extent to which the instrument fully assesses or measures the relevant construct (Karasar, 2009; Başol, 2019). Expert opinion is one of the most frequently used methods to analyze content validity (Uzunboylu & Özdamlı, 2011), to remove inappropriate items and content from the scale (Kapuscinski & Masters, 2010), and to make language and cultural adaptation if necessary. Expert opinion is the most common logical way to test content validity (Büyüköztürk, 2020). Within the framework of content validity, following the translation of the TNL into Turkish, the opinions of eight academics working in the field of child development and education were requested to determine whether the stories, pictures, instructions, and the assessment criteria in the test were appropriate for five-year-old children and Turkish culture.

In addition to content validity, one of the ways that can be used to verify the validity of a measurement tool is construct validity. In construct validity, the term "construct" refers to the psychological trait measured in the test (Demir, 2017). Construct validity is defined as the degree to which the measurement tool can accurately measure an abstract concept (factor) within the scope of the behavior it aims to measure (Büyüköztürk, 2020). It is stated that construct validity covers other approaches to validity and that construct validity is therefore related to the evaluation of validity types (Kline, 2000; Şencan, 2005).

Şencan (2005), Kan (2019), and Baykul (2021) underline that when demonstrating the construct validity of a test or scale, more than one technique and method should be used together and convincing evidence should be presented collectively. Merenda (2017) stated that the first step to be taken in ensuring the construct validity is to analyze the factor structure of the measurement tool and compare this factor structure with the one in the original form (p. 337). Demircioğlu (2015) reported that factor analysis is one of the two most frequently used methods to investigate and ensure the validity of the measurement tool. Factor analysis attempts to summarize how people respond to several items in an

instrument in terms of a minimum number of underlying constructs or "factors" (Martin & Ford, 2018). It is a technique that aims to discover a small number of conceptually meaningful new dimensions or factors by aggregating a large number of interrelated variables (Çilingirtürk, 2011). In measurement tools with a high number of items, this technique is used to make the measurement tool simpler by reducing the complexity in order to analyze the results more easily. Factor analysis is handled in two dimensions as exploratory and confirmatory factor analysis. The purpose of performing exploratory factor analysis is to explain the measurement with a small number of factors by combining variables that measure the same structure or feature (Büyüköztürk, 2020). Through exploratory factor analysis, sub-dimensions of the scale can be obtained. Confirmatory factor analysis can be used to verify whether a previously developed measurement tool measures the relevant theoretical construct and it is stated that it would be appropriate to use confirmatory factor analysis when adapting a measurement tool developed abroad to Turkish (Başol, 2019; Seçer, 2015).

The first step in factor analysis is to determine whether the data are suitable for factor analysis. Kaiser - Meyer - Olkin (KMO) and Barlett Sphericity tests are used to determine whether the data structure is suitable for exploratory factor analysis (Çokluk et al., 2021). The KMO value calculated for the Turkish version of the TNL was found to be .972. The KMO value is within the range of 0-1 and a lower value indicates that the data is not suitable for factor analysis. Kaiser (1974, p. 35) reported that a value between 0.50 - 0.60 is "miserable", between 0.60 - 0.70 is "mediocre", between 0.70 - 0.80 is "middling", between 0.80 - 0.90 is "meritorious" and above 0.90 is "marvelous". Therefore, the KMO value we obtained (.972) can be interpreted as the level of suitability of the data set for conducting factor analysis is "marvelous". In addition, the results of Barlett Sphericity test show that the Chi-Square value ($X2=4,654$; $p<.01$) is significant. Tatlıdil (2002) noted that if the Barlett Sphericity test is found to be significant, factor analysis can be started. In line with the results obtained, it was concluded that the data were suitable for factor analysis, and exploratory factor analysis was performed.

Principal Component Analysis was carried out to reveal the structures called factors which the test evaluated and it was observed that there were six factors with factor loadings greater than 1. The total variance explained was 71.961%. Considering that 60% of the variance explained in scales with more than one dimensions is considered sufficient (Hinkin, 1998; Hair et al., 2010), the high total variance ratio we obtained indicates that the factor structure of the test is strong.

When the factor loadings of the TNL items are analyzed, it is seen that the factor loadings vary between .25 and .97 (see Table 4). In order to decide whether an item is related to the conceptual structure or not, it is suggested that the factor loading of that item needs to be at least .30 (Hopkins, 2000; Şencan, 2005; Büyüköztürk, 2020). It is seen that the factor loadings of 95 items in the test are higher than .30. Büyüköztürk (2013) reported that items with factor loadings of .30 and higher discriminate individuals well, items between .20-.30 can be removed from the test if deemed necessary or the item should be corrected, and items with factor loadings lower than .20 should be removed from the test. Anastasia and Urbina (1997), and Child (2006) suggest that items can be tolerated if necessary, unless the factor loading value is below 0.20. In this regard, two items (item 1 and item 76) with factor loadings between .20 and .30 were not removed from the test. Accordingly, no items were removed from the test and the test consisted of 97 items in total. As a result, it can be said that the discrimination of the scale items is quite high.

Confirmatory factor analysis was conducted to determine whether the factor structure in the original form of the scale could be confirmed in a sample of 5-year-old Turkish children. For confirmatory factor analysis, Chi-Square ($X2$), Degrees of Freedom (df), the ratio of Chi-Square to Degrees of Freedom ($X2/df$), and RMSEA, GFI, AGFI, CFI and NNFI fit coefficients were calculated.

Şimşek (2007) suggests that the acceptable degree of fit differs for each index. There is no standard interpretation for $X2$ and df, but in general, smaller values indicate a more accurate fit. In the

analysis, the X2 value was 1572.36 and the df was 1021. The value obtained with X2/df is mostly used in determining the fit of the model. When these values are compared to each other (X2/df; 1572.36 /1021), the result is 1.540 (see Table 5). A value of 3 or less indicates that the model has a good goodness of fit, while a value of 5 or less indicates that the model has an acceptable goodness of fit (Çokluk et al., 2021). Therefore, it can be concluded that the obtained value indicates a good fit.

Brown (2006) suggests that an RMSEA value below 0.06 is a good fit for the model, and a value below 0.08 is acceptable. The RMSEA value calculated in the present study is 0.021 and according to this result, the model shows a good fit. For acceptable goodness of fit, GFI, CFI and NNFI values should be .90 or higher and AGFI value should be .80 or higher (Kline, 2010). The analysis showed that GFI was 0.96, CFI was 0.97, NNFI was 0.97, and AGFI was 0.89. The data from confirmatory factor analysis indicated that the goodness of fit of the model was acceptable. In other words, the CFA results demonstrate that the model exhibits a good fit. The fit index values resulting from the CFA indicate that the scale items were appropriately selected for the subtests.

The age factor was also taken into consideration to reveal the construct validity of the TNL. Children's mean scores obtained from the tasks in the test increased with age. The difference between the mean scores of two age groups (60-66 months and 67-72 months) was significant at the .05 level.

As in other language domains, pragmatic (language use) development is recognized to increase with age. Research in the field of pragmatic development has shown that age has effects on children's pragmatic development: children's ability to answer questions and provide complex contextual information for answers, and their level of understanding of grammatical structures and words increase and improve with age (Ryder & Leinon, 2003; Güler & Baykoç Dönmez, 2007). In the studies conducted, it was concluded that the stories told by children develop with age (Karabaş 2002; Çelikli 2020; Khan et al., 2016). Eriksson (2006) states that age has a significant effect on the size of vocabulary and average length of speech. Kanmaz (2019) reported that the number of different words, total number of words, and average sentence lengths increase with age. In another study, Kosaka (2016) compared children aged 4 and 5 years and found that children aged 5 years and above were able to produce stories richer in terms of structure and content and that different storytelling skills were exhibited for each age in the preschool period. In this respect, considering that age is a characteristic determinant of children's receptive and expressive language skills, it can be suggested that the data presented in Table 6 support the construct validity of the TNL. As a result, children are naturally expected to be more successful in receptive and expressive language skills as they get older.

Reliability

Reliability refers to the ability of an instrument to measure consistently (Tavakol & Dennick, 2011). That is, reliability tells us how consistently, invariably or stably a method measures something. When we apply the same method to the same sample under as similar or identical conditions as possible, we are expected to get the same results. Otherwise, the measurement method may be unreliable and the results and scores obtained from a measurement tool with poor reliability will be lacking in credibility (Öner, 1997).

Four types of reliability (internal consistency, split-half test, test-retest, and inter-rater reliability) were used to determine whether the results of the Turkish version of the TNL are reliable and if so, to what extent. Looking at the original form of the test, it is seen that three types of reliability were used: internal consistency, test-retest and inter-rater reliability (Gillam & Pearson, 2004). In general terms, internal consistency refers to the overall agreement between items, and split-half test reliability refers to the correlation between the scores of the two halves of the scale divided into two parts. Test-retest reliability refers to the degree to which a test produces similar results over time, and inter-rater consistency refers to the degree of agreement or consistency between the scores of two or more raters.

Since the TNL has a triple scoring system, Cronbach's Alpha formula was used to calculate internal consistency. Alpha coefficient was developed by Cronbach as a generalized measure of the internal consistency of a multi-item (Likert-type) scale (Peterson, 1994). In other words, it assesses the degree to which items in a test are related to each other.

Alpha ranges between 0 and 1 and a minimum reliability threshold of 0.70 is recommended (Cortina, 1993; Frost et al., 2007; Büyüköztürk, 2013). High alpha values indicate a high degree of correlation between items in a test (Tavakol & Dennick, 2011). However, caution should be taken when interpreting alpha values and it is important to remember that alpha is affected by the number of items in a test because the more items in a test, the higher the alpha value. In fact, values higher than 0.95 do not always indicate high reliability because this may indicate the presence of redundant items in the test (Hulin et al., 2001).

The Cronbach Alpha (α) coefficient calculated for the internal consistency of the TNL in this study was found to be 0.78. Şencan (2005) stated that the reliability value calculated for the overall test may be lower and emphasized that if a test consists of subtests, the alpha coefficient should be calculated separately for each subtest. In the study, the Cronbach Alpha (α) coefficients for the tasks of the test ranged between 0.73 and 0.87. The internal consistency coefficients calculated for the tasks one to six are as follows: .76, .79, .73, .78, .78, and .87. The fact that these values are above the minimum reliability threshold of .70 and below the .95 level, which may indicate the presence of unnecessary items in the test, can be considered as an indicator that the test and the results from the test are reliable.

On the other hand, Şencan (2005) emphasizes that Cronbach's Alpha value may not be strong enough for multidimensional scales and is a good reliability coefficient only for unidimensional scales, adding that it would not be correct to use the alpha value in multidimensional scales on its own to reveal the reliability of the entire scale. Therefore, it would be a more appropriate approach to use different methods to ensure reliability.

One of the ways to estimate the reliability of a measurement tool is to use the same tool to measure the same thing at two different points in time. In psychometrics, this approach is called the test-retest method (Cohen & Swerdlik, 2018). Test-retest reliability refers to the ability of a measurement tool to produce the same results for the same participants when repeated in different situations under the same conditions (Berchtold, 2016) and the high correlation between the scores obtained from two measurements (Baykul, 2021).

In the test-retest analysis, the correlation coefficients between the data obtained from the previous and subsequent measurements are calculated. If the correlation coefficient is high, this is considered evidence of test-retest reliability. In other words, the smaller the difference between the two results, the higher the test-retest reliability. The correlation coefficient is a value ranging from -1.00 to +1.00 and the correlation (consistency/stability) coefficient should be close to +1 for reliability.

However, the test-retest procedure makes the assumption that the measured trait does not change over time. If subjects in a study change at different times between the first and second measurement in terms of the trait being measured, the correlation between the two points in time may be low, even if the measurement instrument is highly sensitive (Collins, 2007). Several factors can influence measurement results at different points in time. For example, subjects may learn new things, forget things, acquire new skills, or external circumstances may affect their ability to respond correctly. The length of time can be a source of error variance. The longer the time elapsed, the more likely the reliability coefficient will be low (Cohen & Swerdlik, 2018). Test-retest reliability can be used to assess how well a method withstands these factors over time.

Based on the literature, in order to calculate the test-retest reliability of the Turkish version of the TNL, a period of 4 weeks between the two test administrations was deemed appropriate. The test-retest

reliability conducted with 20 children, corresponding to 12% of the total number of participants, revealed correlation coefficients ranging from .83 to .87 for the six tasks in the test. The test-retest coefficients for tasks one to six were .83, .84, .84, .84, .86, .86, and .87, respectively. In the original form, there was no correlation coefficient calculated specifically for the 5-year age group, and it was calculated with 27 children aged between 5 and 10 years and correlation coefficients of .82 (narration) and .85 (comprehension) were found and these values are close to the correlation coefficients obtained in this study.

Split-half test reliability is another widely used statistical method to measure the internal consistency reliability of a test. It involves dividing a test into two halves and correlating the scores obtained from the two halves, as the name suggests, which requires the test to be administered only once (Thompson, 2010; Frey, 2018). When calculating split-half test reliability, the Spearman-Brown formula is commonly used to estimate full test reliability from the split-test correlation. The Spearman-Brown formula roughly estimates how much the reliability of test scores will change depending on the number of observations or items in a test (Frey, 2018).

When calculating reliability coefficients, there are several ways to split a test. Simply dividing the test into halves is not recommended as it is likely to falsely raise or lower the reliability coefficient (Cohen & Swerdlik, 2018). A test can be divided into two halves by randomly assigning items to one or the other half of the test, by assigning odd-numbered items to one half of the test and even-numbered items to the other half, or by dividing the test by content so that each half contains items that are equivalent in content and difficulty (Frederic, 1956; Crocker & Algina, 1986). The aim here is to create mini-parallel forms in which one half is equal or nearly equal to the other.

Since the TNL contains six tasks, each task was considered as a sub-dimension and each sub-dimension was divided into two halves unbiasedly and the reliability coefficients were calculated. In fact, Tavşancıl (2019) reported that the split-half test reliability is the most widely used method among the methods used to determine scale reliability, and that if the scale has dimensions, these can be considered as a whole within itself and this can also be done for the dimensions. As a result of the calculations, it was seen that the correlation coefficients for the tasks ranged from .74 to .83 (see Table 9). Since the values between 0.70 and 0.89 indicate a strong relationship, it can be concluded that the two-half test reliability of the instrument is high.

Inter-rater reliability was examined as the last step to ensure the reliability of the TNL. Inter-rater reliability is defined as the degree to which two or more raters get the same results under similar assessment conditions (Kottner et al., 2011) and, it can be used to assess the consistency of observations and is useful for data interpretation compared to reliability measures. Inter-rater reliability can be a concern to some extent in many comprehensive studies due to the possibility that multiple data collectors may experience and interpret the target behavior or situation differently. Different observers naturally have different perceptions of situations and events. In reliable research, subjectivity is minimized as much as possible so that a another researcher can reach the same results. When designing the scale and criteria for data collection, different people are expected to consistently assess the same variable with minimal bias. This is particularly important when there is more than one researcher involved in data collection or analysis. Therefore, well-designed research studies should include procedures that measure agreement between raters (McHugh, 2012).

When analyzing the relationship between scorings, it is generally preferred that the calculated correlation or fit coefficient is 0.70 and above, and that it is as close to +1.00 as possible (Erkuş, 2019). When the correlation coefficient is close to +1.00, it is interpreted that different raters score the answers in the test in a similar way and there are few errors in scoring. A weak relationship between the scores or inconsistent scores indicate that the scoring reliability is low (Çetin, 2019).

To ensure the inter-rater reliability of the Turkish version of the TNL, the data from 10 randomly

selected children to whom the researcher administered the test were re-scored by an academician who is an expert in the field of child development and education. The scores regarding the dimensions of the scale were compared with the researcher's scores and analyzed using the Spearman Brown formula. The results of the analysis showed that the correlation coefficients ranged from .82 to .90 for the six tasks (see Table 10). The calculated correlation or fit coefficients of 0.70 and higher confirm the inter-rater reliability of the Turkish version of the TNL.

In the present study, cultural adaptation of the TNL for 5-year-old (60-72 months) Turkish children and its validity and reliability were conducted. Considering that the original form of the test was developed to measure the narrative skills of children between the ages of 5-12, in future studies, Turkish adaptation, validity and reliability for other age groups will allow a wider age range to be reached in the assessment of children's language skills through stories. In this sense, it would be beneficial to conduct longitudinal studies on the importance of narrative skills and monitor the effects of various variables on narrative development by using the TNL to follow the narrative skills of children starting from the age of 5 until the age of 12.

The TNL can be used in the assessment of children with and without developmental language disorders. This study included children with normal language development. In the future, in order to distinguish between children with adequate spoken language development and children with developmental language disorders, studies including children with language development problems can be conducted and the instrument can be used to monitor the development of these children and determine the strengths and weaknesses of their spoken language skills.

Family is another important factor in children's language development. In early years, parents are of great importance for children to acquire various language skills and increase their proficiency in language development. The TNL can be used to see the possible effects of variables on children's oral language development such as shared reading, daily reading time, pre- and post-reading activities, and parental attitudes towards reading.

TNL can serve as an example and criterion in the development of new measurement tools that can assess children's oral language skills through stories and in the adaptation of existing measurement tools into Turkish.

It can contribute to the data collection and evaluation process by utilizing it together with other measurement tools intended for this purpose in various studies to be conducted to evaluate the language development of preschoolers.

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Assessment of an In-Service Training Activity Transformed into an E-Learning Environment Using the Kirkpatrick Model

Veysel Bilal Arslankara[1] (iD) **Elif Arslankara[2]** (iD) **İlyas Asan[3]** (iD)

Mehmet Külekçi[4] (iD) **Ertuğrul Usta[5]** (iD)

[1] Dr., Akyazı District Directorate of National Education, School Manager, Sakarya, Türkiye
vbilalarslankara@gmail.com

[2] İŞMONT Vocational and Technical Anatolian High School, School Manager, Sakarya, Türkiye
elifarslankara90@gmail.com

[3] Ahi Evran Vocational and Technical Anatolian High School, School Manager, Sakarya, Türkiye
ilyasasan@gmail.com

[4] Paris Secondary School, School Manager, Sakarya, Türkiye
mehmetkulekci01@gmail.com

[5] Prof. Dr., Necmettin Erbakan University, CEIT Department, Konya, Türkiye
ertugrulusta@gmail.com

Article Info	ABSTRACT
	The aim of this study is to evaluate an in-service training program transformed into an e-learning environment using the Kirkpatrick evaluation model. A single-group experimental design was employed in the research. Thirty teachers who participated in the in-service training program were included in the study. The program was adapted to the e-learning platform and presented to the participants. Data were collected through surveys. 90% of the participants expressed satisfaction with the program, finding the e-learning format beneficial, and liking the content and presentation of the program, stating that it helped reinforce their knowledge. They mentioned a more flexible and comfortable learning experience compared to face-to-face training and acquired the targeted knowledge and skills by the end of the program. The findings indicate that an in-service training program delivered face-to-face can be successfully transformed into an e-learning environment and evaluated using the Kirkpatrick evaluation model. The e-learning format provided participants with a more flexible and comfortable learning experience. The program significantly improved participants' knowledge, skills, and behaviors. Adapting the program to similar professional groups can offer various benefits, such as enhancing professional skills, increasing workplace productivity, and improving professional satisfaction.

INTRODUCTION

The effective, successful, and efficient implementation of e-learning is influenced by key factors such as students, teachers, content, technology selection, design, and interaction (Hara, 2000; Simonson, Schlosser & Orellana, 2011). In the student dimension, factors like technological literacy, attitudes toward technology, and self-efficacy in technology use play a role, while in the teacher dimension, attitudes toward e-learning are additional considerations. Quality instructional design processes for course content, the quality of the environment used in technology, and ensuring student-student, student-teacher, and student-content interactions are crucial in the content, technology, and interaction dimensions, respectively (Garrison, 2003; Moore, 1989). All these variables collectively contribute to student satisfaction, commitment, and motivation (Pintrich & Zusho, 2002).

Learning environments can be defined as places that enable individuals to construct meaningful knowledge by making various inferences from various learning sources (human or non-human) (Jonassen & Rohrer-Murphy, 1999). In other words, the learning environment is where learning takes place, with the learner/student at its center. The components of learning environments facilitate communication among themselves through the learner. When it comes to e-learning environments, the general structure is similar, with a significant difference being the interconnectedness of all dynamic elements (Salmon, 2002).

Increasing learners' sense of belonging and commitment to learning environments is essential for them to continue learning activities and focus on the process of constructing meaningful knowledge, despite obstacles and challenges (Wenger, 1998). The more connected the learner is to the learning environment, the greater the acquisition of knowledge in that direction (Pintrich & Zusho, 2002). Encouraging collaboration and facilitating interaction is one of the best ways to increase learner connection to the learning environment (Dillenbourg, 1999), leading to motivation for participation in learning activities. Motivation, in turn, plays a significant role in the effectiveness and efficiency of the learning process (Deci & Ryan, 2000). The purpose of interaction can be expressed as a better understanding of course content or an increase in the levels of achieving predetermined goals (Moore, 1989). Many researchers have studied interaction, and Moore (1989) categorized it into three types: learner-learner, learner-instructor, and learner-content. Although these three types of interactions are widely accepted in most distance education environments, with advancing technologies, a fourth interaction area called learner-interface interaction has emerged (Oliver & Herrington, 2000).

Learner-learner interaction involves students sharing knowledge and ideas with each other through communication tools such as chat rooms and forum pages (Gunawardena, 1995). Learner-instructor interaction is a type of interaction that occurs for feedback and motivation (Rovai, 2002). The most requested type of interaction is considered learner-instructor interaction. Learner-content interaction is the interaction that occurs in obtaining information from materials related to the subject. Interface interaction refers to the communication between the learner and the technological environment.

Moore, in developing his theory, began to focus on the problems encountered in distance education and sought solutions, exploring what hindered learning. Further deepening his studies on learner autonomy, he extended his focus to the concept of transaction in Dewey's work, laying the foundations for the theory of transactional distance in the context of distance education (Moore, 1993). Transaction, fundamentally, entails the creation of new meaning by influencing each other's behaviors and environments. From this perspective, Moore emphasized misconceptions about distance in distance education and the distance emphasis that leads to psychological gaps. Another type of interaction, as mentioned above, is interaction that occurs by observing others. When learning takes place by observing friends and their dialogues with the teacher, the type of interaction that emerges is transaction (Moore, 1997).

In the interaction where friends and the teacher are observed, the student is at the center of the environment. The student is self-engaged when moving away from the center, and we can say that interactive learning occurs as the center approaches transactional learning. In other words, the fewer interactions the student has with a minimal number of elements, the more transaction increases; conversely, interaction increases if there are more elements. Thus, if the student's needs are met with very little communication, transaction is considered to be high. In e-learning environments, the concept causing participants to not influence each other accurately is defined as transactional distance (Moore, 1993).

In e-learning environments, structure corresponds to course design. Learning objectives, content presentation, materials, and tests constitute the structure. This structure must be flexible in meeting student needs. It should support individual differences because the more structured it is, the less it will respond to individual preferences (Keegan, 1996). The characteristics of a flexible e-learning environment can be expressed based on dialogues, i.e., interactions, and whether it is structured or not. While structure corresponds to elements such as instructional program, guidance, material selection, and arrangement of the environment, dialogue/communication corresponds to the existence of interaction types mentioned. In this context, attention is thought to be necessary in the design of e-learning environments to the following aspects (Anderson, 2003):

- Sharing learning content at the beginning of the process or weekly [allowing the student to start or not start whenever they want and providing more interaction opportunities]

- Determining whether visual and auditory interaction tools are selected by the student

- Simultaneous and asynchronous nature of learning [only during online times / anytime, anywhere]

- Freedom or strictness of navigation options between contents

- Assigning individual or collaborative-cooperative learning tasks

Ultimately, design and interaction are not entirely independent of each other. In this context, transactional distance is a structure that changes with design and interaction. Considering this situation in every instructional design process is deemed highly important for ensuring the adaptation of students' individual differences to the system to be selected or developed.

With the profound impact of developments and transformations affecting human activities, educational activities have gained more significance for institutions. It is considered crucial to question the effectiveness and efficiency of these training activities organized before, during, or after service. In the process of evaluating the training, measurements and assessments are generally made on aspects such as reactions, satisfaction, and the level of learning (Kirkpatrick, 1994). The purpose of evaluating education is to analyze the impact of the given training within the framework of individual performance effects and its effect on institutional performance, with the aim of making necessary improvements through the value determination process (Brinkerhoff, 2006).

While evaluating educational activities, some key questions that need to be addressed may include: Has a meaningful change occurred as a result of the provided education? If there is a change, has it occurred through the means of education? Has this change contributed to achieving the goals of the institution? Can similar changes be observed when the same education is applied to different groups? In this context, the evaluation of education is often described as a dynamic and systematic process from start to finish.

Evaluations guide education strategies and even policies. One commonly used method in educational evaluations is the Kirkpatrick training evaluation model. The Kirkpatrick model is frequently preferred in educational evaluations due to its ease of meeting corporate requirements, easy applicability,

flexible structure, systematic nature, and the cause-and-effect relationship between its stages (Kirkpatrick, 1994). The model consists of four stages and has been used since the 1960s to assess the effectiveness and efficiency of educational programs. The model allows for a rough classification, making it possible to delve deeper, thereby facilitating the evaluation process (Alliger & Tannenbaum, 2006). The Kirkpatrick model includes the stages of reaction, learning, behavior, and results. Although not all stages are considered in every educational evaluation, Kirkpatrick emphasizes the importance and effectiveness of each stage for the next one. Each subsequent stage provides detail for the evaluation process, and the process becomes more complex and spreads over longer periods. However, the acquired information becomes more valuable (Kirkpatrick, 1994).

The design process of e-learning, if analyzed incorrectly or inadequately, can result in discrepancies between planning and implementation, failure to achieve interaction, low participation or dropout rates, and challenges in the transfer of education (Hara, 2000). The effectiveness and efficiency of e-learning are crucially linked to determining user satisfaction, which is a significant factor in predicting system success (Cahapay, 2021; Alsalamah & Callinan, 2021).

In this context, the main problem of the research is to determine the effectiveness and efficiency of the training to be provided along with the transformation of an in-person in-service training program into an e-learning environment, and the functionality of the e-learning environment in terms of usability.

Kirkpatrick Evaluation Model

The Kirkpatrick evaluation model consists of four stages. In the first stage, the Reaction stage, the assessment measures individuals' overall satisfaction and commitment to the training program. In other words, the satisfaction levels of individuals participating in the training are measured (Alliger & Tannenbaum, 2006). The second stage, Learning evaluation, determines the levels of knowledge, skills, and attitudes targeted to be acquired. Changes in attitudes and the acquisition of specific knowledge and skills are examined. Essentially, learning is defined as a permanent, observable change in behavior (Thorndike, 1913). Consequently, an increase in knowledge and skills and a change in behavior after the provided training indicate that learning has occurred (Gagné, 1985). In the third stage, Behavior Change, the evaluation reveals what changes occurred in individuals' behaviors as a result of participating in the training program (Kirkpatrick, 1994). This stage is more detailed and challenging than the first two (Brinkerhoff, 2006). Because people can only change behavior under appropriate conditions, and it is not possible to predict when a permanent change in behavior will occur (Bandura, 1977). The expectation at this stage is for individuals to express that they like the new behaviors and can use them in their lives (Prochaska & DiClemente, 1983). The final stage, Results, emerges through the evaluation of individuals. It encompasses questions such as whether quality is improving, whether there is a decrease in costs, and positive answers are expected (Parry, 1997). Such results are crucial for assessing the effectiveness of the provided training (Phillips, 2003).

Research Aim and Significance

This study aims to design and evaluate a new online in-service training program that conducted online to enhance the functionality of the e-learning environment in the process of transforming an in-person in-service training program, previously offered by a public institution, into an online format. The evaluation conducted in two dimensions: structural condition/design and instructional quality.

The Kirkpatrick training evaluation model is commonly used in educational evaluations. The quality of instruction evaluated using the Kirkpatrick model, while the evaluation of the e-learning environment in terms of structural condition and design conducted through the usability method. In this context, the main problem of the research is to determine the effectiveness and efficiency of the training to be provided along with the transformation of an in-person in-service training program into an e-learning environment, and the functionality of the e-learning environment in terms of usability. The research will seek answers to the following questions:

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1. What is the level of participant satisfaction with the training program? (Kirkpatrick, Reaction)

2. Has the previously defined learning objectives been achieved as a result of the training program? (Kirkpatrick, Learning)

3. Has the transfer of acquired knowledge or skills to the work environment occurred? (Kirkpatrick, Behavior)

4. To what extent does the output resulting from the acquired knowledge/skills reflect the quality of the training? (Kirkpatrick, Results)

The research is expected to contribute to identifying strengths and weaknesses in the transformation of in-service training to online learning, taking necessary measures, implementing appropriate instructional design processes, and ensuring that selected or developed e-learning environments are user-friendly (suitable for user needs, expectations, etc.) for institutions, instructional designers, practitioners, and particularly researchers.

METHOD

This study was designed using a before-and-after study design. Also referred to as a before-and-after design, this approach is used to measure changes in a subject or situation. It is the most appropriate research design for assessing the effectiveness of a training process. In studies using this design, data is collected from the same group at two different points in time to understand changes in the variables. The changes between these two sets of data are examined, and the results are interpreted as contributions to the effectiveness of the training (Kumar, 2011). Measurement forms suitable for each level of the Kirkpatrick evaluation model were developed. The independent variable of the study is the e-learning environment where the in-service training program delivered. The dependent variables of the research include general satisfaction, academic achievement, evaluation of transfer to the work environment, and product quality.
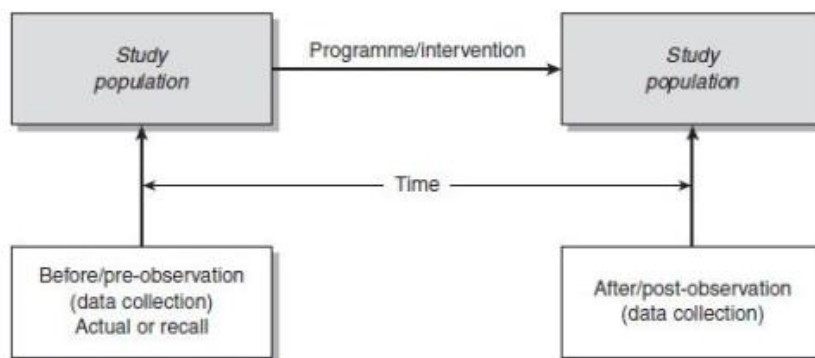

Figure 1. *The before-and-after study design (Kumar, 2011)*

Population and Sample

The employees of the public institution at various levels, who will receive in-service training through e-learning, constitute the universe of the study. This training is important for all employees. The sample of the study consists of employees selected through stratified purposive sampling, representing the universe at all levels. This approach aims to reveal the quality of the in-service training program through e-learning for employees working at different levels. Accordingly, the population for this study was defined as school administrators working in Sakarya province. The sample selected from this population consists of 137 individuals, including 93 male and 44 female administrators. All participants are between the ages of 27 and 56. Twenty-seven participants hold a master's degree, while all other participants are graduates of a faculty of education with a bachelor's degree.

Research design/process

The ADDIE instructional design model was used in the research. Every instruction involves the instructional design process. This process is carried out through instructional designers, divided into various branches based on instructional design models. Our model is based on the ADDIE design model, which is accepted as the core model of instructional design (Reiser & Dempsey, 2012; Smith & Ragan, 2005). Following a specific model in converting traditionally delivered lessons to distance education will maximize benefits while minimizing time and resource losses (Dziuban, Moskal & Thompson, 2004; Simonson, Smaldino & Zvacek, 2011).

In this context, the process represented graphically above is constructed by the researcher based on the ADDIE model. The process starts with a process analysis (Dick, Carey & Carey, 2009). However, even if a lesson delivered through traditional methods is to be transformed into distance education, determining the teams involved in the design process is important to prevent time, energy, and resource loss due to the complex nature of this process. In this regard, it is deemed appropriate to start with two separate teams in the design process: the development team and the control and improvement team (Richey, Klein & Tracey, 2010).

Among the developers, there should be subject matter experts and instructional systems designers, as well as web, graphic, and animation designers, and multimedia producers. In the control and improvement team, measurement and evaluation experts, trainers, and technical support staff are expected to be included (Seels & Richey, 1994). The research was designed and tested in a group with similar characteristics to the main working group according to the ADDIE instructional design model (Gustafson & Branch, 2002). The steps related to this are presented in the diagram below.
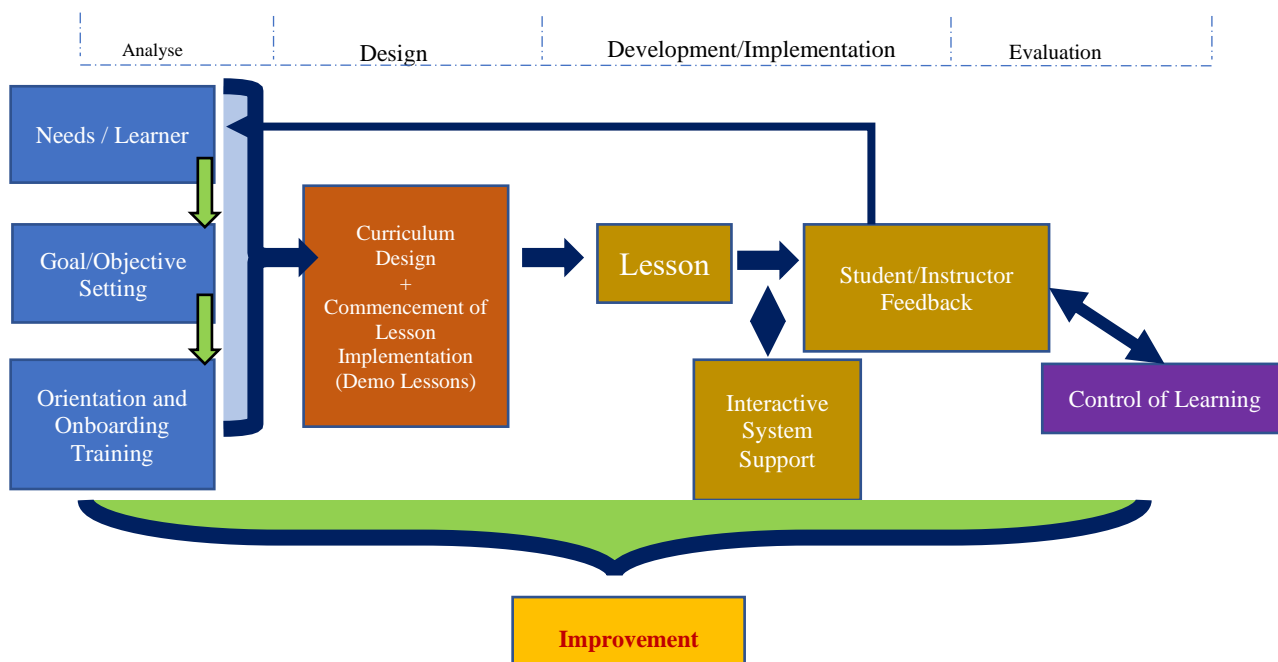

Figure 2. *The used ADDIE instructional design model (Peterson, 2003)*

Analysis Phase

A system approach to instructional design revolves around a mechanism consisting of input, process, and output (Reeves, 2000; Smith & Ragan, 2005). Therefore, the existence of a mechanism involving input-process-output will facilitate the progression of the design with the correct steps. At this point, the requirements of the current situation should be examined in a multidimensional way, and the possibilities should be accurately presented. At the center of the design should be the analysis of learner needs and the analysis of the course to be transformed into distance education. Learners' cognitive, affective, social, physical, etc., general characteristics can be described in these analyses (Driscoll, 2005). In-depth

investigations are crucial in terms of student characteristics such as digital literacy, levels of technology use, attitudes and beliefs about learning, tendencies toward collaborative learning, interests, abilities, etc. Additionally, it should be well-analyzed whether the distance education method is the best solution for the presentation of the identified course.

Learner analysis alone will not be sufficient. The analysis of the content to be presented should also be performed, and goals/objectives should be expressed. In this analysis, the expectations and requirements of the teacher who will teach the course, along with the goals and objectives of the course, should be determined (Dick, Carey & Carey, 2009; Gustafson & Branch, 2002). If the teacher has documents related to the content, they can be requested. Document reviews, comments by subject matter experts, along with learning tasks to be assigned, books to be read (depending on the structure of the course), and project assignments should be planned.

With the analysis phase, the distance education process should essentially be initiated. Following the analysis of learners, content, requirements, etc., students who are introduced to the new environment through distance education should be provided with adaptation and orientation training.

Design Phase

This stage involves deciding on measurement and evaluation tools, lesson plans, and media and material selection or development (Popham, 2009; Stiggins, 2005). The instructional design principles must be adhered to in the selection or development of course materials (Horton, 2011; Smith & Ragan, 2005). A learning management system can be used for course tracking. Interactive discussion areas are used. Courses are initiated synchronously, and the first implementation takes place. For more effective learning, fundamental question-answer, discussion, and review topics related to the content should be identified. The experiences of subject matter experts effective in determining question-answer, discussion, and review contents (Clark & Mayer, 2011).

Development/Implementation Phase

This phase involves translating the processes carried out in the design stage into implementation. The selected materials are processed or produced. Pilot course applications are carried out by the development team within the framework of the selected environment/platform (Smith & Ragan, 2005). Pilot course applications involve evaluating feedback from teachers and students. Based on this feedback, an interactive system support mechanism, thought to be correct and effective, is activated. If situations arise that have not been identified previously, based on teacher and student feedback, these data should be sent to the analysis stage, and situations that will affect the process should be reevaluated.

A learning management system can be taken as the basis for the control and monitoring of the distance education process. It enables the asynchronous delivery of courses (Horton, 2011). Course contents, documents, assessment tools, etc., can be included. For processes that conducted synchronously, an appropriate environment should be selected based on the pilot applications and the courses should be conducted.

Reflection reports requested from students based on annual and daily plans for the pilot courses. Suggestions and feedback from students, as well as teacher feedback, should be evaluated.

During this phase, any unforeseen issues or challenges that arise during the pilot course implementations should be carefully analyzed, and adjustments should be made to ensure the effectiveness and efficiency of the distance education program. Continuous communication and collaboration between teachers, students, and the development team are essential for refining the course content and delivery methods.

After the completion of the implemented course design, the assessment of learning should take place. At this point, the usability of the system needs to be tested (Clark & Mayer, 2011). Usability can be tested in terms of ease and effectiveness. Usability measurements for both the learning management system and the selected synchronous learning environment should be conducted for students. The findings obtained should be compared with student/teacher feedback, and the process should be subjected to a continuous cycle.

In addition to usability evaluation, the effectiveness of the provided education can be assessed using the Kirkpatrick evaluation model, which involves a four-stage evaluation: reaction, learning, behavior, and results (Kirkpatrick, 1994).

This is a crucial step to be taken at every stage of the process, including the evaluation of demo (pilot) courses and design. If improvements are identified during the evaluation, they should be addressed. Even in the analysis stage, improvements should be sought. As a result of these improvements, the final version of the course design becomes ready for implementation.

Data Collection and Analysis

Following the Kirkpatrick evaluation model stages, various forms were used to measure the general satisfaction and engagement of employees in the program and system usage, the level of learning, the transfer of acquired knowledge to the work environment, and changes in behavior. Forms were used to determine the reactions/satisfaction levels of employees. These forms were designed by the researchers to find out about the planning of the education, the content of the courses, the education process, and the instructors; as well as the aesthetic features of the e-learning environment design and the learning difficulties, physical and psychological conditions during usage. Expert opinions were consulted and refined accordingly. A knowledge test prepared by subject experts was used to measure the pre-experimental knowledge levels of employees. After the training program, the same test was used again to measure knowledge levels. The behavior and job transfer level of employees measured as a product evaluation before and after training. In this context, employees were asked to develop a product related to the content of the training program during the training process. A grading key was created based on expert opinions. The projects presented by employees were evaluated by the researcher and at least one expert. The quality scores of the products created by employees were carried out similarly to the product evaluation process. The researcher and at least one subject expert evaluated the products using a graded scoring key.

The collected data analyzed using appropriate statistical methods, and the results interpreted to draw conclusions regarding the effectiveness of the e-learning program for in-service training in the public institution. The feedback obtained from employees and experts crucial in refining the training design and making necessary adjustments for future implementations.

FINDINGS AND INTERPRETATİON

In this section, the research aim and data collection tools are used to convert the collected data into findings and to make sense of them. Evaluation has been conducted in four fundamental stages as anticipated in the Kirkpatrick Model, reactions/Satisfaction, learning, behavior/Job Transfer and results/Organizational Impact. Explanations regarding the stages forming the model and evaluations made for measurement and assessment forms applied at each stage are provided below.

Findings on Participant Satisfaction Level for the Training Program (Reaction)

Overall Satisfaction Level: According to the survey results, the overall satisfaction level was found to be quite high. The majority of respondents, who exhibited positive emotional reactions regarding the planning, content, and process of the training program, expressed their overall satisfaction. The overall satisfaction situation is given in bullet points and evaluated under four main themes:

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o Compared to face-to-face training, they mentioned a more flexible and comfortable learning experience.

o They liked the program's content and presentation, stating that it helped reinforce their knowledge.

> **L15:** *"Prof, online classes felt more flexible and comfortable to me compared to face-to-face. That's how it seems to me, I really liked it."*

> **L23:** *"Really liked the content of the program and how it was explained."*

> **L95:** *"Felt more freedom and comfort with online learning.*

> **L98:** *"Honestly, it was much better, really awesome, in my opinion."*

Course Content and Planning: The vast majority of individuals have positive opinions about the planning and content of the training program. Frequently expressed views about the clarity and appeal of the training content indicate that participants actively engaged in the learning process. All of them mentioned that interactive elements and visual materials made the program interesting. They also appreciated various learning activities catering to different learning styles. It was observed that examples and case studies provided helped them understand the practical application of the training.

Instructor Performance: Survey results indicate high overall satisfaction with the instructor or instructors. Traineesprovided positive feedback on the instructors' knowledge level, communication skills, and ability to engage with the audience.

Aesthetic Features of the E-Learning Environment: Regarding the design of the e-learning environment, participants generally made positive evaluations of aesthetic features. User-friendly interface and content organisation positively affected the e-learning experience.

System Usage (Learning Difficulties and Psychological States): Feedback was provided on technical problems or learning difficulties encountered during the training programme. However, these problems did not significantly affect the overall satisfaction level and most participants were able to overcome these difficulties.

Results Regarding Achievement of Learning Objectives after the Training Program (Kirkpatrick, Learning)

Findings related to the learning stage assess how effective the training program provided learners with a learning experience and whether the targeted knowledge, skills, or behavior changes have occurred. The obtained findings can be summarized under the following main headings:

Knowledge and Skill Acquisition: The knowledge and skills acquired after the training programme were evaluated. The findings related to the measured learning objectives reflect the effectiveness of the learning phase.

o Participants stated that they acquired the targeted knowledge and skills by the end of the program.

o They expressed that the content of the program was current and applicable to professional practice.

o Mentioned they could apply the acquired knowledge and skills in the workplace.

o They stated that regular review and application opportunities would enhance the retention of knowledge.

o Highlighted that the provided resource materials facilitated easy access to information.

> **L1:** *"Got the targeted knowledge and skills by the end of the program, made*

me really happy."

L33: *"Just what I was looking for, the content was current and relevant to my job."*

L42: *"Think I can use the knowledge and skills at work, found it really useful."*

L43: *"Feel that if I regularly review and practice, the knowledge will stick better."*

L101: *"Resources provided made it easy to access information, really helped me a lot."*

Application and Practical Skills: In order to evaluate the success of the training programme, the application skills of the learned knowledge and skills were observed. Their success in the application phase and their capacity to use this knowledge and skills in practical life after the training were measured..

- o They stated that there was a change in their workplace behaviours after the programme.

- o They stated that they were able to fulfil their duties more effectively and efficiently by using the knowledge and skills they learnt.

- o They stated that the programme contributed to their professional development.

L8: *"Noticed I did, that my workplace behaviors changed after the program."*

L71: *"Could fulfill my duties more effectively and efficiently, using the knowledge and skills I learned."*

L137: *"Think I do, that the program contributed to my professional development."*

Findings Regarding the Transfer of Acquired Knowledge or Skills to the Work Environment (Kirkpatrick, Behavior)

The findings related to the behavioural phase assess how the training programme influences and how the learned skills are integrated into daily work behaviours. The key findings related to the behavioural phase are the following:

Application of Learned Information: Volunteers evaluated how effectively they could apply the information learned in the training program to their daily work tasks. Feedback regarding the practical utility of the skills and knowledge acquired during the training was gathered.

- o It was expressed that they were willing to apply the knowledge and skills learned in the programme in the workplace. They stated that the program helped them perform their duties better in the workplace.

- o However, they stated that they could contribute to the overall development in the workplace by sharing the knowledge and skills they have acquired.

L121: *"Expressed I did, that I was willing to apply the knowledge and skills learned in the program in the workplace. Helped me perform my duties better in the workplace, it did."*

L133: *"However, stated I did, that I could contribute to the overall development in the workplace by sharing the knowledge and skills I have acquired."*

Team Collaboration and Communication Skills: Topics such as teamwork and effective communication skills emphasized in the program were specifically addressed with special questions to evaluate **respondents**'behavioral changes in these areas. The impact of the training on these skills and the

positive experiences these skills would bring to daily work life were determined.

Innovation and Problem-Solving Abilities: The innovative and problem solving skills targeted by the training programme were evaluated in terms of their reflection on the participants' daily work practices. Behavioural changes related to the adoption of new approaches after the training were discussed.

Resistance to Change and Acceptance Rates: The impact of the programme on organisational changes was evaluated in terms of resistance to change and post-training acceptance rates. It was stated that the necessary support was provided for the implementation of the programme in the workplace. They expressed that their managers and colleagues were aware of the program and encouraged its implementation.

- o It was stated that the necessary resources and tools were provided to implement the programme.

- o They stated that they may encounter some obstacles in the implementation of the programme in the workplace. They indicated that barriers such as lack of time, technological infrastructure, and increased workload could limit the effectiveness of the program.

- o Trainees suggested that necessary steps should be taken to overcome these barriers.

> **L2:** *"Stated it was, that the necessary resources and tools were provided to implement the program."*

> **L21:** *"Encounter some obstacles I might, in the implementation of the program in the workplace. Indicated I did, that barriers such as lack of time, technological infrastructure, and increased workload could limit the effectiveness of the program."*

> **L40:** *"Suggested I did, that necessary steps should be taken to overcome these barriers."*

These findings are a crucial source of information for understanding the behavioral effects of the training program and evaluating its contribution to organizational objectives. This evaluation plays a critical role in understanding the impact of the training program on business world practices.

Reflection of the Quality of Education Based on the Outcome of Acquired Knowledge/Skills (Kirkpatrick, Results)

Findings related to the results stage focus on evaluating the impact of the training program on organizational objectives and overall success. This stage aims to assess how the training program contributes to the strategic goals of the organization.

Development of Targeted Competencies: The impact on the development of competencies targeted through the training program has been addressed. These findings are considered crucial for understanding how participants apply the skills they gained and the targeted competencies after the training.

Alignment with Objectives: The alignment of the training program with objectives has also been examined. The findings measured the success of better alignment with strategic objectives after the training, expressing the positive contribution of the training program to these objectives.

Participant Feedback: In the results phase, the feedback received was analysed. This feedback provides an important insight in assessing the overall impact of the programme and satisfaction.

- o It was explain that the content and presentation of the programme could be adapted for other professional groups. They expressed that the program's fundamental principles and teaching methods are applicable in different professional fields.

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○ All of them emphasized the need to consider the profession's group and requirements in adapting the program.

> **L52:** *"Explained it was, that the content and presentation of the program could be adapted for other professional groups. Expressed I did, that the program's fundamental principles and teaching methods are applicable in different professional fields."*

> **L79:** *"Emphasized all of them did, the need to consider the profession's group and requirements in adapting the program."*

This study has demonstrated success at every stage according to the Kirkpatrick evaluation model. Adapting the program to similar professional groups could provide numerous benefits, such as enhancing professional skills, increasing workplace productivity, and improving professional satisfaction.

DISCUSSION AND CONCLUSION

The study has demonstrated success at every stage of the Kirkpatrick evaluation model. Findings indicate that the program was well-received by everbody, offering a significant learning experience. All of them expressed high overall satisfaction, finding the e-learning format beneficial. They noted the flexibility and comfort of online learning compared to face-to-face sessions. Positive sentiments were also shared about the program's content and presentation. A similar study with employees in professional development reported that 90% were satisfied with the program and found e-learning beneficial (Aydin & Taşçı, 2023). Research by Hudak (2013) on teachers' professional development showed an increase in beliefs, attitudes, and preferences. Another study in East Asian culture revealed improvements in teachers' self-confidence and self-efficacy (Soprano & Yang, 2012). Positive evaluations at this stage, according to Kirkpatrick's model, are suggested to trigger positive reflections in the following two stages (learning and behavior) (Kirkpatrick & Kirkpatrick, 2006).

The findings of this study indicate that teacher characteristics and expertise significantly influence teacher satisfaction with education. Thus, the high satisfaction levels of participating teachers are believed to stem from well-designed training that meets their needs, rich content, and the competence of the instructor. This aligns with a frequently observed result in the literature associating satisfaction levels with the quality and content of training. Participants demonstrated the acquisition of targeted knowledge and skills by the end of the program. They expressed that the program's content was up-to-date and suitable for professional application, affirming their ability to apply gained knowledge and skills in the workplace. A study by Ergün and Kurnaz (2019) found recalling a significant portion of the learned information even three months after the program, suggesting potential similar results in this study. Literature suggests that high satisfaction correlates with increased levels of knowledge and skill acquisition (Zhetpisbayeva et al., 2020; Malik & Asghar, 2020).

Engagers stated that they were able to apply the knowledge and skills they learnt to perform their work more effectively and efficiently. They believe that the programme contributed to their professional development and enabled them to perform better. They reported that the programme provided the necessary support to implement the outcomes. Similarly, Mankan (2019) concluded that the knowledge and skills acquired in a study can be highly applied in their lives and transformed into behaviour. Contributors emphasised the universality of the principles and teaching methods of the programme and suggested that the content and presentation of the programme can be adapted for other professional groups. They underscored the importance of considering the specific needs and requirements of the relevant professional group when adapting the program. This study has demonstrated that a face-to-face, in-service training program can be successfully transformed into an e-learning environment. E-öğrenme formatı daha esnek ve rahat bir öğrenme deneyimi sunmuştur. Program bilgi, beceri ve davranışlarda önemli ölçüde iyileşme sağlamıştır. Adapting the program for similar professional groups could offer numerous benefits, including enhancing professional skills, increasing workplace productivity, and improving professional satisfaction (Kirkpatrick, 1994).

Finally, in the study conducted by Akbaş (2023), the differences between backward design, forward design and central design are emphasized by introducing learning outcome-oriented education and backward design approaches in the context of curriculum design. The stages and framework of backward design are detailed to provide practical implementation guidance. The study also compares retrospective design to Tyler's approach to scientific program development and design, identifying both similarities and differences. In the result-oriented education approach, emphasis is placed on what students should know and be able to do at the end of their learning experience. In contrast, backward design focuses on evidence of learning based on desired outcomes and structures the design to convey knowledge through authentic tasks. At this point, considering all the designed stages of the training program evaluated with the Kirkpatrick evaluation model with the backward design model in future research will undoubtedly add a different dimension.

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Evaluation of Emergency Distance Education Based Lifelong Learning Environment Use from Student Perspective: A Phenomenological Research

Yakup Yılmaz[1] (iD)

[1] Necmettin Erbakan University, Science Faculty, Mathematics and Computer Science Department, Konya, Türkiye
yyilmaz@erbakan.edu.tr

Article Info	ABSTRACT
	The purpose of this study is to explore the use of emergency distance based lifelong learning environment during the COVID-19 pandemic in terms of learning practices from the perspective of adult learners. Designed as a phenomenology in qualitative studies, this study focused on adult learners' experiences in the emergency online lifelong learning environment provided by the local government during the pandemic. Data were collected from three adult learners recruited through criterion and convenience sampling methods. The data were collected through semi-structured interviews and analyzed using content analysis technique. The findings revealed that the adult learners who participated in the study were satisfied with the distance-based online lifelong learning environment, but they encountered various shortcomings. According to the participants, four themes and their sub-themes were identified regarding the emergency online lifelong learning environment: student, perceived teacher support, environment and content. As a result of the study, it was determined that there is a need for studies that will reveal evaluations of online lifelong learning from different aspects.

INTRODUCTION

One of the most significant impacts of the COVID-19 pandemic crisis has been the urgent and rapid transition of face-to-face education and training programs to distance-based online education. This change has affected both teachers and students. The shift to distance education in formal and non-formal education has created a "need to know" about how to teach and learn remotely (Kaiser & McKenna, 2021), and the pandemic has been a catalyst for the adoption and implementation of online learning (Rhim & Han, 2020).

During the COVID-19 lockdown period, sustainable and flexible learning options with distance education telemedicine were urgently organized (Ng & Lo, 2022). As in the rest of the world, synchronous (synchronous) and asynchronous (asynchronous) teaching has been used to sustain adult education. The development of digital devices, network technologies and IT skills have made online teaching possible (Zuppo, 2012). According to Amiti (2020), during the pandemic period, lessons were mostly taught in three types of online environments: Asynchronous online video courses, synchronous online traditional courses, and online flipped courses. Among these, the prominent usage model is synchronous traditional online courses. The online traditional course approach is the transfer of traditional teaching to online courses. This situation brings with it the necessity to evaluate the impact of sudden changes in teaching approaches.

For flexible and sustainable online learning to be effective and efficient, educators, organizations and institutions need to have a comprehensive understanding of its benefits and limitations (Hrastinski, 2008). Distance learning-based online learning was a model used in in-service programs, some certified courses, and adult education such as higher education before it spread across the world and the country (Johnston vd., 2015). Distance-based online learning was used to overcome common barriers faced by adults who want or need to participate in learning for various reasons (Blieck vd., 2017).

Learning takes place at all stages of life in different contexts such as home, school, work and society. From a lifelong learning perspective, all citizens as self-directed individuals should have open, flexible and personally relevant opportunities to develop the knowledge and competences required at every stage of their lives. From a broader perspective, a basic skill is seen not only as a fundamental skill such as reading and writing, but also as a set of competencies applied to tasks in technology-rich environments (Hickling-Hudson, 2007; Wilson, Scalise & Gochyyev, 2015). It is the provision of distance education through print media, radio, television and the Internet to individuals who cannot attend school or have dropped out of school for various reasons. In distance education, students and teachers are geographically and temporally separated, it is carried out by an institution, technical environments are used, there is interaction, teachers and students can meet face to face at certain times and education is given based on a model (Keegan, 1980). Although distance education is carried out using different environments, this research focuses on synchronous online learning. According to Watts (2016), synchronous interaction uses live video and audio and allows the teacher and participants to see each other.

The online education process needs to be well thought out, designed, coherent and pre-planned. In addition, content should be created by selecting and using appropriate methodologies in the online education program. On the other hand, by using emergency distance learning in crisis situations, the subject content and the design of the training programs are improved compared to traditional classroom learning (Bakov, Opolska, Bogus, Anishchenko & Biryukova, 2021). The pandemic period was declared as a crisis situation and education and training activities were carried out online around the world.

The aim of this study is to have information about the experiences of the Konya Vocational Training Course (KOMEK), which was carried out face-to-face by Konya Metropolitan Municipality within the scope of lifelong learning during the pandemic period, moved to the online environment simultaneously due to the COVID-19 pandemic, and to be able to learn about the experiences of the students who are the

subject of the system and to reveal this. In addition, the impact of online lifelong courses provided by the local government during the period when it is not known when the COVID-19 pandemiç will recover will be determined. For this purpose, the research question was determined as "How would you describe your experiences as a student of an online lifelong learning course?". The key words in this research question are "lifelong learning", "online environment", "student", "experiences" and "describe". In phenomenological research, the key words in the research question are first identified, defined and discussed. In the research question, "lifelong learning and online environment" refers to the courses within KOMEK, while "student" refers to the participants who participated in the study as adult students who completed the course by attending one of the programs in KOMEK. The term "experience" refers to how the participants perceived the phenomenon personally. The expression "you describe" is used to mean what the phenomenon means to the participants and how it is defined.

As in face-to-face teaching, institutions, teachers and students are the components in online teaching. During the COVID-19 pandemic days, teachers and students had to participate in simultaneous online teaching urgently and quickly (Acar-Çiftçi, 2022). This study aimed to obtain the experiences and suggestions of the students who attended the online distance education course that the local government organized for adult students during the pandemic period. In line with the results of the research, it is thought that it will contribute to improving the quality by providing information to adult education to be realized online. From this point of view, answers to the following questions were sought in the research.

1. What are the experiences of adult learners regarding the courses they have taken in emergency distance education-based synchronous online education environments during the pandemic period?

2. What are the suggestions of adult learners in line with their experiences regarding the courses they have taken in emergency distance education-based synchronous online education environments during the pandemic period?

Adult Education in Turkey during the Pandemic

COVID-19 has been declared a pandemic worldwide as a result of being an epidemic disease and spreading to large geographies. The primary decisions taken to prevent this spread have been the use of masks, hygiene and social distancing (World Health Organisation-WHO, 2020). Social distancing is recommended by health institutions to maintain physical distance between people to prevent the spread of the disease and to avoid contact such as handshaking, hugging and kissing.

Due to the pandemic, all educational institutions in our country, as in the whole world, were asked to switch to online platforms, causing physical closures globally. K-12 educational institutions used TRT EBA TV and EBA live lecture platform (Çetin & Göçebe-Yüceer, 2023); higher education institutions used their own "Learning Management System (LMS)" (Yüksek Öğretim Kurulu-YÖK, 2020); organizations that continue other education and training activities tried to contribute to working adult education by using image transfer platforms (ZOOM, MS Teams, Whatsapp, Google Classroom, e-mail) (Casanova & Paguia, 2022).

During the pandemic period, it had a greater impact especially in urban areas with dense populations. The role of local governments, which are authorized to provide and deliver services closest to individuals in urban areas, has once again emerged as important in the fight against the pandemic. Accordingly, it has been observed that local governments around the world have improved their service delivery and transportation methods and skills to support the fight against the pandemic and aim to mitigate the spread of COVID-19 (Bayraktar, 2020). The importance of providing solutions at the local level against global problems has become more prominent with the COVID-19 pandemic. When the unique, fast and effective solutions of local governments around the world and in our country are examined, the following topics stand out: Public information activities, social support and assistance, education, culture, arts, moral and psychological support and health services (Bilgiç, 2020). In our country, the support provided by local governments during the pandemic is of great importance.

METHOD

In this section, the research model, participants, data collection tool, and the data analysis process following data collection are outlined.

Research Design

This study was conducted using qualitative research method in order to examine in depth the experiences of adult learners who participated in the courses realized within the scope of emergency online lifelong learning. The research was conducted in phenomenology design, one of the qualitative research methods. In the phenomenology design, it generally tries to examine what individuals' experiences of any phenomenon are and how they make sense of their experiences (Creswell, 2019). The phenomenon examined in this study is being an adult learner in a course in an emergency online lifelong learning environment and the experiences related to it. In this context, the research aims to examine the experiences of those who are adult learners in a course in an emergency online lifelong learning environment and who have completed the course, and to obtain information about the advantages it provides, the limitations they face, and the necessary suggestions for it to be more effective.

Participants

In this phenomenologically designed study, individuals who attended and successfully completed the Online KOMEK course were informed about the scope and duration of the study via e-mail and invited to the interview. Individuals who responded positively to the invitation according to their availability for multiple interviews constituted the participants of the study. The research was conducted with the participation of three students who attended and successfully completed the KOMEK course conducted online in the fall semester of the 2020-2021 academic year. The ideal number of participants in a phenomenological study depends on the nature of the study (Laverty, 2003), but a smaller number of participants is usually preferred to clearly depict their lived experiences (Crimmins, 2017; van Manen, 2016). Table 1 shows the participating adult students demographic characteristics.

Tablo 1. *Demographic characteristics of the participants*

Nickname	Gender	Age	Education Status	Previous Online Course Experience	Reason for Taking Course
Ayşe	F	24	Faculty Student	Yes	Support for lesson
Ayça	F	28	Master's Degree Student	No	Writing a thesis
Aysel	F	34	PhD Student	No	Getting promoted

Table 1 provides information about the adult learners who participated in the phenomenological research. Pseudonyms were used for the adult students whose opinions and experiences were consulted. The gender of all of them is female. Their education levels are bachelor's, master's and doctorate. Their ages were 24, 28 and 34, respectively. One of the adult learners had previous emergency online course experience, while the other two did not. The reasons for attending the course were to support their undergraduate course, to write a thesis and to get promoted.

Data Collection

While collecting data in phenomenological research, different methods such as observation, diary, art product, reflection report, all kinds of artistic content in which experiences are reflected can be used, but the most preferred method is in-depth interview or multiple interviews (Çekmez, Yıldız & Bütüner, 2012). During the interviews, a single question can be asked to determine the subjective experiences of individuals or more than one question can be asked to collect detailed information according to the purpose of the research. The most preferred questions are: 1. What did you experience? 2. What conditions and situations affected your experiences? During the interview(s), the researcher does not intervene unless it is mandatory. The direction of the interview is shaped by the answers of the

participants. Audio and video recordings can be taken during the interview and the researcher can also take detailed notes.

In this study, multiple interview technique was used to determine the subjective experiences of the participants towards the identified phenomenon in detail. Interviews consisting of multiple open-ended questions were conducted as a data collection tool. Due to the small number of participants, each participant was allocated 25-30 minutes and two rounds of interviews were conducted. In the first round of interviews, the 5-10 minute introductory part of the time specified in the first round of interviews was mainly conversations about daily life in order to strengthen the communication between the researcher and the participant and to enable the participant to express himself/herself more comfortably. In the second round of interviews, it was aimed that the participants could express themselves better and that more detailed information could be obtained about the experiences they mentioned in the first interview. In the unstructured interviews, a dialogic, open and interactive structure was adopted and during the interviews, two open-ended questions were asked to the participants about how they evaluate taking a lifelong learning course online and which conditions affect this evaluation positively and negatively. In addition, based on the participants' discourse, additional sub-questions were added to these questions to collect more detailed data. The interviews were conducted in a comfortable and reassuring environment using an online communication platform at a time determined by the participants. The subjective experiences of the researcher were not reflected in the findings, and the findings were organized only on the basis of the participants' statements. No forms were given to the participants during the interviews. All interviews were audio recorded with the knowledge of the participants.

Data Analysis

In studies designed with qualitative research method and phenomenologically designed, it is generally aimed to examine the phenomena in depth. In this study, which aims to examine the goals, expectations and overall experiences of students attending courses in the emergency online lifelong learning environment and to provide a student perspective on the courses, interviews were conducted with the participants for data collection. In order to analyze the content of the data obtained from these interviews, the content analysis technique (Kızıltepe, 2015), which requires focusing on contextual features in the text content, was used. This technique requires a detailed scanning of the content rather than counting the concepts or words in the text one by one and creating categories as a result (Weber, 1990). Thus, both explicit and hidden messages in the text are addressed by determining the similarities and differences between the categories or codes (Glesne & Peshkin, 1992). In this study, after the data obtained from the interviews were transformed into text, the codes were determined by the researchers through content analysis, taking into account the contextual features. In order for the codes to be better reflected and clearly understood by the reader (Yıldırım & Şimşek, 2011), data examples were frequently included.

Functioning of the Online Lifelong Learning System

The emergency online lifelong learning system, which is the subject of the research, is the form of KOMEK courses conducted face-to-face by Konya Metropolitan Municipality, organized on the basis of distance education-based online learning during the pandemic period. During the pandemic period, it is known that local governments abroad support adult education in various ways. One of the local governments that pioneered this in Turkiye was Konya Metropolitan Municipality's distance education-based online KOMEK courses.

Learning Management System

A module with a student and teacher panel has been prepared for distance education based online courses prepared by the local government. Teachers and students connect to their own modules with their registration information. In the teacher module, which course(s) are given, the list of registered students in the course(s), course attendance options to be entered to students, zoom information, teacher

information are included. In the student module, they can see which course or courses they have taken, absenteeism information for the course(s), zoom information of the teacher. They can also access status information about whether they will receive a certificate of attendance at the end of the course. However, in this LMS-like module, there are no records of simultaneous courses, homework, projects, content material tracking, teacher-student messaging or student-student messaging. It is an LMS module with limited features.

Course Delivery, Content and Structure

The course followed is "Data Analysis with SPSS". Lessons were held via Zoom and were planned as 4 lesson hours a day, 2 days a week, with 30 minutes of lessons and 10 minutes of class breaks. There are 80 lesson hours in total and the course is planned to last 10 weeks. The absence period of the course is 20% of the total course hours, that is, 20 lesson hours. Those who exceeded 20 lesson hours were deemed to have failed the course. Lessons were held in the evening of the specified day. Adult students participated in the course by connecting via Zoom on the specified day and time. While the lesson was being taught, the administrators of the system randomly connected the controller during one of the relevant lesson hours to check whether the lesson was completed and whether there was participation.

The courses were held simultaneously, and the curricula were followed based on the courses and their contents created by the Ministry of Education General Directorate of Lifelong Learning. Students are informed about course content and scope. The course subject to the research has a high number of effective courses because its content includes applied subjects. The content of the course was shared both via Zoom's chat area and via WhatsApp class group. During the course, students' questions and requests were received through the video and audio environment of the Zoom program and the chat area, and feedback was given in the same ways. In addition, when students had questions and/or requests outside of class, written interviews were held on the WhatsApp account of the class group.

It is expected that there will be process, result or process-result evaluation in every teaching given. However, not having the LMS system mentioned above is one of the reasons that prevents this. In addition, due to the concern that being during the pandemic period would put additional pressure on the learners, an achievement test was not applied, instead, those who did not exceed the specified absence period were deemed successful and were entitled to receive a certificate of participation.

Validity and Reliability

The validity and reliability of the results of qualitative studies are among the most important criteria of scientific research. For researchers conducting qualitative research, reliability raises the question "Can the findings be trusted?" (Korstjens & Moser, 2018; Lincoln & Guba, 1985). There are several definitions and criteria for reliability, but the prominent criteria are credibility, transferability, dependability and confirmability as defined by Lincoln and Guba (Korstjens & Moser, 2018). It is recommended to use one or more of these strategies to check the credibility of the findings in a qualitative research. In this study, in order to ensure credibility, participants were asked whether the findings of the study accurately reflected their own thoughts, and participant confirmation was used with the answers received. For this purpose, during the interviews with adult students, the questions and answers were repeated and the meaning was clarified where necessary to confirm whether the adult student understood the question correctly and whether the answer given was understood correctly by the researcher (Lincoln & Guba, 1985). Direct references were also included to increase the credibility of the study. Another technique to ensure credibility is transferability. In order to ensure transferability, a "dense description" of the participants and the research process was provided to enable the reader to assess whether the findings can be transferred to their own setting (Korstjens & Moser, 2018; Lincoln & Guba, 1985).

In line with the aim of the research, an analysis of emergency distance education based online lifelong learning processes was conducted. However, lifelong learning processes are a comprehensive concept that also examines different dimensions such as social, cultural and economic dimensions of individuals. The findings of this study are limited to the emergency distance education-based online lifelong learning dimension implemented during the pandemic period.

Ethic

The study was conducted according to ethical principles. The research was conducted within the framework of ethical principles and with the approval of the decision of "Necmettin Erbakan University Social and Human Sciences Scientific Research Ethics Committee" dated 13.11.2020 and numbered 2020/69.

FINDINGS

In these sections, the data obtained from the adult participants were coded, the coded data were classified, themes were created and presented.

Tablo 2. *Themes, categories and codes obtained from adult students' opinions*

Theme	Catogory	Code
Student	Adaptation to the Environment	Expectations from the learning environment
		Integration into the learning environment
	Belong	Learning satisfaction
		Confidence
	Experince	Change in learning
		Amenities obstacles
		Concentration
		Motivation
Perceived Teacher Support	Communication	Frequency
		Sharpness
	Support	Feedback
Media	Technology	Access
	Course Infrastructure	Lack of LMS system
		Using two environments
Content	Lesson Content	It depends on the curriculum
		Clarity of topics
	Time Management	Knowing the day and time

In line with the data collected at the end of the research, four different themes were identified under the titles of student, teacher, environment and content. The themes consist of categories and codes in their own context. According to the findings obtained from the themes, they are explained by including quotations.

Theme 1: Student

Learner Adaptation during Online Adult Education

Tools such as Hangout, Teams, ZOOM, which are used to provide video and audio communication in distance education-based online learning environments, had low recognition before the lockdown. Adult learners who participated in the study reported that the continuation of their lifelong courses online during the pandemic was a positive development. However, the synchronization and non-recording of course lectures had a negative impact on course learners' expectations. Therefore, it was determined that it negatively affected their expectations of adaptation to the learning environment.

> Aysel: Our course was an applied course. I was not used to both watching the lecture and practicing what was explained. Although our instructor taught the lesson at a normal pace, it was very difficult for me to follow the lesson in such an environment. The fact that the lessons were taught simultaneously and not recorded created a fear of not learning because we could not watch them again. This situation lowered my expectations for the course.

While starting the lesson on the day of the course, it was determined that sharing files suitable for the subject from the chat section of the ZOOM program and whatsapp student group, sharing requests, questions and problems accelerated the integration of adaptation to the environment.

> Ayça: In the first lessons of our course, I think there was a lack of communication both with the lessons and with the instructor and other learners. However, the guidance and encouragement of our course instructor helped us to solve this confusion quickly. She put us at ease by responding positively to our reasonable requests. Because we were able to use ZOOM's chat room in class and whatsapp group outside of class. This helped us get used to both the course and each other.

Learner Belonging during Online Adult Education

When the course participants are examined, the level of education is bachelor's, master's and doctoral students; the age range is between 20 and 40; the working status is student, student-employee. The number of those with no previous online education experience is high. This situation brought difficulties in the first lessons, and it was reported that the teacher effort reduced this and increased student belonging.

> Ayşe: In addition to using the usual lecture method, our instructor sometimes asked questions to involve us in the lesson, sometimes asked volunteer friends to share the screen and made us do the application together. If we were wrong or incomplete, he corrected us immediately. This increased our interest in the course, the lesson, the subject and our sense of accomplishment.

Learner's Experience during Online Adult Education

During the pandemic period, with the transition from face-to-face to emergency online learning across the world, there were changes in the teaching habits of teachers and learning habits of students. Lessons were taught and recorded simultaneously, and it was possible to watch the lessons again asynchronously. Course materials were digitized, assignments and projects were digitally transmitted to students and delivered digitally, and different interaction tools were explored. However, in these courses, the lessons were taught simultaneously and the lessons were not recorded. This meant that the student could not watch the lesson again later. Since there was no LMS, there was no sharing of assignments, projects and materials, the responsibility, management and supervision of learning was left more to the student.

> Aysel: In adult education, the learner participates in the course(s) for a specific purpose. He/she tries to reach his/her goal by controlling his/her own learning. In such a course, I realized that I had more control over myself. There were no homework and projects in our course, there was no exam pressure. Although there were no lecture recordings, the fact that our teacher shared digital content with us, that the topics were repeated from time to time, that we could ask questions freely during the lesson showed that I learned and could do it, and it was a driving force.

Not being able to go out, go to school, go to work in lockdown has limited individuals. Learners' ease of attending courses from home brought with it positive and negative effects on barriers, concentration and motivation.

> Aysel: As a working woman, participating in online courses from home contributed to both my personal development and professional development. Without the pandemic, it would have been difficult for me to attend such a course, and I would not have been able to complete it. I was able to easily ask my questions during the course. I had the opportunity to easily access digital content. I think I had different opportunities. While listening to the lecture at home, I can say that I had a hard time as a mother, wife and working woman. I added a new responsibility to my responsibilities. Considering the personal and professional contributions it would provide, it was easy for me to recover.

> Ayşe: Being an undergraduate student and taking this course contributed to my lessons. It corrected my deficiencies. In face-to-face education, our class was very crowded. We could not communicate our questions and the answers we received were not satisfactory. With this course, I was able to ask my questions comfortably and get my answers personally. It was easy for me. Being at home helped me to be comfortable, but there were times when I got disconnected from the lesson. There are too many distractions.

Theme 2: Perceived Teacher Support

Perceived Teacher Communication Support During Online Adult Education

The students who gave opinions stated that the frequency and clarity of teacher communication was the key to their learning. They stated that being able to ask instant questions about the subject in the simultaneous lesson, getting answers, and being able to get answers to the questions they asked through different communication tools outside the lesson, and being satisfied with the answers they received supported their learning and their presence in the system.

> Ayça: I can say that our instructor enabled us to be in communication both with him and between us from the first lessons. During the live lessons, he would ask us from time to time whether we understood or not. A question asked by another friend led to other questions, and there were times when he made us look at what we learned from other angles. Again, when some of my friends stated that they did not understand the subject, he explained it again by giving different examples.

> Ayşe: During the lectures, she always answered the voice questions from the chat area of ZOOM sincerely and patiently. Outside the class, he answered our questions related or unrelated to the topic. The answers we received were in a way to clear all the rough edges in our minds.

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Perceived Teacher Support During Online Adult Education

Responding to requests and questions from learners during and after the lesson through communication tools was perceived as a positive response to teacher support. It was determined that the feedback and quality given to the students supported cognitive and affective learning.

> Aysel: I was impressed to get answers to my questions during and after the lesson. Especially outside the lesson, there were places that stuck in my head, and I was able to get an answer when I asked my instructor on whatsapp. It alleviated the congestion during the pandemic period to some extent and reinforced what I learned.

Theme 3: Environment

Online Adult Education Environment

Access to Technology for Online Adult Education Environment

As a result of the analysis of the opinions of the learners, it was determined that they had no problems in accessing technological devices. The learners who participated in the course and whose opinions were taken had at least one desktop computer, laptop computer, tablet computer and smart cell phone. In addition, the fact that the course participants were from different provinces reported that they attended the courses without experiencing any problems in the internet infrastructure.

> Aysu, Ayşe, Ayça: We had our own laptop and/or desktop computers that we used for both learning and private purposes. The fact that I live in the city center meant that I was able to follow the courses without having much trouble with the internet connection and I did not experience any disconnections.

Course Infrastructure in the Online Adult Education Environment

Lack of LMS System for the Course

With the declaration of the pandemic, distance education was rapidly introduced, and there was no LMS to manage the courses supported by the local government. However, there were information platforms organized for teachers and students. Students' views on the lack of an LMS are as follows.

> Ayşe: As an undergraduate student, I expected a flexible LMS like the one at my university. It would be nice to have access to content, materials and lecture recording videos. The fact that the course lectures were simultaneous and not recorded required me to follow the lectures more carefully and I made an effort not to miss the topic. This made it a bit difficult in the home environment. Course information was available on the student dashboard, which was not very satisfying.

> Aysel: I learned the importance of the LMS system thanks to this course, because the lack of lecture videos for the course was quite difficult at first. I can say that it took time to adjust myself to this situation. This was perhaps the most negative aspect of the course. The lessons are taught simultaneously, and the fact that there is no compensation if you cannot attend the lesson or if you miss the subject during the lesson is a deficiency in my opinion.

Using Two Mediums in the Course

Within the course, students were using two different environments. The first was the ZOOM platform where simultaneous lectures were held and the second was the informative system where user information was entered. The two environments were independent of each other. In the structures used in formal education, the lecture platforms and LMS platforms were used together. This situation created a

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follow-up problem for the course participants.

> Ayça: Using two separate structures did not seem very functional to me. I used the student platform at first, then I almost never used it because the lack of content, material, video recordings about the lessons reduced my interest. I only used ZOOM on the day and time of the lecture. However, our lecturer would send the files used in the lecture via whatsapp and this deficiency was overcome a little bit.

Theme 4: Content

Online Adult Education Content

Dependence of Course Content on Curriculum

During the pandemic period, it would be appropriate to carry out the online courses offered by the local government according to a certain program. The courses were based on the courses published by the General Directorate of Lifelong Learning of the Ministry of National Education within the scope of non-formal education and the curricula of the courses. The fact that the courses opened according to the fields, course contents, and total course hours are certain shows that it is effective.

> Aysel: During pre-registration, the courses were divided according to their fields. This made it easier for me to make a choice. It was important for me to look at the subjects of the course I wanted to enroll in and know what would be taught and what its scope was. Since I knew what I wanted, it helped me understand whether it was suitable for me or not. I think following the lessons knowing that the course topics would contribute to my development increased my motivation.

> Ayça: I enrolled in this course thinking that it would contribute to my master's studies. I made the right decision, it contributed. Seeing the subject contents while enrolling in the course and teaching the lessons according to these contents contributed me to reach my goal.

Time Management

Determination of Class Day and Time

The importance of having a certain time for the course attended under pandemic conditions was emphasized. The participants fulfilled their daily routines, with students following their courses during the day and employees doing their professional work and attending meetings, even remotely. However, learners reported that they organized themselves according to the day and time of the courses they attended for their personal, professional and/or social development.

> Ayşe: Since I am an undergraduate student, I had classes during the day. The course I wanted to attend was in the evening. This situation was very useful for me. When I registered, I had taken this into consideration and organized my time accordingly.

DISCUSSION, CONCLUSION, RECOMMENDATIONS

With the impact of the pandemic caused by Covid-19, formal and non-formal education programs that provide education in our country, as well as around the world, have initiated and spread the use of distance education-based online learning environments. The local administration of Konya Metropolitan Municipality, which organizes face-to-face lifelong courses, has moved these courses to distance education-based online courses with the pandemic. This study aims to reveal the experiences and suggestions of adult learners who participated in distance education-based online lifelong learning courses.

According to the experience of the adult learner who participated in the course for the emergency online lifelong learning environment, it was seen that the simultaneous processing of the lessons and the lack of access to the course after the course was not recorded negatively affected the expectation. The transition to an online environment in lifelong courses, as in all levels of education during the pandemic period, negatively affected the student, teacher and learning performance, and showed that they were not ready for new experiences. In order to raise the adult learner's expectations from the online learning environment, it is thought that recording the lessons taught simultaneously and sharing them in the learning management system will support various learning opportunities (Khlaif & Farid, 2018).

Digital content such as materials, information, presentations, etc. related to the course content are normally delivered to students via LMS. However, although the local government did not provide such an infrastructure support while conducting emergency distance education-based online lifelong courses, the digital content was delivered to the students attending the course through ZOOM's chat area and whatsapp group. On the other hand, it is seen that similar communication tools are used in higher education institutions (Aduba & Adebara, 2022; Magableh & Alia, 2021). During the pandemic period, it was observed that using different communication tools indirectly to address student requests and expectations in the system positively affected student integration into the online environment.

The potential for isolation that emerged during the pandemic emerges as a factor that should not be ignored during the crisis period of student sense of belonging in emergency online environments. It is seen that the sense of belonging in the students participating in the course was low at first and then increased with the use of some communication methods by the teacher. Emergency online learning activities carried out in the first period of the pandemic brought various difficulties by affecting both students and teachers. However, in the following periods, with the increase in teachers' online platform pedagogy competencies, it had a positive effect on students' sense of belonging on online learning experiences (Blignaut vd., 2022). Learning satisfaction (Fan, Luchok & Dozier, 2021; Gachigi vd., 2023) and self-confidence (Peacock & Cowan, 2021) are among the factors that develop and nurture student sense of belonging in the online environment.

In the student theme sub-heading of the research results, the change in learning, facilities, obstacles, concentration and motivation of the experiences obtained in relation to emergency online learning emerged. In emergency online learning, students are responsible for their own learning and their duties have increased by managing and controlling their own learning. It is seen that the learning responsibilities of individuals participating in educational activities with emergency online learning increase (Calamlam, Ferran & Macabali, 2022), the student fulfills the necessary and relevant management in the online environment (Al Awabdeh & Albashtawi, 2023) and the student can achieve efficiency in such environments by fulfilling learning controls (Jiang vd., 2023).

During the pandemic period, education and training activities were carried out online, and students were mainly concerned with the learning experiences they received in this environment, such as the convenience of attending classes from home, such as not having time and space constraints, being able to spare time for themselves, not having transportation problems, the positive motivation brought by these conveniences (AbuKamar & Kamar, 2022; Gedik, 2023), lack of internet infrastructure, lack of informatics, lack of familiarity with the software used (Zammit, 2021), and the presence of distractions in the home environment have been reported to negatively affect concentration (Khalaf, Abubekr & Ziada, 2023; Öztürk, 2021).

It should be recognized that the online learning environment is different from the classroom learning environment and that effective ways of communication should be used. It is important for students in the emergency online learning environment to be able to ask questions and get answers from the teacher during the simultaneous lesson, and for the answers to be clear and unambiguous, and not to be in a way that can be interpreted in other ways, in order to eliminate the question marks in their minds.

It should also be sustained through various communication channels (e-mail, whatsapp, etc.) outside of class time (Sason vd., 2022), which is thought to support community engagement.

The main role of feedback is to provide practical advice to improve student performance in online teaching as in face-to-face teaching. It also increases student motivation, confidence and self-esteem (Fine vd., 2019). The fact that the feedback given during the pandemic was during a period of high isolation and anxiety made the supportive role of the teacher more important (Fine vd., 2022).

The communication between the teacher and student about the course content given in this type of online environment is considered as pedagogical support, and it has also been reported that it provides academic progress and reduces stress (Yates vd., 2021).

There are many studies that mention problems with computers, internet, and system infrastructure for a certain part of the students who had to participate in online learning at different levels during the pandemic period (Shamir-Inbal & Blau, 2021). However, it is seen that other trainees who contributed to this study with their experiences and other trainees did not report many such problems.

Learning management systems play an important role in online learning. It is a system that supports the teacher by providing instant assessment of the learner, managing content, student engagement and tracking (Ndou, Mashau, & Chigada, 2023). In the current study, the fact that the current local government, which provides the management of the courses, does not have such an infrastructure has limited the service provided to students during the pandemic period. In addition, there is a system created, but this system is only an informative system and does not store any digital resources.

Students participating in the course use two different platforms. The ZOOM program, where the courses are taught, and the interface section where students get information about the courses they are enrolled in.

Emergenc online learning has been used during the pandemic and is likely to continue to be used in various situations. There is a need to reorganize the curriculum for online learning in terms of pedagogy (Rhim & Han, 2020). The urgent transition to distance education during the pandemic period caught the student and the teacher unprepared at the point of curriculum, as well as the way of teaching, method, curriculum and content to be followed were continued in the face-to-face environment. In this study, in which student experiences were taken, it was determined that the curriculum of the course followed the lifelong learning course curricula of the Ministry of National Education and that the students did not express much negative opinion about this.

It is a normal situation that there is a certain course schedule in face-to-face education and that there is a course schedule in the simultaneous online learning environment. On the other hand, it is a normal and usual situation that the days and hours of the lifelong emergency online courses in which the study was conducted are certain. This is important for both teachers and adult learners to organize their own programs. On the other hand, the certainty of the course schedule has an active role in monitoring students' absenteeism and attendance (Cong, 2020). Having a clear program is also important for the local administration that manages the courses in terms of monitoring whether the courses are being taught or not. The adult learners who participated in the course(s) stated that they supported this situation and planned themselves. This will ensure consistency between students, teachers and the coordinating institution.

In the Covid-19 era, emergency remote education models are seen as prototypes that education systems can emulate well beyond periods of crisis such as the pandemic. Although the worldwide shift to emergency online education has been haphazard and practically chaotic, critical studies will need to situate these changes within the broader political economy of the COVID-19 pandemic, its antecedents and long-term consequences. Education in crisis situations like the pandemic can also shed light on long-term changes in the relationship between technology and society through the seamless adoption of digital

services as a solution to any problem. In line with the research findings, if local governments want to transform lifelong learning into a more sustainable structure in times of crisis, an LMS system should be implemented and the duties and responsibilities of teachers should be conveyed to those who teach/will teach in the courses online in various ways. The pandemic policies, pedagogies, and practices characteristic of education in 2020 call for different approaches to research again, analyzing critical and theoretical accounts of educational technologies and media.

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The Effect of The Modified Solve It! Strategy on The Mathematical Problem-Solving Skills of Students with Learning Difficulties[1]

Nurgül Gencan[1] (iD) **Zehra Atbaşı**[2] (iD)

[1] Ministry of Education, Ankara, Türkiye
nurgulgencan@gmail.com

[2] Department of Educational Sciences, Necmettin Erbakan University, Konya, Türkiye
zehrasutcu@gmail.com

Article Info	ABSTRACT
	Problem-solving skills, which require the active use of many cognitive strategies, are a difficult and comprehensive process for students with learning disabilities. The Solve It! Strategy developed by Montague (1992), includes the cognitive and metacognitive skills required to solve problems. In this study, the effect of the Modified Solve It! Strategy on the addition and subtraction problem-solving skills of students with learning disabilities was investigated. Thestudy aimed to find the following: The effect of the Modified Solve It! Strategy on the problem-solving skills of students with learning difficulties for change problems, including one-step addition and subtraction; the effect of the strategy on the generalization of their problem-solving skills to comparison problems, including one-step addition and subtraction problems; whether the students were able to use the cognitive and metacognitive skills after the instruction of the Modified Solve It! Strategy; the views of the students and families on the Modified Solve It! Strategy. The study was conducted in the Sincan of Ankara with three students with learning difficulties in classes. The study was carried out with multiple probe designs across subjects. The research was carried out in four stages: collecting baseline data, teaching strategy, collecting post-teaching data, and collecting monitoring data. The teaching process was carried out in eight steps: revealing prerequisite skills, introducing the strategy, modeling, memorizing the strategy, guided application, independent application, fading, and evaluation. The experimental data that was obtained was analyzed using graphics. As a result of the research, it was seen that the Modified Solve It! Strategy applied to students with learning disabilities was effective in solving mathematical problems.

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INTRODUCTION

Problem-solving skills, which are the main targets of different disciplines, are skills that we use most in daily and academic life, and are among the most important skills of the 21st century. Problem-solving is a difficult and comprehensive process as it requires the active use of skills such as calculating, predicting, and thinking (Joyner & Reys, 2000).

Montague (2000) has defined solving mathematical problems as a cognitive activity that includes several mathematical processes and strategies. During mathematical operations, cognitive and metacognitive processes and strategies are used (Montague & Dietz, 2009). The problem-solving process includes the following processes: comprehension, translating, transformation, planning, predicting, calculating, and evaluation (Montague, 1992). Metacognitive processes include making predictions about problem-solving, evaluating the solution process constantly, and having the ability to monitor answers (Montague & Applegate, 1993). Students with learning difficulties experience problems related to attention, memory, and organizing themselves, and these problems affect their mathematical performances negatively (Swanson & S'aez, 2003, as cited in Montague, 2007). In addition, these problems that children with learning difficulties face daily, cause them to experience problems when using problem-solving and self- regulation (Montague & Applegate, 1993). Researchers have stated that overtly structured teaching is not sufficient for teaching mathematical problem-solving skills to children with learning difficulties, and have expressed that they should have strategy instruction in order to use cognitive and metacognitive skills effectively and actively in order to maintain a successful problem-solving process (Montague, 1997). It was observed that when students with learning difficulties are taught how to use problem-solving strategies, their problem-solving skills are as good as their peers (Montague & Applegate, 1993).

During strategy instruction, cognitive routines, metacognitive, and self-organization strategies are used in order to enable students to develop their comprehension, monitoring, and evaluation processes (Teaching LD, 2020, February 12). Cognitive strategy consists of the following seven stages, respectively; revealing prerequisite skills, introducing the strategy, creating a model, memorizing the strategy, guided practice, and evaluation (Reid & Lienemann, 2006). Apart from these seven stages, cognitive strategy includes creating a model by thinking aloud in order to reveal cognitive processes that are not normally seen in the teaching process, interactive dialogues in which the teacher shows the students how to think aloud and how the strategy is used, and scaffolding, which is used to facilitate the thinking process of the student. These three factors are important factors for cognitive strategy instruction (Guzel- Ozmen, 2006).

Montague and Dietz (2009) conducted a study in which they analyzed the effects of cognitive strategy instruction on the mathematical problem-solving skills of students with learning difficulties. As a result of this study, it was observed that the cognitive strategy instruction used to develop the mathematical problem-solving skills of students with learning difficulties does not meet evidence-based criteria. Montague and Dietz (2009) have stated that it is crucial for researchers to conduct further studies on cognitive strategy instruction by taking into consideration quality standards and criteria in order to identify the shortcomings in empirical literature and evidence-based applications. One of the findings by Ozkubat et al. (2020) in their study, in which they studied the research conducted, including the 'Solve It! Strategy' was that further research should be conducted in order to promote the problem-solving skills of students with special needs.

The Solve It! Strategy developed by Montague (1992), which contains the cognitive and metacognitive skills necessary for solving problems, is a process based strategy instruction model.

The Solve It! Strategy contains seven steps, which are: read, paraphrase, visualize, hypothesize, estimate, compute, and check. In addition, each of these seven steps has self-instruction, self-questioning, and self-monitoring strategies (e.g., say, ask, check), and these steps equal metacognitive strategies

(Montague, 1992). Self-regulation skills are metacognitive strategies. The self-regulation skills consist of different strategies: antecedent cue regulation, self-instruction, reinforcement, monitoring oneself, and evaluating oneself (Koegel & Koegel, 1990, as cited in Aykut, 2013). Antecedent cue regulation, which is a self-regulation skill in the Solve It! Strategy, corresponds to the 'Say it' step, and this step requires the students to train themselves. The 'Say it' step helps the students define and direct themselves while solving problems. The 'Ask it' step, which corresponds to the self-instruction in self-organization skills, promotes inner dialogue, which helps in organizing the implementation of cognitive processes, and aids in systematic analysis of information. The 'Ask It' step enables students to question themselves. The 'Check' step, which corresponds to the self-monitoring strategy of self-organization skills, motivates students to use strategies correctly, and enables students to monitor their performance during the problem-solving process (Montague & Dietz, 2009).

Researchers have carried out numerous studies with different groups with special needs using different research patterns in which the Solve It! Strategy is used. Some researchers have made adaptations to the stages and steps of the Solve It! Strategy in their research. Chung and Tam (2005) eliminated the 'make an assumption' and 'make a prediction' stages of the Solve It! Strategy and modified it as a five-step strategy, which included the 'read the problem aloud, select the most important information, make a visual of the problem, make a calculation, and check the answer' stages. In their adaptation, they remained loyal to the steps 'say it, ask a question, and check it' in Montague's Solve It! Strategy. Karabulut (2015) developed Understand and Solve! by adapting Montague's Solve It! Strategy. The Understand and Solve It! Strategy that was developed consists of five stages: read the problem and tell, underline the keywords, draw the schema of the problem, make a plan and solve the problem, and check (Ozkubat & Karabulut 2021). Karabulut (2015) did not include the steps 'say it, ask it, and check it' in the Solve It! Strategy developed by Montague in his adaptation, and included self-regulation skills in the instruction process.

Reviewing the literature, it is observed that there are numerous international studies on teaching problem-solving skills during which cognitive strategy instruction is used. As a result of the literature review, it is observed that there is no research in Turkey during which cognitive strategy instruction was conducted with students with learning difficulties (Ozkubat & Ozmen, 2018). It is crucial to conduct studies on this topic in order to identify the strategies used by students with learning difficulties in solving mathematical problems (Ozkubat & Ozmen, 2018).

As a study conducted with cognitive strategy instruction on mathematical problem-solving skills of students with learning difficulties cease to exist in Turkey, and as there is limited research on this subject in which evidence-based implementations are used, the aim of this study is to study the effectiveness of the Modified Solve It! Strategy on the mathematical problem-solving skills of students with learning difficulties.

METHOD

Research Design

It was decided that the multiple probes across participants design would be used in this study in order to examine the effect of the Solve It! Strategy on the mathematical problem-solving skills of students with special needs. The multiple probes across participants pattern were designed as multiple probes design with multiple conditions.

In order to study the opinions of the students and the parents, the semi-structured interview technique, which is a qualitative research method, was used.

Dependent and Independent Variables

The dependent variable of the study was the number of problems that the students solved accurately, whereas the independent variable was the Modified Solve It! Strategy.

Participants

This study was conducted with three students with learning difficulties who were attending school in the Sincan of Ankara.

The first student

A 12 year-3 month-old female student diagnosed with learning difficulties, attending grade 6. She takes additional math classes. She was able to solve 10 mathematical operations with addition with carry 100% accurately. Similarly, she was able to complete 10 operations with subtraction without borrowing 100% accurately. She was able to solve 4 of the 10 change problems including one step addition and subtraction. She attends classes regularly.

The second student

A 12 year-5 month-old female student diagnosed with learning difficulties, attending grade 6. She takes additional math classes. She was able to solve 10 mathematical operations with addition with carry 100% accurately. Similarly, she was able to complete 10 operations with subtraction without borrowing 100% accurately. She was able to solve 4 of the 10 change problems including one step addition and subtraction. She attends classes regularly.

The third student

An 11 year-6 month-old female student diagnosed with learning difficulties, attending grade 7. She takes additional math classes. She was able to solve 10 mathematical operations with addition with carry 100% accurately. Similarly, she was able to complete 10 operations with subtraction without borrowing 100% accurately. She was able to solve 3 of the 10 change problems with one step addition and subtraction. She attends classes regularly.

The Development of The Modified Solve It! Strategy

During the research five steps of the seven steps of Montague's (1992) Solve It! Strategy, which are 'read, paraphrase, visualize, hypothesize, predict, calculate and check' were used as modified by Chung and Tam (2005) and later used in research. These five steps are 'read, paraphrase, visualize, plan and calculate, and check.' In the study, the steps 'say, ask, and check,' which enable the students to use self-regulation skills and metacognitive skills, were used as they were. In the 'visualize' stage of the study, the students were asked to choose the appropriate schemas, and to fill them in as in the strategy modified by Karabulut (2015) as different to the strategy modified by Chung and Tam (2005). During strategy instruction, the cognitive strategy instruction was used as cognitive strategy instruction is evidence-based. In addition, appropriate scaffolding which are used in cognitive strategy instruction, and which enable the students to internalize the strategy, and use self-organization skills were used during the process.

Table 1. *The steps of the modified Solve It! strategy*

Steps of the Strategy	Dimensions of the Strategy
Read (In order to understand the problem)	Say: Read the problem. Answer the questions on the Reading the Problem Check List.
	Ask: Have I read the problem and understood it?
	Check: I must make sure that I understand in order to solve the problem better.
Explanation (Paraphrasing it in your own words)	Say: Underline important information and key words.
	Ask: Have I underlined important information? What is the question? What am I looking for?
	Check: I must make sure that the key words I have underlined are appropriate for the question.
Visualize (Draw the schema)	Say: Make a schema.
	Ask: Is the schema I have drawn appropriate for the problem?
	Check: I must make sure that the schema is suitable for the problem.

Plan and Calculate (Create the plan for solving the problem and solve)	Say: Decide on how many calculations are needed and which ones will be made. Write the calculations on the Planning Sheet. Solve the calculations in the correct order.
	Ask: How many steps are needed? Which processes do I have to carry out? Is my answer meaningful?
	Check: I must make sure that the plan is logical and that all the steps are carried out in the correct order.
Check (Make sure that everything is correct)	Say: Check your steps and your calculations.
	Ask: Have I checked every step? Have I checked the calculations? Is my answer correct?
	Check: I must make sure that everything is correct. If not, go back. Ask for help if you need it.

The Implementation Steps of The Modified Solve It! Strategy

Teaching the Modified Solve It! Strategy, the independent application step for the cognitive strategy instruction consisting of seven stages, was divided into two independent practice and withdrawal stages, and the application was conducted in this way. During the application, the following stages were followed: revealing prerequisite skills, introducing the strategy, creating a model, memorizing the strategy, guided practice, independent practice, withdrawal, and evaluation.

The Scaffolding Used in The Strategy

Scaffolding is an important factor that enables students to learn strategies and internalize them during cognitive strategy instruction (Case et al., 1992; Guzel-Ozmen, 2006; Karabulut, 2015; Reid & Lienemann, 2006). During the research process, scaffolding was used to enable students to learn the Modified Solve It! Strategy easily. The scaffolding used in this study was an observation sheet for the Modified Solve It! Strategy, a check list for reading the problems, problem schemas, a planning sheet, a problem-solving sheet, and a Modified Solve It! Strategy checklist.

Data Collection Tools

In order to assess the changes in the dependent variable in the study, the following data collection tools were used: preparing the problems; a problem evaluation sheet, which includes preparing the problems; addition and subtraction problems; a strategy observation form; and a social validity questionnaire.

The Research Process

This research was conducted in five stages: the collection of baseline data, the Solve It! Strategy instruction, collecting the evaluation data, monitoring, and generalization. A preliminary application was carried out in order to prevent possible problems during the research process and to adjust the length of the sessions. An observer observed the preliminary application stage and filled out a practice reliability form. Thus, the shortcomings of the research process were identified. The preliminary application process ended when the application reliability was 80%. During the experimental process, there were one-on-one sessions every day with each student at specific times.

The Collection and Scoring of Data

In order to identify their problem-solving performances, the students were given a problem evaluation sheet, and they were given the instruction, 'I want you to solve the problems written on this sheet. You may leave a question blank if you wish to'. After the student had solved the problems, the answers were written in the problem-solving performance recording chart by the teacher as 'correct, incorrect, or blank'. In order to accept the solution to a problem as correct, special care was taken to guarantee that both the solution and the result were correct. If there was a mistake in any step of the solution to the problem, that example was considered to be incorrect. The correct answers of each student were found by looking at the problem-solving performance recording chart, and the correct answers of the students were evaluated as their performance. Similarly, baseline data, post-instruction data, monitoring data and generalization data, were collected and

scored in the same way.

Data Analysis

Graph analysis was used for analyzing the problem-solving performance data of the students. The data was analyzed using a line graph. The data, which was collected using the semi-structured interview form, were interpreted and analyzed using descriptive analysis, whereas the social validity data collected using the questionnaire were interpreted using frequency.

Reliability Data

Before collecting the reliability data, the limitations of the target were determined. The targets were written clearly using observable and measurable terms, and they were prepared as an implementation reliability form. During the study, implementation reliability was collected by a special education teacher using the Implementation Reliability Data Collection Form. The observer sat in a part of the classroom where the student would not see him or her, observed the implementation process, and put ticks on the data recording form. The percentage for implementation reliability is calculated by dividing the observed practitioner behavior by the planned practitioner behavior and multiplying it by 100 (Erbas, 2018).

The observer observed only the implementation process and the evaluation process of the first and third students completely. The observer was asked to watch at least 30% of the videos recorded during the implementation process and the evaluation process, which were selected randomly, and fill out the Implementation Reliability Data Collection form. Special care was taken to include videos for every student and every implementation stage while selecting the videos randomly. The implementation reliability of the study was found to be 96.75 percent as a result of the reliability data that was collected. The implementation reliability according to students and implementation sessions is presented in Table 2.

**Table 2**. *Implementation reliability data*

Students		Evaluation	Activating Prerequisite Skills	Introducing the Strategy	Creating a Model	Memorizing the Strategy	Implementing the Guidelines	Independent Implementation	Withdrawal	Generalization	Total
					Implementation						
First Student		100%	100%	93,75%	100%	100%	100%	100%	94%	90,9%	97,62%
Second Student		100%	88,8%	100%	97,1%	100%	100%	100%	89%	90,9%	96,2%
Third Student		100%	100%	93,75%	93,75%	100%	100%	100%	89%	90,9%	96,37%
Total		100%	96,26%	95,83%	96,95%	100%	100%	100%	90,66%	90,9%	96,73%

To calculate the reliability, the observer was asked to watch at least 30% of the implementation evaluation sessions (baseline, post-instruction evaluation, monitoring, and evaluations related to generalization). The observer was given an Observer Reliability Form, and he or she was asked to fill out the form according to the performance of the student by watching the videos. After the observer watched the videos and filled out the forms, the observer's reliability was calculated by comparing the evaluations of the researcher and the observer. To calculate observer reliability, the observer and researcher's disagreement was divided by the total of disagreement and agreement between the observer and the researcher and multiplied by 100 (Erbas, 2018).

For the first student, approximately 35% of the evaluation sessions (baseline, post-instruction, monitoring, generalization baseline, generalization post-instruction, and generalization monitoring) were watched. Similarly, for the second student, approximately 31%, and for the third student, approximately 31% of the evaluation sessions were watched. The observer's reliability was found to be 100% for all three students.
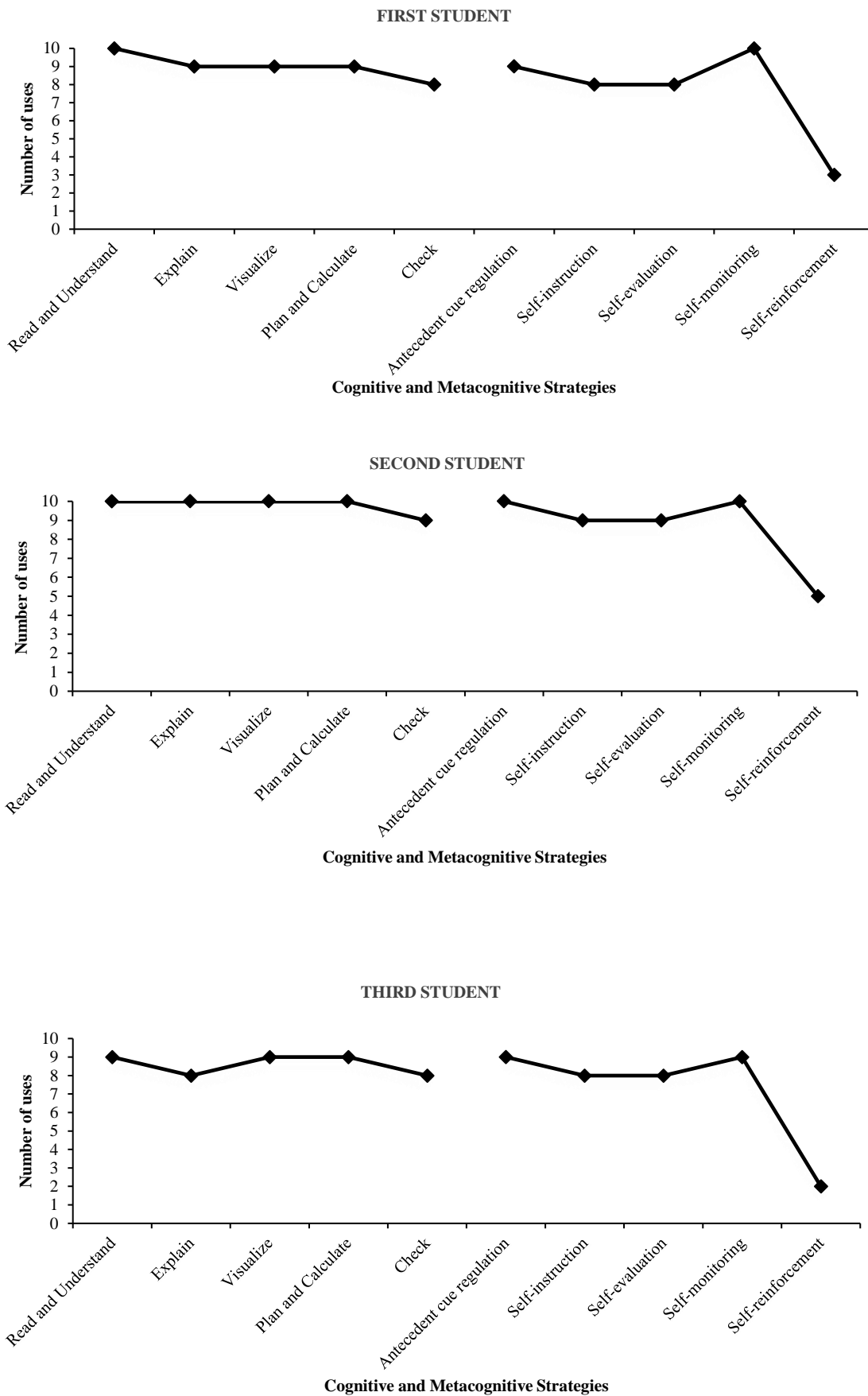
FINDINGS

The data for the baseline, post instruction and monitoring for the problem-solving performances of the students for change problems with addition and subtraction are presented in Graph 1.
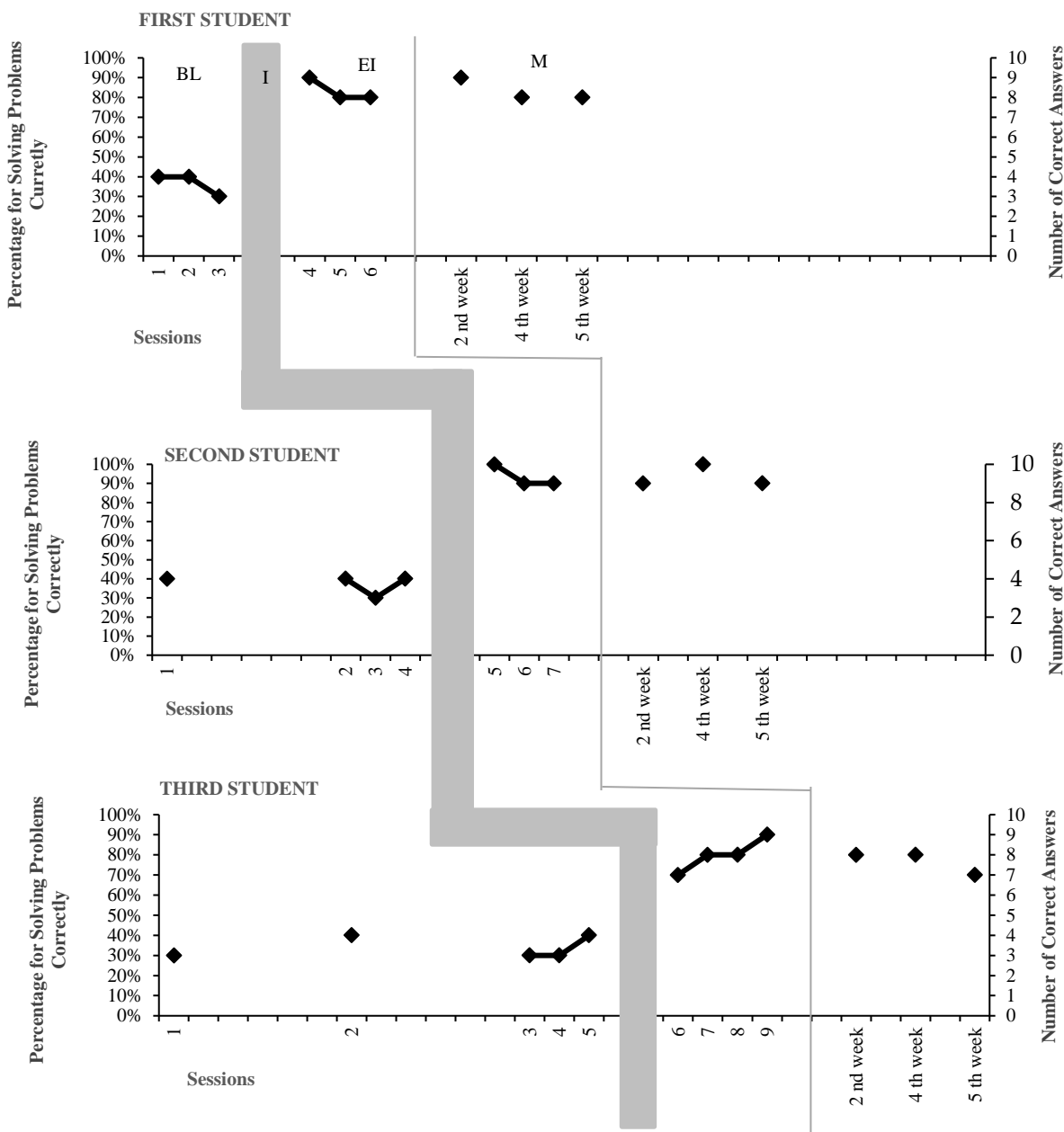
Graph 1. *Findings on baseline, post instruction and monitoring process of students' problem-solving performances for the change problems with addition and subtraction problem*
(**Note.** *BL: baseline, I: instruction process, EI: end of instruction, M: monitoring*)

Studying the baseline data, it was observed that all three students had a maximum of four correct answers in evaluations, including 10 problems. An increase was observed in the problem-solving skills of all three students after the students received the Modified Solve It Strategy instruction, and all students met the 80% accuracy criterion. While the post-instruction data became consistent faster for the first and second students, this took a longer time for the third student. It was observed that all students maintained the post instruction achievement levels in the monitoring data collected two weeks later and four weeks later. However, although there was no decrease in the performance of the first and second students in the monitoring data that was collected five weeks later, it was observed that there was a decline in the performance of the third student and that the students' performance fell to 70%.

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Graph 2 illustrates how much of the cognitive and metacognitive strategies in the Modified Solve It! Strategy were used by the students following instruction.

FIRST STUDENT

SECOND STUDENT

THIRD STUDENT

Graph 2. *Findings on the students' performance while using strategies*

It was observed that all three students used the cognitive and metacognitive strategies 'read and understand, explain, visualize, plan and calculate check, antecedent cue regulation, self-instruction, self-evaluation, self- monitoring' effectively while solving problems. However, it was seen that they were not able to use the metacognitive strategy 'self-reinforcement' effectively.

The ability of the students to generalize the Modified Solve It! Strategy to comparison problems with addition and subtraction are presented in Graph 3.
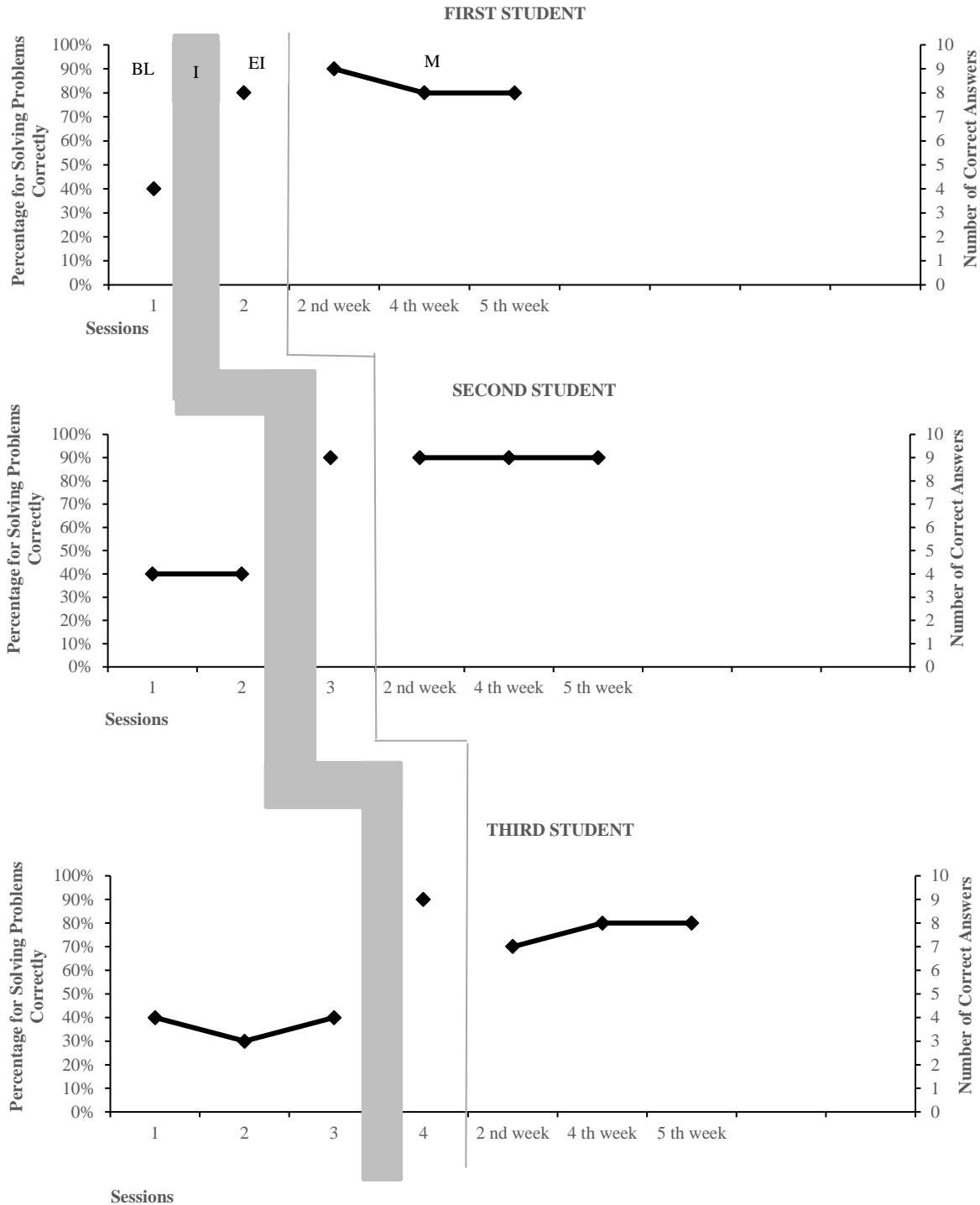
Graph 3. *Findings on baseline, post instruction and monitoring process of students' problem-solving performances for the comparison problems with addition and subtraction*
(**Note.** *BL: baseline, I: instruction process, EI: end of instruction, M: monitoring*)

While the baseline data was four correct answers in general for all three students, it was observed that the problem-solving performances of the students for comparison problems increased to 80% and 90% after generalization instruction. When the data collected after instruction is compared to baseline data, it was observed that there was a significant increase in the problem-solving performance of the students. That is, students with learning difficulties generalized their problem-solving performances for solving change problems that they developed with the Modified Solve It! Strategy to comparison problems. It was observed that there was no decrease in the performance of the first and second students based on the monitoring data collected two weeks, four weeks, and five weeks after post-instruction sessions, and that they maintained their learning. It was observed that the performance of the third student fell to 70% in the monitoring data collected two weeks later. However, it was also observed that there was no change in the performance of the third student in the monitoring data, which was collected four weeks and five weeks later, and that she met the 80% accuracy criterion.

The data, which was collected using the 5-point Likert scale social validity form, was administered to the students in order to determine their thoughts on the Modified Solve It! Strategy are presented in Table 3.

Table 3. *The social validity questionnaire scores of the students*

Questionnaire Questions	First Student	Second Student	Third Student
Using the strategy makes it easy to solve problems	5	5	5
I will use the strategy	5	5	5
Using the strategy enables me to solve problems faster	5	5	3
Using the strategy is fun	5	5	5
Using the scaffolding is fun	5	5	4
The graphs help me understand the problems more easily	5	5	5
I can use the strategy without the scaffolding	5	5	5
I can draw the graph myself	5	5	5
Thinking aloud helps me	5	5	3
Telling myself what to do helps me	5	5	5
From now on, I will tell myself what to do	5	5	5
Asking questions to myself helps me	5	5	5
From now on, I will ask questions to myself	4	5	4
Evaluating myself helps me	5	5	5
From now on, I will check myself	5	5	5

It was found out that most of the evaluations of the students for the Modified Solve It! Strategy were positive, and the students stated that they completely agreed by giving five points to most of the items. However, the third participant stated that she was indecisive by giving three points to the item 'The strategy enables me to solve problems faster'. On the other hand, she stated that she agreed with the item 'It is fun to use scaffolding' by giving it four points. It was observed that students completely agreed with items on metacognitive strategies as a whole. The first student and the second student gave four points to the item 'I will ask questions to myself from now on' and stated that they agreed.

The data that was obtained by administering the semi-structured interview to the students was analyzed and interpreted using descriptive analysis. In light of the social validity form and the semi-structured interview that were administered to the students, the social validity of the Modified Solve It! strategy and the social validity of the study were found to be high. However, although the students were expected to generalize the metacognitive strategies in the strategy instruction process to daily life, the data obtained by using semi-structured interviews has revealed that the expected outcomes were not achieved.

The data obtained from students by using the 5-point Likert scale social validity form was used to determine the views of the families on the Modified Solve It! strategy and social validity are presented in Table 4.

Table 4. The Social Validity Questionnaire Scores of the Families

Questionnaire Questions	First Student	Second Student	Third Student
My child is more willing when solving maths questions	4	5	4
My child has more correct answers for the problems that s/he solves at home.	5	5	5
My child asks for less help when s/he solves problems.	5	5	5
My child visualizes the problem by making various drawings while solving problems.	5	5	5
My child spends less time while solving problems.	4	5	4

Based on the answers the parents have given to the questions in the questionnaire, it is observed that the students transfer the strategy to home settings, and that the parents are also pleased with this situation.

DISCUSSION

The Efficiency of The Modified Solve It! Strategy

During the implementation stage of the research, the students were taught the Modified Solve It! strategy. Based on the data following the instruction of the strategy, it was observed that there was an increase in the performance of students in change problems, which included addition and subtraction. It was observed that the average performance of students was 30–40% for baseline data that was collected prior to the Modified Solve It! strategy. On the other hand, it was observed that the average performance of students was 80–90% in the data that was collected following the instructions of the Modified Solve It! strategy. The baseline data and the data collected after instruction on the strategy show that the Modified Solve It! strategy positively affected the performance of students when solving change problems, which included addition and subtraction. This result, which was obtained as a result of the study, displays similarities with research that studied the effectiveness of the Solve It! strategy or the Modified Solve It! strategy by using different research methods.

The results of this research and the results of other studies in the literature point out that strategy instruction is effective in helping students with learning difficulties acquire problem-solving skills for math and other academic skills and that these students can learn and use these strategies (Daniel, 2003; Freeman-Green et al., 2015; Jitendra, 2002; Krawec, 2014; Mercer & Miller, 1992; Montague, 1992; Montague & Bos, 1986; Montague et al., 2014; Owen & Fuchs, 2002; Ozmen & Ozkubat, 2018; Pfannenstiel et al., 2015; Zhu, 2015).

When monitoring data was collected in the second, fourth, and fifth weeks after the instruction of the Modified Solve It! strategy to students, it was observed that the students maintained their performance following the instruction on the whole. A slight decrease was observed in the performance of the third student in week five. Based on the data obtained, it may be said that on the whole, the Modified Solve It! strategy can be used by students for a long time and that it is an effective strategy as the improvement in the performance of students is maintainable. It is believed that as students are able to maintain their performance two, three, and five weeks later, this is related to the self-regulation skills in the Modified Solve It! strategy as well as the effective use of these strategies by the students. Similarly, in their study, Cassel and Reid (1996) stated that metacognitive strategies were effective in their maintenance. In his studies, Montague (1992) stated that it would be beneficial to provide support to the students by using reinforcement sessions and other types of teaching, as students would experience a decrease in their performance for using the strategy after long intervals. In this research, no support or teaching was provided for the students following the teaching process. The fact that the performance of the third student fell to 70% in the monitoring session in the fifth week reveals that reinforcement sessions are vital for the students to maintain their performance and to be able to use the strategy for longer periods.

While prior to the generalization instruction, the performance of the students for solving comparison problems with addition and subtraction was 40%, their performance rose to 80% following the generalization instruction. Thus, there was a significant increase in performance.

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It was observed that, on the whole, the students preserved their generalization performance in the monitoring data, which was collected two weeks, four weeks, and five weeks later. A slight decrease was observed in the performance of the third student in the fourth week.

When the performance of the students is studied, it is observed that the students generalize the Modified Solve It! strategy to different types of problems. The increase in the generalization performance of the students was related not only to their generalization of problem-solving but also to their generalization of the cognitive and metacognitive processes in the strategy. Cognitive and metacognitive strategies had an effect on the maintenance of the students' generalization performances in the second, fourth, and fifth weeks following instruction. The fact that the second-week performance of the third student was lower than the monitoring data collected in the fourth and fifth weeks was interpreted as the possibility of the student being affected by environmental factors on that day. Montague and Bos (1986) reached the conclusion that students with learning difficulties generalized the Solve It Strategy to problems with increasing levels of difficulty, whereas Whibity (2015) concluded that students with autism spectrum disorder generalized the Solve It! strategy to different environments. Similarly, Karabulut (2015) concluded that students with mild mental disabilities generalized the Understand and Solve It! strategy (modified from the Solve It! strategy) to different environments, different types of problems, and problems with increasing difficulty. Similarly, based on data, this study has reached the conclusion that students with learning difficulties generalize this cognitive strategy to different problem types, and the findings support literature.

The students have stated that they found the cognitive strategy fun and easy to use, are pleased with the stages in the strategy, and that they will use the strategy in the future while solving problems. In addition, they have expressed that thinking aloud and using scaffolding are fun, and that using the strategy helps them understand where to start when solving the problem. They have also stated that using the strategy makes problem-solving easier. According to the social validity of the research conducted by Freeman-Green et al. (2015), students knew how to start solving mathematical problems and how to work on the problems by using the Solve It! strategy. The findings of the mentioned study support the findings found in this research. As a result of the study, it has been observed that the Modified Solve It! strategy has important social effects and has high social validity.

The Evaluation of The Effectiveness of The Modified Solve It! Strategy In Terms of Its Strategy Aspects

For this research, a five-step strategy was developed by adapting the Solve It! strategy. Cognitive strategy instruction was conducted during the strategy instruction process. The cognitive strategy instruction was criterion-based, and this enabled the researchers to accurately collect and analyze the increase in student performance and facilitated the systematic advance of the student to the next level during the strategy instruction process (Case et al., 2002; Karabulut, 2015). Using a criterion-based instruction method in the study prevented the random independence of the students and made the study more reliable. The main goal of cognitive strategy instruction is the teaching and internalization of the strategy rather than the goal that needs to be achieved (Karabulut & Ozmen, 2018). The following factors enabled the independence of students when they became individuals who were able to use good strategies and who could solve problems well: (a) talking aloud during instruction; (b) providing a routine for the students; (c) using scaffolding and prompts; (d) displaying a detailed model; (e) providing guidance and developing interactive dialogues in order to facilitate the interaction between the teacher and the student; (f) providing corrective feedback and offering prompts when the student needs it (Case et al., 1992). It was observed that talking aloud during all stages of strategy instruction and enabling the students to think out loud during practice enabled the students to internalize the strategy, and this supports the literature (Case et al., 1992; Daniel, 2003; Freeman-Green et al., 2015; Guzel-Ozmen, 2006, 2011; Montague et al., 2014).

The scaffolding in cognitive strategy instruction was developed with special care and integrated into the stages of the Modified Solve It! Strategy during this study in order to enable students to use self-regulation

skills actively and to enable them to internalize the strategy. The scaffolding made it easier for the students to internalize the strategy by making the strategy concrete (Guzel-Ozmen, 2006; Karabulut, 2015). The 'Strategy Observation Sheet 'was used to enable the students to create a routine to use the stages of the strategy (Karabulut, 2015). It was observed that students who used the scaffolding 'Reading Check List' in the 'Read' stage were able to analyze and talk about a problem in the other practice sessions without using this scaffolding. The 'explain' step expected the students to underline key words in the problem. It was observed that students who displayed high performance in underlining key words during the teaching of prerequisite skills did not experience difficulties during this stage and found the key words immediately (Chung & Tam, 2005; Mesler, 2004; Montague, 2000). During the 'Visualize' stage, the schemas were given to the students as different from the Solve It! strategy. The students were asked to fill in the schemas that had been prepared as appropriate to the problems. Marshall (1995) has stated that the schemas are as important as solving the problems. This also proves why the students who forgot to fill in the schemas or filled them in incorrectly during the study process had incorrect answers while solving the problems. Jitendra (2002) has stated that the schemas decrease the cognitive load of the students as well as contribute to the analysis and solution of the problem. It was found out that it was easier for the students to comprehend and decide on the process as the problems were made concrete through visualization. It may be said that the schema directs the students while they understand the problem better and decide what to do in the next step.

The steps 'say it, ask, and check' steps which are part of the strategy are metacognitive strategies which enable the students to internalize the cognitive strategies that they have learned, and enable them to create a routine (Case et al., 1992; Daniel, 2003; Montague, 1992; Montague & Bos, 1986; Ruya-Ozmen & Ozkubat, 2018). Case et al. (1992) have stated that the fact that strategy instruction has become an important teaching approach in teaching problem-solving skills is not merely related to cognitive strategies with a few stages, but that this situation is also related to combining these strategies with self-regulation strategies and using them together. In their study, Case et al. (1992) stated that metacognitive strategies are effective when students internalize the strategy that they have learned. Additionally, these strategies enable them to solve problems more easily and generalize the strategy.

A social validity scale was collected from the families in order to find out whether the students were able to generalize the strategy to home settings as the research was conducted during the pandemic and as the schools were closed during this period. Although the social validity data collected from the families made us believe that the students generalized the strategy to home settings, there is no evidence-based data for this study concerning this. However, there are findings in the literature that have shown that students generalize the strategy to different situations (Karabulut, 2015; Montague, 1992; Whibity, 2015).

While it was observed that students used the metacognitive strategies in the Modified Solve It! strategy effectively, it was also seen that they were not able to use the self-reinforcement skill, which was verbally integrated into the strategy process, effectively. It is thought this is related to the fact that the self-reinforcement skill was not integrated into the steps of the strategy, but was used only verbally during the process. It is believed that adding self-reinforcement to the steps of the strategy will promote the self-reinforcement skills of the students, and thus the student will motivate himself or herself about solving the problem and using the strategy, as well as enabling the student to increase self-motivation. It was observed that the students were able to maintain both metacognitive skills and cognitive skills even after withdrawal. This is also an indicator that shows that the students have internalized the strategy and have created a routine with it (Montague et al., 2014).

It is seen that in the literatüre, problems with addition and problems with subtraction are taught separately (Case et al., 2002; Montague, 1992; Montague et al., 2014). However, in this study problems with addition and problems with subtraction were presented to the students simultaneously in order to shorten the instruction process and facilitate the generalization process. In addition, the student was motivated to solve problems by learning, which prevented the student from managing the process in a rote fashion. Moreover, monitoring data was collected two weeks, four weeks, and five weeks after post-

instruction data, as well as generalization data. On the whole, it was observed that the students maintained their performance. It is believed that presenting metacognitive skills along with strategy instruction has been effective (Case et al., 1992; Cassel & Reid, 1996; Karabulut, 2015).).

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Determination of Secondary School Students' Misconceptions about the Concept of Seed with the Four-Tier Misconception Diagnostic Test[1]

Sevgi Onay[1] (iD) **Musa Dikmenli[2]** (iD) **Tuğçe Duran[3]** (iD)

[1] Ministry of Education, Türkiye
sevgionay01@gmail.com

[2] Prof. Dr., Department of Biology Education, Ahmet Kelesoglu Faculty of Education, Necmettin Erbakan University, Konya, Türkiye
mdikmenli@erbakan.edu.tr

[2] Res. Asst., Department of Biology Education, Ahmet Kelesoglu Faculty of Education, Necmettin Erbakan University, Konya, Türkiye
tugce.gulesir@erbakan.edu.tr

Article Info	ABSTRACT
	Studies show that students have difficulty understanding topics such as fruit formation, germination and seed dispersal. The concept of seed is perceived as a general concept by students and its boundaries cannot be drawn exactly. In this context, the study aimed to determine the misconceptions of 12th grade secondary school students about seeds by developing a four-tier concept diagnostic test. For this purpose, a four-tier multiple-choice seed concept diagnostic test was developed for 12th grade secondary school students. The four-tier seed concept diagnostic test consisted of 11 questions and had a 3-factor structure. As a result of the analysis, this test was found to be valid and reliable. 30 different misconceptions were revealed with the four-tier seed concept diagnostic test. The results of the study showed that approximately one fourth of the 12th grade secondary school students had misconceptions about the concept of seed, and the rate of three of the misconceptions was above 10%. This study, which was conducted on 12th grade secondary school students, should also be conducted on different sample groups, and various studies should be conducted to eliminate the misconceptions determined in this study.

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[1] *This article was produced from the first author's master's thesis. The second author was the first author's master's thesis advisor and contributed to all processes of the research. In addition, the third author made great contributions in analysing the data and reporting and discussing the results with the support of the literature. For this reason, this study, in which all authors worked together, was organized with three authors. All authors contributed to the concept and design of the study. All authors read and approved the final manuscript.

INTRODUCTION

The topics such as fruit formation, seeds, seed dispersal and pollination included in plant biology require holistic and systematic thinking. Research shows that students have difficulty in understanding the topics such as fruit formation, germination and seed dispersal. In addition, with many studies has been revealed misconceptions about plants (Bell, 1985; Brown & Schwartz, 2009; Parker et al., 2012; Roy & Mohapatra, 2022; Södervik et al., 2015; Svandova, 2014; Wang, 2007; Yangin et al., 2014; Yürük et al., 2011). In the study conducted by Jewell (2002), it was revealed that students were unable to realise that all flowering plants bear fruit, and that they associated germination with the emergence of leaves rather than shoots and roots. In another study, students stated that they believed that flowers exist only to be aesthetically pleasing. It was also determined that students had vague ideas about the transport of pollen. In this context, it was understood that students had incomplete knowledge about reproduction in plants (Warwick & Sparks-Linfield, 1996). According to the results of some studies, it was found that students generally do not accept the seed as a plant structure until it grows and do not associate it with the plant (Allebone, 1995; Bell, 1981). Tamir et al. (1981) determined in their study that nearly half of the students studying in the fourth grade and above did not accept the seed or seed embryo as living. They stated that this may be due to the fact that the seed is normally in a dormant state and it is thought that it will revive when planted.

In the biology curriculum of 12th grade secondary school education in Türkiye, the concept of seed is included in the "Sexual Reproduction in Plants" topic of the Plant Biology Unit. Within the scope of this topic, students are expected to gain the following skills: (1) explaining the parts of the flower and the functions of these parts, (2) explaining fertilization and the formation of seeds and fruits in flowering plants, (3) designing experiments to observe seed germination, (4) establishing a relationship between dormancy and germination. In this unit, sexual reproduction in plants is taught through the example of a angiosperm by using visual elements, graphic organisers, e-learning objects and applications. The role of seed and fruit in the reproduction and dispersion of plants is discussed with examples. The factors affecting germination are determined with experiments (Ministry of National Education [MoNE], 2018). Although the concepts related to reproduction in plants are sufficiently included in school curricula, in a study conducted by Tunnicliffe and Reiss (2000), it was determined that the knowledge of students about plants was mostly based on their own observations and individual experiences. An interesting result of this study is that students give more importance to the information obtained from out-of-school environments or daily life rather than the education they receive in schools. Direct observations of students in daily life form the basis of their learning about plant seeds. For example, students can easily observe the dispersion of dandelion seeds in daily life. However, this observation does not contain any information about the structure and functions of the seed.

In his study, Jewell (2002) analyzed the understanding of seed concept of 75 students aged 7-11. The findings of this study showed that participants have a limited understanding of "seed" and have some non-scientific ideas about the internal structure of a seed, germination and seed formation. It was observed that plant structures, which are generally small in size, round or drop-shaped and inedible by humans are the seed model in the minds of many students.

As a result of the literature review, it was seen that students had various misconceptions about the concept of seed. Hershey (2004, 2005) mentioned the existence of misconceptions related to plant science among students and in science textbooks and made suggestions to eliminate them. Important misconceptions revealed in these studies are as follows: "All plants photosynthesize", "Oxygen is absolutely necessary for germination", "Plants are terrestrial organisms". Books, it can be stated that all seed plants have one or two cotyledons. This situation is an example of focusing on angiosperms and therefore ignoring gymnosperms. Gymnosperm seeds usually have more than two cotyledons.

Most of the seeds that can be grown have the ability to germinate if the necessary conditions are provided. Therefore, the seeds are not dormant. It is merely sedentary. Truly dormant seeds do not have the ability to germinate even if the necessary environmental conditions are met. It is a common misconception that the cotyledons of angiosperm seeds are filled with abundant endosperm or stored nutrients. For example, the small seeds of Orchidaceae have almost no nutritional tissue. Therefore, they depend on mushrooms to meet their nutritional needs (Mauseth, 2009; Reece et al., 2010).

Learning does not occur if students fail to understand scientific concepts correctly. When students learn and internalize scientific concepts incorrectly, it is called misconception (Haydari & Costu, 2021). In particular, the misconceptions that teachers have limit students' learning (Sagdic & Sahin, 2023). Today, in addition to misconceptions of teachers, the misuse of scientific concepts in textbooks and media, and the use of scientific concepts in different meanings in daily language are the main reasons for misconceptions in students. The main reasons for misconceptions are individual life, experiences and the teaching process. Misconception is not an ordinary lack of knowledge or error.

The individual who has a misconception is not only unaware of this, but also blindly adheres to this misconception and defends its accuracy with justifications. In order to change the misconception, the individual must first realize this misconception and feel uncomfortable (Hewson, 1996). Therefore, it is very difficult to change misconceptions. Detection and elimination of misconceptions are very important in terms of making the learning process meaningful. Today, many methods are used to detect and eliminate misconceptions. The most powerfull measurement tools used in detecting misconceptions are two-, three- and four-tier misconception diagnostic tests. Misconceptions can as well be determined through the agency of open-ended questions and open-ended interviews, but it is not clear whether they are lack of knowledge or misconceptions.

Due to the disadvantages of multiple-choice tests such as having a chance factor, students' inability to explain the reasons for answering, having limitation of answering, inability to determine metacognitive levels and conceptual learning, multiple-choice tests were transformed into two, three and four-tier concept diagnostic tests. Multi-tier concept diagnostic tests have been used in many studies that form the basis of the literature, such as Odom and Barrow (1995), Haslam and Treagust (1987) and Treagust (1985) and have become increasingly widespread. First, the positive results obtained from studies based on the justification of questions in multiple choice concept diagnostic tests led to the spread of two-tier multiple choice concept diagnostic tests (Treagust, 2006). Over time, three-tier and four-tier concept diagnostic tests were developed. In determining misconceptions, four-tier tests produce more realistic and concrete results than two-tier or three-tier tests (Bozdağ & Ok, 2018; Taşlıdere, 2016). Kaltakci Gurel et al. (2015) reported that in scientific studies conducted with four-tier tests, the tests reduced the rate of lack of knowledge and increased the rate of students' misconception and correct answer scores. Four-tier tests allow a clear distinction between lack of knowledge and misconceptions.

The aim of this study is to reveal secondary school students' misconceptions about the concept of seed by developing a "four-tier seed concept diagnostic test". As a result of the literature review, it was seen that there were studies on the development of multi-tier concept diagnostic tests on the subjects of plant biology, substance uptake and transport in plants (Akyurt & Akaydın, 2009; Vitharana, 2015; Wang, 2004), photosynthesis and plant respiration (Atchia et al., 2022; Haslam & Treagust, 1987; Lin, 2004; Lim & Poo, 2021; Svandova, 2014; Urey, 2018; Uzunhasanoğlu et al., 2020), reproduction in plants (Amelia, 2023) and growth and development of flowering plants (Lin, 2004). However, there were no multi-tier concept diagnostic tests directly related to the concept of seed. This formed the starting point of the study. The concept of "seed" discussed in this study is perceived as a general concept for students and its boundaries cannot be drawn exactly. Therefore, determining the perceptions in students' minds about the concept of seed and revealing existing misconceptions, if any, will contribute to the field of biology education.

Aim of the Study and Research Questions

The aim of this study is to reveal 12th grade secondary school students' misconceptions about the concept of seed by developing a "four-tier seed concept diagnostic test". The sub-objective of the study was to determine the percentages of students' scientific knowledge, lack of knowledge and misconceptions about the concept of seed on the basis of sub-dimensions. In this study sought answers to the following questions:

1. What are the factor-based values of the percentages of 12th grade secondary school students' scientific knowledge, lack of knowledge and misconceptions about the concept of seed?

2. What are the misconceptions of 12th grade secondary school students about the concept of seed that are common at 10% and above?

METHOD

Research Design

The survey model, one of the quantitative research methods, was used in this study. This study includes the development process of the "Four-tier Seed Concept Diagnostic Test" and the processes of detecting students' misconceptions about the concept of seed that are common at 10% and above.

Study Group

This study was conducted with 12th grade students studying in 6 high schools in Konya. The study group consists of 409 randomly selected 12th grade secondary school students. The study group was intent on by random sampling method among students with similar socioeconomic levels. The most important feature of this sampling method is that all units in the population have an equal and independent chance to be selected for the sample (Büyüköztürk et al., 2014). The criterion of grade is an important factor in determining the study group because the subject of "Seed" is included in detail in the "Plant Biology" unit within the 12th grade subjects of secondary education. The students studying in the 12th grade were preferred accordingly. The data of this study was obtained from the application carried out in the 2022-2023 academic year. The students forming the study group participated in the research on a voluntary basis. The study group consisted of 67% (n=274) female students and 33% (n=135) male students.

Research Instrument and Development Processes

In this study as a measurement tool a four-tier seed concept diagnostic test was developed. There are many studies on the use of multiple-choice tests in detecting misconceptions. Multi-tier tests first started as two-tier tests and were later developed and transformed into their current form. Two-tier concept diagnostic tests are based on the justification of a problem. In other words, they consists of two tiers: a question and the justification of the answer to this question. The disadvantage of two-tier tests is that it is not possible to determine whether incorrect learning is due to misconceptions or lack of knowledge. Therefore, three-tier tests were developed to eliminate the shortcomings of two-tier tests (Kıray et al., 2015). Three-tier tests include confidence tier which is additional to the two-tier tests. In the confidence tier, it is questioned to what extent the participant is sure of his/her answer. If the student gives an incorrect answer to either or both of the content or reason tiers and expresses that he/she is sure in the confidence tier, this indicates that the student has a misconception. Although three-tier tests are seen as more valid and reliable than two-tier tests, they are considered inadequate in determining whether the answer given in the confidence tier belongs to the content tier or the reason tier. For this reason, four-tier tests were developed and started to be administered (Taban & Kiray, 2022).

Four-tier tests include a confidence tier after both the reason and content tiers. First tier, the content tier, the participant's knowledge is questioned. Second tier, the confidence tier, the participant is asked to indicate his/her degree of confidence in the answer he/she gave in the content tier. Third tier, the reason

tier, the participant is asked to state the reason for his/her answer in the first tier. Finally, fourth tier, confidence tier, the participant is asked to indicate his/her degree of confidence in the answer he/she gave in the reason tier. The participants' scientific knowledge (SK), lack of knowledge (LoK), false negative (FN), false positive (FP) and misconception (MC) can be determined by scoring their answers to these four tiers (Kiray & Simsek, 2021).

In this study, firstly, the possible misconceptions of secondary school students about the concept of seed were tried to be determined. In this context, 2 open-ended questions were asked to 55 12th grade secondary school students. In determining these questions used in the pilot scheme, the results obtained in the literature review and the opinions of 2 faculty members who are experts in the field of biology education who works university were used. In the first question, students were asked to define the concept of seed. In the second question, students were asked to write 5 examples of seeds. The prepared questions were administered to 55 12th grade secondary school students without any time limit so that they could express themselves comfortably. Students' answers to these questions were analyzed by the researchers. When the analysis result of the study was reported, students' misconceptions about seed were determined. The high-frequency expressions in the answers and the misconceptions that students had about seeds in the literature review were used to organize the questions and items in the concept diagnostic test to be developed. Finally, an item pool was formed by including misconceptions determined based on the experiences of faculty members.

The questions in the prepared item pool were transformed into a test with 2 options, "True" and "False", in the 1st tier (content tier). In the 2nd tier (confidence tier) consists of the options "absolutely not sure", "not sure", "sure" and "absolutely sure". In the 3rd tier (reason tier), a multiple-choice test consisting of 7 options was administered to indicate the justification of the answer given in the 1st tier. The analyses obtained from the pilot study and the results obtained from the literature review were to taken into accounted in writing the options for each questions. In the multiple-choice test, an open-ended option was added to allow the student to write his/her opinions in case the justifications given in the 3rd tier were insufficient. The 4th tier similarly constitutes the confidence tier and consists of the options "absolutely not sure", "not sure", "sure" and "absolutely sure". The test was transformed into a four-tier form by adding confidence tiers after both content and reason tiers. The opinions of three faculty members who are experts in biology education were taken and the test prepared accordingly was given its final form. Finally, the four-tier test consisting of 14 questions was named "Seed Concept Diagnostic Test (SCDT)". Figure 1 is given as an example of the questions included in SCDT.

6.1. The statement "A seed is a reproductive cell",	
A ( ) True	B ( ) False
6.2. Of my answer, I'm	
Absolutely Not Sure ( ) Not sure ( ) Sure ( ) Absolutely Sure ( )	
6.3. BECAUSE, A ( ) The seed is a body cell. B ( ) The seed is a tissue. C ( ) The seed is not alive. D ( ) The plant develops from this cell. E ( ) This cell undergoes meiosis. F ( ) The seed is a gamete. G ( ) ………………………………………………………………………………………	
6.4. Of my answer, I'm Absolutely Not Sure ( ) Not sure ( ) Sure ( ) Absolutely Sure ( )	

Figure 1. *An example question from the four-tier seed concept diagnostic test*

Data Collection

The four-tier SCDT was administered to 409 12th grade students studying in 6 high schools in Konya in the 2022-2023 academic year. Before data collection, the participants were informed about four-tier diagnostic tests. The four-tier SCDT was distributed to the students and they were asked to answer it individually, without being influenced by each other. Students were asked to answer all parts of the questions and select only one option for each tier. Students were given approximately 56 minutes to answer the test. The data obtained as a result of the study were analysed by entering them into Excel and SPSS programs.

Data Analysis

After the pilot scheme, the final administration of the four-tier SCDT was carried out and the data obtained was entered into the Excel program. Possible decisions that can be determined by analysing the results obtained from the four-tier concept diagnostic test are has been given in Table 1 (Taban & Kiray, 2022). Excel program was used to analyze the study data according to these possible decisions.

Table 1. *Finalization of four-tier test decisions*

1st tier	2nd Tier	3rd Tier	4th Tier	Four-tier test decision
True	Sure	True	Sure	Scientific Knowledge
True	Sure	False	Sure	False Positive
False	Sure	True	Sure	False Negative
False	Sure	False	Sure	Misconception
True	Sure	True	Not sure	Lack of Knowledge 1
True	Not sure	True	Sure	Lack of Knowledge 2
True	Not sure	True	Not sure	Lack of Knowledge 3
True	Sure	False	Not sure	Lack of Knowledge 4
True	Not sure	False	Sure	Lack of Knowledge 5
True	Not sure	False	Not sure	Lack of Knowledge 6
False	Sure	True	Not sure	Lack of Knowledge 7
False	Not sure	True	Sure	Lack of Knowledge 8
False	Not sure	True	Not sure	Lack of Knowledge 9
False	Sure	False	Not sure	Lack of Knowledge 10
False	Not sure	False	Sure	Lack of Knowledge 11
False	Not sure	False	Not sure	Lack of Knowledge 12

The data were analyzed by scoring them separately as scientific knowledge, misconception, false negative and false positive. In the analysis, correct answers were coded as "1" and incorrect answers were coded as "0" in the 1st tier and 3rd tiers for all questions. In the 2nd and 4th tier, the options "absolutely sure" and "sure" were coded as "1", and the options "absolutely not sure" and "not sure" were coded as "0". While calculating scientific knowledge scores, the data in which the students answered correctly to all tiers of the question, that is, the data coded as 1-1-1-1 were analyzed. When calculating the false-positive scores (correct with incorrect reasons), the cases in which the students answered correctly in the content tier but answered incorrectly in the reason tier and were sure in both confidence tiers, that is, the codings as 1-1-0-1, were analyzed. While calculating false-negative scores (incorrect with correct reasons), the cases in which students answered incorrectly in the content tier but answered correctly in the reason tier and were sure in both confidence tiers, that is, the codings as 0-1-1-1, were analyzed. While calculating the misconception scores, the cases in which the students answered incorrectly in both the 1st and 3rd tiers, but were sure in both confidence tiers, that is, the codings as 0-1-0-1, were analyzed.

After coding the data obtained by administering the four-tier SCDT, frequencies and percentages were calculated. Firstly, students' scientific knowledge, false negative, false positive and misconceptions averages related to the three sub-dimensions of the 11-item test were calculated according to possible decisions given in Table 1. Then, each of the four tiers of the test was matched and the value in percent of 30 misconceptions were calculated. In the justifications given for different questions, there may be cases where the same misconception is also included in another question. In such cases, the total

misconception rate at all tiers determined to have the same misconception was calculated by dividing it by the number of questions. The list of misconceptions included in SCDT is presented in Table 2.

Table 2. *The list of misconceptions about seeds included in SCDT*

	List of misconceptions	
M1	Since the seed and flower have the same genetic structure, the seed plant and the flowering plant are the same.	1.1.b,1.2.c/d,1.3.a,1.4.c/d
M2	Since a seed plant is a flowering plant and a seedless plant is a non-flowering plant, a seed plant and a flowering plant are the same.	1.1.b,1.2.c/d,1.3.c,1.4.c/d
M3	Since the seed is inside the flower, the seed plant and the flowering plant are the same.	1.1.b,1.2.c/d,1.3.d,1.4.c/d
M4	The potato plant cannot reproduce by seed because it is planted in the soil as a tuber; a tuber is not a seed.	2.1.a,2.2.c/d,2.3.c,2.4.c/d
M5	Since the potato plant does not have flowers, it cannot reproduce by seed.	2.1.a,2.2.c/d,2.3.d,2.4.c/d
M6	Potato plant does not reproduce by seeds, it reproduces asexually.	2.1.a,2.2.c/d,2.3.e,2.4.c/d
M7	A zygote is formed by fertilization of the seed because the seed is a gamete and is capable of fertilization.	3.1.a,3.2.c/d,3.3.b,3.4.c/d 6.1.a,6.2.c/d,6.3.f,6.4.c/d
M8	Zygote is formed with the fertilization of the seed because in plants, seed means zygote.	3.1.a,3.2.c/d,3.3.c,3.4.c/d
M9	In a seed plant, both male and female individuals produce seeds because seeds are necessary for the plant to reproduce.	4.1.a,4.2.c/d,4.3.d,4.4.c/d
M10	In a seed plant, both male and female individuals produce seeds because each individual can produce seeds since it bears fruit.	4.1.a,4.2.c/d,4.3.f,4.4.c/d
M11	A pine cone is a seed because a pine tree grows from each cone.	5.1.a,5.2.c/d,5.3.b,5.4.c/d
M12	A pine cone is a seed because each pine cone carries pollen.	5.1.a,5.2.c/d,5.3.e,5.4.c/d
M13	A pine cone is a seed because pine is a gymnosperm plant.	5.1.a,5.2.c/d,5.3.f,5.4.c/d
M14	The seed is a reproductive cell because the plant develops from this cell.	6.1.a,6.2.c/d,6.3.d,6.4.c/d
M15	The seed is a reproductive cell because this cell undergoes meiosis.	6.1.a,6.2.c/d,6.3.e,6.4.c/d
M16	Oxygen is absolutely necessary for germination because oxygen is the molecule that initiates germination reactions.	7.1.b,7.2.c/d,7.3.c,7.4.c/d
M17	Oxygen is absolutely necessary for germination because oxygen is essential for gas exchange and photosynthesis.	7.1.b,7.2.c/d,7.3.d,7.4.c/d
M18	Oxygen is absolutely necessary for germination because no living thing can grow and develop in an oxygen-free environment.	7.1.b,7.2.c/d,7.3.f,7.4.c/d
M19	The tulip is not a seed plant because this plant reproduces by bulbs and does not produce seeds.	8.1.b,8.2.c/d,8.3.c,8.4.c/d
M20	The tulip is not a seed plant because it reproduces by spores, not seeds.	8.1.b,8.2.c/d,8.3.d,8.4.c/d
M21	The tulip is not a seed plant because it does not have a seed since it does not have a nucleus.	8.1.b,8.2.c/d,8.3.f,8.4.c/d
M22	Sunlight is needed for photosynthesis during seed germination because the seed cannot survive in a light-free environment.	9.1.a,9.2.c/d,9.3.a,9.4.c/d
M23	Sunlight is needed for photosynthesis during seed germination because the seed meets its nutritional needs from photosynthesis.	9.1.a,9.2.c/d,9.3.c,9.4.c/d
M24	Sunlight is needed for photosynthesis during seed germination because the Sun is the primary energy source of living things.	9.1.a,9.2.c/d,9.3.e,9.4.c/d
M25	A plant that reproduces vegetatively is a seedless plant because these plants have no sexual organs, and therefore no seeds.	10.1.a,10.2.c/d,10.3.b,10.4.c/d
M26	A plant that reproduces vegetatively is a seedless plant because it does not need seeds to continue its generation.	10.1.a,10.2.c/d,10.3.c,10.4.c/d
M27	A plant that reproduces vegetatively is a seedless plant because in these plants the vegetative organ and the seed are the same thing.	10.1.a,10.2.c/d,10.3.d,10.4.c/d
M28	A dormant seed is not alive because it cannot grow and develop.	11.1.b,11.2.c/d,11.3.a,11.4.c/d
M29	A dormant seed is not alive because it does not respire.	11.1.b,11.2.c/d,11.3.b,11.4.c/d
M30	A dormant seed is not alive because it is motionless.	11.1.b,11.2.c/d,11.3.f,11.4.c/d

Ethic

For this article obtained ethics clearance from Necmettin Erbakan University Social and Human Sciences Scientific Research Ethics Committee Presidency. (Decision no:2022/462)

RESULTS

In this section, data on the reliability and validity analysis of the four-tier SCDT were presented. In addition, the frequencies and values percent of scientific knowledge, lack of knowledge and misconceptions were presented on a question and factor basis.

Reliability analysis of the test

The reliability of these four-tier concept diagnosis tests, which are used to determine both students' scientific knowledge levels and misconceptions, is calculated with two different coefficients. These are the "Scientific Knowledge Reliability Coefficient" and the "Misconception Reliability Coefficient".

Scientific knowledge reliability coefficient (First type)

This coefficient is calculated according to the scientific knowledge score of the participants. As a result of the KR-20 analysis, the first type reliability coefficient of the four-tier SCDT was calculated as 0.743.

Misconception reliability coefficient (Second type)

This coefficient is calculated according to the participants' misconception score. As a result of the KR-20 analysis, the second type reliability coefficient of the four-tier SCDT was calculated as 0.610. The fact that this ratio is higher than 0.70 in multiple-choice tests indicates that the test is reliable (Tavakol & Dennick, 2011), but this ratio may be lower in concept diagnostic tests. In concept diagnostic tests, a KR-20 reliability coefficient of over 0.60 is considered sufficient for reliability (Eryilmaz, 2010; Kaltakci, 2012). Therefore, the misconception reliability coefficient calculated for the four-tier SCDT is at an acceptable level.

Validity analysis of the test

Four different methods are used for validity in four-tier concept diagnosis tests (Taban and Kiray, 2022).

Validity 1: Correlation between participants' correct answer scores and confidence scores

In four-tier tests, the correlation between participants' correct answer scores and confidence scores expresses the extent to which the items in the test measure the desired feature. Participants who score high on the test are expected to have a high level of reliability in the confidence levels. For this purpose, 3 different correlation coefficients were calculated to ensure the construct validity of SCDT. These are,

1) First Confidence Score; Correlation between 1st and 2nd tiers

2) Second Confidence Scores; Correlation between 3rd and 4th tiers

3) Both Confidence Scores; Correlation between 1st and 3rd tiers and 2nd and 4th tiers

Before calculating the correlation coefficient, it was checked whether the variables whose relationship would be investigated had a normal distribution in order to fulfil the assumptions. According to the results obtained, it was seen that the data did not provide normal distribution ($p < .05$), therefore Spearman's product-moment correlation, which is the nonparametric equivalent of Pearson correlation, was used. Analysis results are given in Table 3.

Table 3. *Correlations regarding the confidence levels of the test*

Confidence Scores	Spearman's rho	Sig. (2-tailed)	N
First Confidence Score	.137	.006	409
Second Confidence Scores	.241	.000	409
Both Confidence Scores	.244	.000	409

According to the results in Table 3, it is seen that the Spearman correlation coefficient in the first confidence score calculated according to the participants' answers to the 1st and 2nd tiers is 0.137. This coefficient shows that significant, positive and weak relationship between the participants' answers to 1st and 2nd tiers. It is seen that the Spearman correlation coefficient in the second confidence score calculated according to the participants' answers to 3rd and 4th tiers is 0.241. This coefficient shows that significant, positive and weak relationship between the participants' answers to 3rd and 4th tiers. The last, the Spearman correlation coefficient calculated between both confidence scores of the participants' is 0.244. This coefficient shows that significant, positive and weak relationship between both confidence scores of the participants'. Since four-tier concept diagnostic tests are very difficult, the correlation coefficients obtained between the tiers are generally calculated to be low. For this reason, a positive correlation between the 1st and 3rd tiers in four-tiers concept diagnosis tests is considered sufficient to meet the construct validity criterion of the test (Kaltakçı-Gürel et al., 2017; Kiray and Şimşek, 2021). Therefore, according to the results of the analyses, it was seen that the four-tier SCDT met the criterion of construct validity.

Validity 2: Factor analysis

Factor analysis was conducted at this stage to ensure the construct validity of the four-tier SCDT, developed to determine the misconceptions of 12th grade secondary school students about seeds. Before starting factor analysis, the suitability of the data for factor analysis should first be tested (Özdamar, 2017). In order to perform factor analysis, it is generally recommended that the measurement level of the variables be intermittent. In measurements coded with 0 and 1, that is, non-continuous measurements, programs that carry out analyses using multi-tier correlation coefficients can be preferred. In this study, since the answers of the students are coded as 0 and 1 and have two tiers, they are suitable for factor analysis using the program. There are many different opinions in the literature regarding the sample size for factor analysis. According to Kline (1994), the sample size should be twice the number of items. In this study, considering that there were 14 questions at the beginning and each question consisted of 4 tiers, it was seen that the sample size was sufficient for the minimum conditions. As another criterion for factor analysis, Kaiser-Meyer-Olkin (KMO) criterion, which takes a value between 0 and 1, was tested to check the sufficiency of the sample. According to the results obtained from the preliminary analysis, the KMO value of the four-tier SCDT was determined to be 0.698 at the beginning of the factor analysis, and it was found to be sufficient for factor analysis since it was greater than 0.60 (Field, 2005). Whether the answers to the four-tier SCDT items were independent or correlated with each other was evaluated with Bartlett's test of sphericity. The sphericity test result of $p \leq 0.05$ indicates significance (Field, 2005). The result of Bartlett's test of sphericity for the four-tier SCDT was found to be statistically significant (p=0.00) and it was determined that the test was suitable for factor analysis.

Explanatory factor analysis (EFA) was implemented to the data obtained from the four-tier SCDT. Initially, according to the EFA results, it was determined that the questions were grouped under 5 factors and the total variance explanation rate of these factors was 51.30%. Rotation (axis rotation) is implemented in test and scale development studies to facilitate the interpretation of the factor structure. In SPSS, varimax is mostly preferred because it is easy to interpret (Landau & Everitt, 2003; Thompson, 2004; Yong & Pierce, 2013). Therefore, Varimax, one of the vertical rotation techniques, was preferred in the study. After the rotation, the items were discarded due to the imbalance in factor loadings. The reasons for discarding these items were that they did not give significant loadings (minimum .40) to any factor (S2), although they gave significant loadings for two factors, the difference between them was less

than .10 and therefore they were considered as overlapping items (S8), and each factor did not include at least 3 items (S10). EFA was repeated after each item was discarded. In the last case, a 3-factor ideal structure was formed for the four-tier seed concept diagnostic test and the final KMO value was determined as 0.714. Bartlett's test of sphericity result was again found to be statistically significant (p=0.00). In consequence of EFA are given in Table 4.

Table 4. *Findings related to the factors determined as a result of EFA*

Factor	Eigenvalue	Variance Percentage	Percentage of Total Variance
1	2.314	21.039	21.039
2	1.214	11.037	32.076
3	1.084	9.858	41.934

When Table 4 is analysed, it is seen that the test has a 3-factor structure and the eigenvalues of the factors are 2.314, 1.214 and 1.084, respectively. The explanation rates of the factors for the total variance are as follows; Factor 1 21.039%, Factor 2 11.037%, Factor 3 9.858%. In general, the factors explain 41.934% of the total variance. The lower limit of the variance explained in multi-factor structures is accepted as 40% (Karagöz, 2016). Therefore, it was seen that the total variance explanation rate was sufficient and met the necessary conditions. The question contents were analysed and a name was given for each factor covering all the questions in the factor. Factor 1 was named as "Physiology of Seed", Factor 2 as "Seed and Reproduction Relationship" and Factor 3 as "Seed and Classification Relationship".

According to the results obtained, the four-tier SCDT developed consists of 11 questions in the final case. Findings regarding the factor loadings of the questions are given in Table 5.

Table 5. *Factor loading values of SCDT*

Question No	Factors*		
	Factor 1 Physiology of Seed	Factor 2 Seed and Reproduction Relationship	Factor 3 Seed and Classification Relationship
Q9	.661		
Q7	.609		
Q3	.562		
Q11	.521		
Q6	.512		
Q2		.741	
Q8		.487	
Q5		.455	
Q1			.759
Q10			.592
Q4			.450

*: Values below .40 are not shown in the table.

According to the results obtained from the factor analysis, Factor 1 includes 5 questions (factor loading values from 0.512 to 0.661), Factor 2 includes 3 questions (factor loading values from 0.455 to 0.741), and Factor 3 includes 3 questions (factor loading values from 0.450 to 0.759). When factor loading values are evaluated (Bursal, 2017),

• For Factor 1, 1 question contributes at a very good level (Q9), 2 questions at a good level (Q3, Q7) and 2 questions at a medium level (Q6, Q11).

• For Factor 2, 1 question contributes at an excellent level (Q2) and 2 questions contribute at a medium level (Q5, Q8).

• For Factor 3, 1 question contributes at an excellent level (Q1), 1 question at a good level (Q10) and 1 question at a medium level (Q4).

Validity 3: False negative and false positive

The averages of participants' scientific knowledge, lack of knowledge, false negative, false positive and misconceptions can be obtained with four-tier concept diagnostic tests. False positive show up when participants give a correct answer to a question in the concept diagnostic test in the content tier and give an incorrect answer in the reason tier, while expressing that they are sure of their answers in both confidence tiers. False negative show up when the participants' give an incorrect answer to a question in the concept diagnostic test in the content tier and give a correct answer in the reason tier, while expressing that they are sure of their answers in both confidence tiers. False negative and false positive averages the concept diagnostic test are used as a criterion for the validity of concept diagnostic tests. According to Hestenes and Halloun (1995), false negative and false positive averages should be below 10% for concept diagnostic tests to be valid. In the analyses conducted after the administration of the four-tier SCDT developed in this study to 12th grade secondary school students, it was determined that the average of positive false was 8.85% and the average of false negative was 1.51%. Since both values were below 10%, they were found to be sufficient for validity.

Validity 4: Expert opinion

The expert opinions of two lecturers who are experts in biology education were used to determine the questions used in the pilot scheme. During the preparation of the questions and finalization of the test, expert opinions were received from 3 different lecturers who are experts in biology education. The test was finalized with the feedback received from expert opinions. As a result of the analyses, it was seen that the four-tier SCDT was a reliable and valid.

Percentages of participants' scientific knowledge, lack of knowledge and misconceptions based on test items and subscales

The percentages of scientific knowledge, lack of knowledge and misconceptions were calculated based on factors and test items of the four-tier SCDT and were given in Table 6.

Table 6. *Percentages of participants' scientific knowledge, lack of knowledge and misconceptions*

Factor	Test Items	Scientific Knowledge	Lack of Knowledge	Misconception
Factor 1 Physiology of the Seed	Q9	%7.33	%58.92	%27.63
	Q7	%10.27	%63.08	%16.38
	Q3	%3.18	%64.79	%10.51
	Q11	%17.11	%70.66	%4.16
	Q6	%3.42	%66.99	%20.05
	Average	**%8.26**	**%64.89**	**%15.75**
Factor 2 Seed and Reproduction Relationship	Q2	%5.87	%55.99	%26.65
	Q8	%5.62	%66.75	%13.45
	Q5	%5.13	%65.53	%16.63
	Average	**%5.54**	**%62.76**	**%18.91**
Factor 3 Seed and Classification Relationship	Q1	%12.96	%70.42	%8.56
	Q10	%11.00	%70.42	%13.45
	Q4	%10.27	%71.64	%11.25
	Average	**%11.41**	**%70.83**	**%11.09**
Overall Average		**%8.40**	**%66.16**	**%15.25**

When Table 6 was analysed, it was seen that the average percentage of participants' scientific knowledge for the questions in the first factor was 8.26%, the percentage of lack of knowledge was 64.89% and the percentage of misconceptions was 15.75%. For the questions in the second factor, the average percentage of participants' scientific knowledge was 5.54%, the percentage of lack of knowledge was 62.76% and the percentage of misconceptions was 18.91%. Finally, for the questions in the third factor, the participants' average percentage of scientific knowledge was 11.41%, the percentage of lack of knowledge was 70.83% and the percentage of misconceptions was 11.09%. When evaluated on a factor

basis, it was determined that the highest average of scientific knowledge was in the third factor. The highest average of lack of knowledge was in the third factor and the highest average of misconceptions was in the second factor. When evaluated in general, it was seen that the average percentage of scientific knowledge was 8.40%, the percentage of lack of knowledge was 66.16% and the percentage of misconceptions was 15.25%. This showed that approximately one fourth of the 12th grade secondary school students had misconceptions about seeds.

All validity and reliability analyses were repeated after each question and the values presented in all analysis tables were given for the final data. For SCDT, all analyses of which were completed, the question numbers were revised and the questions were listed homogeneously. New item numbers were used in all tables where analysis results were presented in order to ensure standardisation and clarity. In the last case, the question numbers included in factors are as follows; Factor 1, Q1, Q3, Q6, Q7, Q9, Q11; Factor 2, Q2, Q5, Q8; Factor 3, Q1, Q4, Q10.

Findings regarding misconceptions

The misconception rates given in Table 6 were obtained from each question separately and combined under factors and given as averages. However, at this stage, the total rates of misconceptions were calculated for each of the misconceptions about the seed, which were created by combining some questions and given in Table 2. In this context, the percentages showing how many 12th grade secondary school students have the 30 misconceptions that showing up during the development of SCDT within the scope of the study are given in Table 7. In Figure 2, the percentage values of these misconceptions are shown graphically.

Table 7. *Percentages of misconceptions in SCDT*

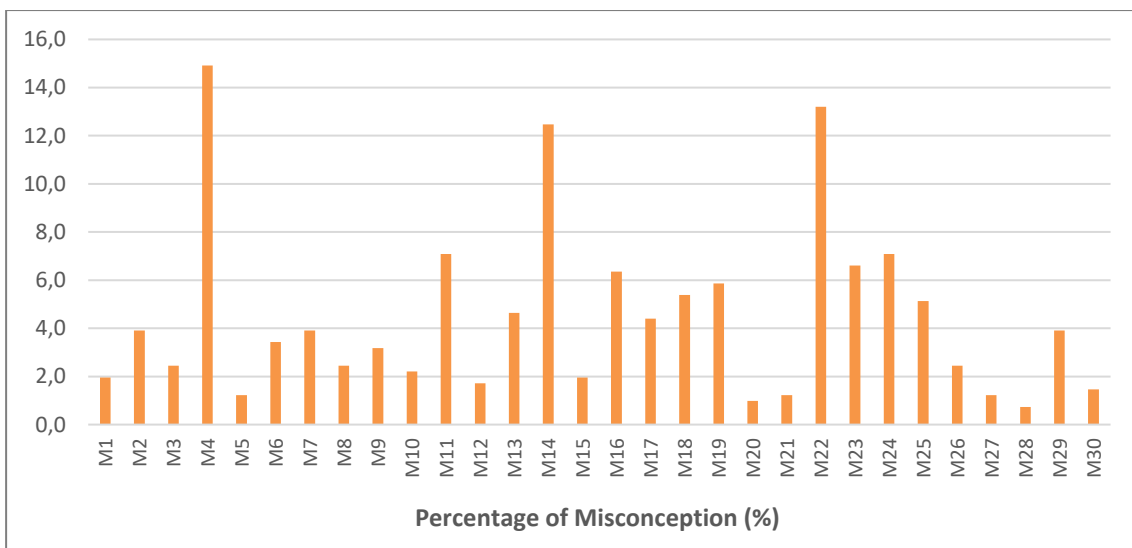| *N*=409	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Mean	8	16	10	61	5	14	16	10	13	9
%	2.0	3.9	2.4	14.9	1.2	3.4	3.9	2.4	3.2	2.2
N=409	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20
Mean	29	7	19	51	8	26	18	22	24	4
%	7.1	1.7	4.6	12.5	2.0	6.4	4.4	5.4	5.9	1.0
N=409	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30
Mean	5	54	27	29	21	10	5	3	16	6
%	1.2	13.2	6.6	7.1	5.1	2.4	1.2	0.7	3.9	1.5

Figure 2. *Percentages of misconceptions of 12th grade secondary school students*

When Table 7 and Figure 2 were analysed, it was seen that more than 10% of 12th grade secondary school students had 3 misconceptions. These misconceptions included sexual and asexual reproduction of seed and photosynthesis in seed germination. These misconceptions are as follows:

• M4 (14.9%). The potato plant cannot reproduce by seeds because this plant is planted in the soil as a tuber; the tuber is not a seed.

• M14 (12.5%). The seed is a reproductive cell because the plant develops from this cell.

• M22 (13.2%). Sunlight is needed for photosynthesis during seed germination because the seed cannot survive in a light-free environment.

DISCUSSION

In this research, a four-tier SCDT was developed to determine 12th grade secondary school students' misconceptions about seeds. Factor-based values of students' scientific knowledge, lack of knowledge and misconception percentages about seed concept were calculated. As a result of these analyses, it was determined that the highest scientific knowledge average was under the "Seed and Classification Relationship" factor. It was determined that the lowest scientific knowledge average of the students' was under the " Seed and Reproduction Relationship" factor. When evaluated questions, it was understood that the highest scientific knowledge average was in the 11th question, and the lowest scientific knowledge average was in the 3rd question. It was determined that the highest lack of knowledge average was under the "Seed and Classification Relationship" factor. It was determined that the lowest lack of knowledge average was under the "Seed and Reproduction Relationship" factor. When evaluated on the question basis, it was seen that the highest lack of knowledge average was in the 4th question, and the lowest lack of knowledge average was in the 2nd question. It was determined that the students' highest misconception average was under the "Seed and Reproduction Relationship" factor, and that the lowest misconception average was under the "Seed and Classification Relationship" factor. When evaluated on the question basis, it was seen that the highest misconception average was in the 9th question, and the lowest misconception average was in the 11th question.

30 different misconceptions were found out with the developed four-tier SCDT. The results of this research it indicates that approximately one quarter the 12th grade secondary school students had misconceptions about seed, and the rate of three of the misconceptions was over 10%. It was observed that these misconceptions included the sexual and asexual reproduction of seeds and photosynthesis in seed germination. "Potato plants cannot reproduce by seeds because this plant is planted in the soil as a tube; a tuber is not a seed" (M4) was the most common misconception among students (14.9%). M4 is a misconception that appears only in the 2nd question (Table 2). The 2nd question is under the 2nd factor (Seed and Reproduction Relationship). It was understood that the students' highest misconception average was in the second factor. The average percentage of misconceptions in this category was 18.91%.

Another misconception frequently encountered by students (13.2%) was "Sunlight is needed for photosynthesis during seed germination because the seed cannot continue its vitality in a light-free environment" (M22). M22 is a misconception that only appears in the 9th question. The 9th question is under the 1st factor (Physiology of the Seed). When the factors were evaluated among themselves, it was understood that the average of the highest number of misconceptions was in the first factor after the second factor. The average percentage of misconceptions in this category is 15.75%. Additively M22, misconception "The seed is a reproductive cell because the plant develops from this cell" (M14) is also under this factor (12.5%). M14 is a misconception that only appears in the 6th question.

It is known that the subject of photosynthesis is a difficult subject for students (Marmaroti & Galanopoulou, 2006). Svandova (2014) determined, with the two-tier concept diagnostic test he developed for photosynthesis and plant respiration, that 6th, 7th, 8th and 9th grade students had many misconceptions such as plant respiration and photosynthesis are the same processes, photosynthesis

occurs during the day and respiration occurs at night. Similarly, Uzunhasanoğlu et al. (2020) determined, with the two-tier concept diagnostic test they developed for general biology topics, that prospective biology teachers had the misconception that plants photosynthesize during the day and respire at night. In their study with a two-tier test on the subject of photosynthesis, Atchia et al. (2022) found that Secondary school Cambridge A level biology students had the misconception that photosynthesis occurs in the presence of light energy. With the two-tier concept diagnostic test he developed for the subject of photosynthesis, Urey (2018) determined that prospective science teachers had the misconception plants photosynthesise during the day and respire just at night. With the two-tier concept diagnostic test he developed for the growth and development of flowering plants, Lin (2004) found that 10th and 11th grade students had misconceptions such as "Seeds need sunlight during photosynthesis to produce energy for germination." In their study, Haslam and Treagust (1987) developed a two-tier test for secondary school students about photosynthesis and respiration in plants. They determined that students had important misconceptions like a "If there is no light energy at night, photosynthesis stops while respiration continues." regarding respiration and photosynthesis in plants. As can be seen from all these studies conducted by Svandova (2014), Uzunhasanoğlu et al. (2020), Atchia et al. (2022), Urey (2018), Lin (2004) and Haslam and Treagust (1987), even though they are at different age groups and grade levels, students have an important misconception that sunlight is absolutely necessary for photosynthesis. The misconception coded M22, which was determined to be held by the 12th grade secondary school students with the four-tier SCDT developed for the concept of seed in this study, that the seed cannot photosynthesize in the light-free environment, is similar to the results of all these studies. Considering the study of Haslam and Treagust (1987), which is the oldest of these studies, it is seen that students have still had the same misconceptions for 35 years, and therefore it is thought that no elimination or prevention studies have been carried out for these misconceptions. Teachers play the most important role here. They should know the literature well and prepare the lesson plan by knowing the existing misconceptions and use different teaching methods and techniques when necessary to prevent possible misconceptions.

Sesli and Kara (2012) determined, with the two-tier concept diagnostic test they developed for the subject of cell division and reproduction, that high school students had misconceptions such as "Plants cannot reproduce asexually because they have no gender", "Plants reproduce asexually while animals reproduce asexually", "Plants cannot reproduce asexually because they cannot move and develop reproductive organs". Similarly, with the two-tier concept diagnostic test they developed for the subject of cell division and reproduction, Arslan et al. (2015) determined that 10th grade students had misconceptions such as "Non-flowering plants reproduce by asexual reproduction and flowering plants reproduce by sexual reproduction" and "Plants reproduce only by asexual reproduction". The misconceptions coded M4 and M14 that the potato does not have a seed because it reproduces by asexual reproduction and that the seed is a reproductive cell because the plant develops from this cell, which were determined to be held by 12th grade secondary school Students with the four-tier SCDT developed for the concept of seed in this study, are similar to the results of this study. Therefore, it was observed that students generally had misconceptions about reproduction in seeds and could not fully understand sexual and asexual reproduction in plants.

When the 9th, 10th, 11th and 12th grade biology curriculum is examined, the distinction between seedless and seed plants in the plant kingdom is mentioned in the "World of Living Things" unit in the 9th grade curriculum. In the 10th grade curriculum, the concept of seed is included within the subject of sexual reproduction in plants in the "Cell Divisions" unit. In the 12th grade curriculum, the concept of seed is covered in detail within the subject of reproduction in plants in the "Plant Biology" unit. Therefore, students are required to have basic knowledge on subjects involving the concept of seed. According to the analysis results of this study, it was seen that the percentage of misconceptions of 12th grade students about seed was quite high. This result revealed the importance of transforming the knowledge acquired by students until 12th grade into permanent and meaningful learning in their mental structures and preventing possible misconceptions.

The four-tier SCDT, which was developed within the scope of this research and whose validity and reliability analyses were performed, aims to determine the misconceptions of 12th grade secondary school students about the concept of seed. It is thought that this test will contribute to the literature and will be used by teachers and researchers in detecting misconceptions about seeds on different sample groups, and therefore will be a pioneer in similar studies. In addition, various studies should be clearing misconceptions determined in this research.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Author contributions

This article was produced from the first author's master's thesis. The second author was the second author's master's thesis advisor and contributed to all processes of the research. In addition, the third author made great contributions in analysing the data and reporting and discussing the results with the support of the literature. For this reason, this study, in which all authors worked together, was organized with three authors. All authors contributed to the concept and design of the study. All authors read and approved the final manuscript.

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The Mediating Role of Positive Rumination and Negative Rumination in The Relationship between Intolerance of Uncertainty and Interpersonal Problem Solving[1]

Ayşe Demirci[1] (iD) **Coşkun Arslan[2]** (iD)

[1] Ph.D., Psychological Consultant, Ministry of National Education, Ankara, Türkiye
aysedemirciiii@gmail.com

[2] Prof. Dr., Necmettin Erbakan University, Department of Guidance and Psychological Counselling, Konya, Türkiye
coskunarslan@erbakan.edu.tr

Article Info	ABSTRACT
	The mediating roles of positive rumination and negative rumination in the relationship between intolerance of uncertainty and interpersonal problem solving were examined. Data were collected from the participants (n=983) using the Interpersonal Problem-Solving Scale, Positive and Negative Rumination Scale, and Intolerance of Uncertainty Scale. The indirect effect of intolerance of uncertainty on approaching problems in a negative way, constructive problem solving, insistent-persevering approach through the mediation of positive rumination was significant. The indirect effect of intolerance of uncertainty on lack of self-confidence and unwilling to take responsibility through the mediation of positive rumination was not significant. The indirect effect of intolerance of uncertainty on approaching problems in a negative way, lack of self-confidence, and unwilling to take responsibility through the mediation of negative rumination was significant. The indirect effect of intolerance of uncertainty on constructive problem solving and insistent persevering approach through the mediation of negative rumination was not significant. The findings of the study were discussed within the framework of the relevant literature and recommendations were made for future studies.

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[1] This article is derived from the PhD thesis of the first author under the consultancy of the second author. In addition, this study was presented as an oral presentation at the 24th International Psychological Counselling and Guidance Congress (November 2023).

INTRODUCTION

Interpersonal problems are situations where at least one of the interacting individuals notices the difference between the ideal interaction and the existing one and experiences tension, and the steps he takes to eliminate the situation are unsuccessful due to the obstacles he encounters (Öğülmüş, 2006). When students transition from high school education to university, they enter into is a more populous environment with more interpersonal relations and also are in contact with their peers coming from different regions for many university students (Santrock, 2011). During this period, many university students are included in different social environments by leaving their families and run up against situations that require numerous interpersonal interactions such as making new friends and managing social relations. In the literature, numerous studies have been conducted on the problems encountered by university (Aluede et al., 2006; Donat et al., 2019; Erkan et al., 2012; Kacur & Atak, 2011; Şahin et al., 2009; Schweitzer, 1996; Topkaya & Meydan, 2013.). There are also studies investigating the variables related to interpersonal problem solving / social problem (D'Zurilla et al., 1998; Polat, 2020; Topal, 2011; Arslan et al., 2012; Arslan, 2010; Koç & Arslan, 2017; Hasegawa et al., 2015; Hasegawa et al., 2016). When the literature was reviewed, it was found that approaching problems in a negative way was positively associated with depression, suicide risk, and hopelessness (D'Zurilla et al., 1998). Moreover, another study reported that approaching problems in a negative way, lack of self-confidence, and unwilling to take responsibility, which are the subscales of interpersonal problem solving, were positively correlated with depression, anxiety, and stress (Polat, 2020). Therefore, determining the factors affecting interpersonal problem solving is important in terms of preventing negative approaches to interpersonal problem solving and guiding the development of intervention programs to develop constructive problem-solving skills.

Intolerance of Uncertainty and Problem Solving

Intolerance of uncertainty is defined as one's tendency to see an unfavorable event as unacceptable, and when considering that daily life is full of difficult situations, individuals who are intolerant to uncertainty can perceive many unacceptable and disturbing events in a single day (Dugas et al., 2001). Freeston et al., (1994) stated that intolerance of uncertainty interferes the problems by causing impulsive behaviors that reduce uncertainty but do not solve problems, creating dysfunctional emotional states, preventing problem-focused behavior, and requiring a high level of evidence before making a decision. Individuals who have a high level of intolerance of uncertainty might feel paralyzed due to the uncertainty of life and become inactive while facing the difficulties during daily life and might be highly anxious. Afterwards, these individuals may experience many difficulties they encounter in daily life by making impulsive decisions. While this impulsivity temporarily reduces the hassle they experience, it negatively reinforces impetuous decision-making and poor problem-solving strategies, resulting an ongoing cycle of anxiety (Zlomke & Jeter, 2014). In the literature, there are not only studies (Norr et al., 2013; Dugas et al., 2005; Patrick, 2016) reporting that the intolerance of uncertainty is positively correlated with worry but also the studies supporting the correlation between intolerance of uncertainty and anxiety (Patrick 2016; Tantan-Ulu & Yaka, 2020). Furthermore, while numerous studies have analyzed the relationship between worry and different aspects of problem-solving have been (Davey, 1994; Davey et al., 1996; Dugas et al., 1995; Clarke et al., 2017; Barahmand, 2010; Parkinson & Creswell, 2011; Wilson & Hughes, 2011; Belzer et al., 2002), there are few studies on the correlation between intolerance of uncertainty and various aspects of problem-solving. When international literature is reviewed, several studies revealing the correlation between approaching problems in a negative way dimension of problem- solving and intolerance of uncertainty have been encountered. When the studies are examined, it has been observed that intolerance of uncertainty is positively associated with approaching problems in a negative way (Robichaud et al., 2003; Bottesi et al., 2016; Fergus & Wu, 2010; Fergus & Wu, 2011; Clarke et al., 2017).

Intolerance of Uncertainty and Rumination

Ward et al. (2003) mention that as well as the harms of rumination on thinking and problem-solving, self-focused rumination increases uncertainty and thus prevents instrumental behaviors and might result in more rumination and behavioral inaction. In addition, it is stated in the literature that individuals may engage in rumination when they feel uncertainty (Liao & Wei, 2011), there are also studies reporting that intolerance of uncertainty is positively correlated with rumination (Satıcı et al., 2020; Yook et al., 2010).

Rumination and Problem Solving

Among the initial studies on rumination, Nolen-Hoeksema (1991) determined that individuals are rethinking about their depressive symptoms and their possible causes and consequences. Yang et al., (2018), on the other hand, pointed out that the studies on rumination are on either negative affect (Nolen-Hoeksema, 1991) or positive emotional states (Feldman et al., 2008) and defined rumination as repeated thoughts about positive and negative affect which function positively or negatively in terms of psychological adjustment (Yang et al., 2018). Hasegawa et al., (2015) state that as rumination is a cognitive-behavioral set that aims to avoid negative environmental and special events, and due to the abstract and evaluative nature of depressive rumination, it may disrupt or deteriorate social problem-solving. Moreover, the authors stated that the abstract nature of rumination might explain the negative relationship between social problem-solving and rumination, and poor problem-solving might prevent individuals from solving their own problems and lead to disruption in their environment and continuous rumination about their problems. In their study, Ward et al., (2003) examined the relationship between rumination and the possibility of initiating action-oriented problem solving and found that individuals who ruminated were less satisfied with the solution of the problems and had less confidence and less commitment to these solutions. In addition, the authors suggest that rumination is destructive in developing instrumental behaviors such as applying solutions to problems. When the national literature is examined, one study examining the relationship between rumination and problem-solving, which is a broader concept than interpersonal problem-solving (Neziroğlu, 2010), it was concluded that as the university students' scores on the brooding subscale of the rumination scale increased, their problem-solving skills were less sufficient, and as their scores on the reflection subscale increased, their problem-solving skills increased.

The Present Study

When the literature is analyzed, it is seen that individuals may engage in rumination when they feel uncertain (Liao & Wei, 2011), negative thinking caused by rumination may also occur in the problem-solving processes, resulting in negative problem orientation, and these negative comments may lead to an avoidance style that prevents individuals from solving their problems and this problem-solving style will work to create continuous rumination about one's problems (Hasegawa et al., 2018). In this context, in line with the above-mentioned information, it is aimed to examine the related model considering that intolerance of uncertainty may be associated with interpersonal problem solving and rumination has a mediation effect in this relationship. No study was encountered in the literature examining the relationship between the forms of rumination (positive and negative rumination) and analyzing the interpersonal problem-solving as discussed in this study. Additionally, there has been no study addressing the relationship between university students' interpersonal problem-solving approaches and behaviors and intolerance of uncertainty and rumination together. It is thought that identifying the mediating role of rumination in the relationship between intolerance of uncertainty and interpersonal problem-solving behaviors and approaches would make considerable contributions to the field. It is also important to search for this pattern of relationship among university students who have to cope with many interpersonal problems related to university life.
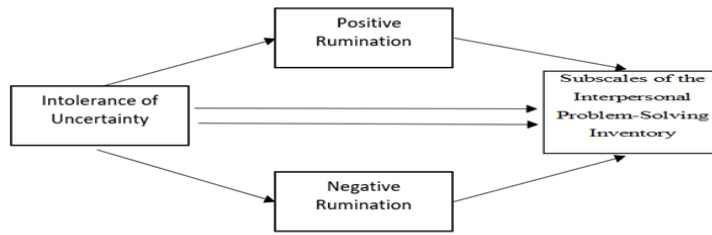
Figure 1. *Hypothesis Model for Interpersonal Problem Solving*

In this study, answers were sought to the following research questions to test the proposed model shown in Fig. 1:

1. Does intolerance of uncertainty significantly predict the positive rumination subscale of the Positive and Negative Rumination Scale?
2. Does intolerance of uncertainty significantly predict the negative rumination subscale of the Positive and Negative Rumination Scale?
3. Does the positive rumination subscale of the Positive and Negative Rumination Scale, significantly predict the subscales of the Interpersonal Problem-Solving Inventory (approaching problems in a negative way, constructive problem solving, lack of self-confidence, unwilling to take responsibility, insistent persevering approach)?
4. Does the negative rumination subscale of the Positive and Negative Rumination Scale significantly predict the subscales of the Interpersonal Problem-Solving Inventory (approaching problems in a negative way, constructive problem solving, lack of self-confidence, unwilling to take responsibility, insistent persevering approach)?
5. Does intolerance of uncertainty significantly predict the subscales of the Interpersonal Problem-Solving Inventory (approaching problems in a negative way, constructive problem solving, lack of self-confidence, unwilling to take responsibility, insistent persevering approach)?
6. Does intolerance of uncertainty significantly predict the subscales of the Interpersonal Problem-Solving Inventory (approaching problems in a negative way, constructive problem solving, lack of self-confidence, unwilling to take responsibility, insistent persevering approach) through positive rumination subscale of the Positive and Negative Rumination Scale?
7. Does intolerance of uncertainty significantly predict the subscales of the Interpersonal Problem-Solving Inventory (approaching problems in a negative way, constructive problem solving, lack of self-confidence, unwilling to take responsibility, insistent persevering approach) through negative rumination subscale of the Positive and Negative Rumination Scale?

METHOD

In this section, information about the research design, participants, instruments and data analysis are presented.

Research Design

This study, which tested whether or not positive and negative rumination has a mediation effect on the relationship between university students' intolerance of uncertainty and their interpersonal problem-solving, was conducted in the correlation model. The purpose of correlation models is to determine the existence and level of alteration jointly between two or more variables (Karasar, 2014).

Participants

The sample group consisted of 983 university students. 708 (72%) were female and 275 (28%) were male. They studied at various universities in Turkey during the 2021-2022 academic year. The ages of the participants ranged from 17 to 33, with an average age of 20.40 and were calculated with a standard deviation

of 1.91. The distribution of the sample group also according to the university year was that 255 (25.9%) were attending the preparatory class, 214 (21.8%) were the first-year students, 198 (20.1%) were the second-year students, 227 (23.1%) were the third-year students, and 88(9%) were the fourth-year students and 1 student (0.1%) was a fifth-year student. Informed consent was obtained from all the participants.

Instruments

The data for this research were collected through the "Interpersonal Problem Solving Inventory", "Intolerance of Uncertainty Scale", and "Positive and Negative Rumination Scale" detailed below.

Interpersonal Problem-Solving Inventory (IPSI)

The Interpersonal Problem-Solving Inventory, developed by Çam & Tümkaya (2007), consists of 50 items (e.g. I feel helpless when I have a problem) and five subscales. This inventory is a five-point Likert (1-not at all suitable, 2- somewhat suitable, 3- suitable, 4-mostly suitable, 5-completely suitable) type scale. A high score calculated for the subscales of the inventory signifies a high level of interpersonal problem-solving characteristic. As a result of the factor analysis performed on the inventory, five factors (Approaching Problems in a Negative Way (APNW), Constructive Problem Solving (CPS), Lack of Self-Confidence (LSC), Unwilling to Take Responsibility (UTR), and Insistent-Persevering Approach (IPS)) were obtained, explaining 38.38% of the variance that was related to problem solving. The correlation values calculated with the total scores of the subscales also vary between .22 and .74. Cronbach's alpha coefficients for the subscales of the inventory were determined as APNW=.91, CPS =.88, LSC =.67, UTR=.74, and IPA=.70.

Cronbach's alpha internal consistency coefficient for this study was calculated as .91 for approaching problems in a negative way, .89 for constructive problem solving, .77 for lack of self-confidence, .74 for unwilling to take responsibility, and .73 for insistent-persevering approach.

Intolerance of Uncertainty Scale (IUS-12)

Intolerance of Uncertainty Scale was developed by Carleton et al., (2007) and its Turkish adaptation study was conducted by Sarıçam et al., (2014). The scale, which consists of 12 items (e.g. Uncertainty prevents me from living life to the fullest.), is a 5-point (1- Not at all suitable for me, 2- Slightly suitable for me, 3- Somewhat suitable for me, 4- Very suitable for me, and 5- Completely suitable for me) Likert type scale. The fit index values of the scale were calculated as (χ2= 147.20, sd= 48, RMSEA=.073, CFI=.95, IFI=.95, GFI=.94, and SRMR=.046). The Cronbach's alpha internal consistency coefficient is .88 for the overall scale. In this study, Cronbach's alpha internal consistency coefficient was calculated as .87 for the overall scale.

Positive and Negative Rumination Scale (PNRS)

The Positive and Negative Rumination Scale was developed by Yang et al. (2018) and adapted to Turkish by Demirci & Arslan (2022). The participants were asked how often they think like the expressions in the items (e.g. Think "I will not be always so lucky/ Think "I am a useless person") when they experience positive emotions such as happiness, excitement or enthusiasm or negative emotions such as sadness, anger or embarrassment. They were asked to rate their responses between 1 (never) point to 4 (always) points. As a result of the first-level confirmatory factor analysis applied to the 23-item scale, it was determined that the five-factor structure including enjoy happiness, suppress happiness, negative attribution, positive coping, and self-deny showed an adequate fit (χ2/df=2.313, NFI=.92, NNFI=. 95, IFI=.95, RFI=.91, CFI=.95, GFI=.87, RMR=.054, RMSEA=.065, SRMR=.067). In addition, in order to examine the factor structure of the Positive and Negative Rumination Scale, the second- level confirmatory factor analysis was applied for 2-factor second-level model in which enjoy happiness and positive coping were loaded to positive rumination (PR) and suppress happiness, negative attribution and self-deny were loaded to negative rumination (NR). As a result of the analysis, it was observed that adequate adaptation of the 2-factor second-level structure (χ2/df=2,375, NFI=.92, NNFI=.94, IFI=.95, RFI=.91, CFI=.95, GFI=.87, AGFI=.84, RMR=.058, RMSEA=.067, SRMR=.072) and the original factor structure of the scale were consistent with the factor structure of its Turkish version. For the subscales of the scale, Cronbach's alpha internal consistency reliability coefficient

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varies between .65 and .88 and the test-retest correlation varies between .61 and .74.

In this study, Cronbach's alpha was calculated as .81 for the positive rumination subscale and .87 for the negative rumination subscale.

Data Analysis

Write down the data analysis of your research without changing the format. Write down the data analysis of your research without changing the format. In the study, null items were determined with the frequencies and the missing value analysis was done. Mahalanobis distances were calculated to determine the extreme values in the preliminary analysis. Then, it was examined whether or not the data were normally distributed. Skewness and kurtosis values were calculated to examine the normality distribution. Then, the Pearson Correlation Coefficient was calculated to determine the correlation between the variables. All these analyses were performed using the IBM SPSS Statistics 26.0 software. Then, the mediation model proposed in the study was examined. Mediation analysis is frequently used to test hypotheses examining causal effects. Here, the mediator variable helps researchers better understand the relationship between independent and dependent variables (Sürücü et al., 2021). Regression analysis based on the bootstrap method was performed to test whether or not there is a mediating role. SPSS Process macro 4.1 was used to analyze the models created to examine the mediation effects of positive and negative rumination in the intolerance of uncertainty and interpersonal problem-solving relationship (Hayes, 2022). In the analysis, 5000 resampling options were preferred with the bootstrap technique. As a result of the bootstrap analysis, it was determined whether or not there was a mediation effect by examining the values, at the confidence interval of 95%. Accordingly, if the lower and upper confidence interval values corresponding to the indirect effect (a.b) value do not cover the zero value, the indirect effect is considered as significant and it is determined that there is a mediation effect. If the confidence interval includes 0 (zero), it is understood that a.b value is not significant and has no mediation effect (Gürbüz, 2021; Zhao et al., 2010). According to the modern approach, if a.b value is significant as a result of the bootstrap test, the mediation model is considered as validated and no other test is needed (Gürbüz & Bayık, 2018). The analysis of mediation models was carried out separately for the subscales of approaching problems in a negative way, constructive problem solving, lack of self-confidence, unwilling to take responsibility and insistent-persevering approach by using Model 4 in the SPSS PROCESS macro.

RESULTS

To determine the extreme values, Mahalanobis distances were calculated and 8 extreme values of p<.001 were removed from the data set. Then, the normal distributions of the variables were evaluated with skewness and kurtosis values. Considering the skewness and kurtosis values of the variables in terms of normal distribution evaluation angle, it was observed that the skewness values varied between -.180 and .877; and the kurtosis values varied between -.287 and .628. George & Mallery (2016) state that ±1 value is excellent for skewness and kurtosis values, depending on the application and values between ±2 are acceptable in most cases. Therefore, it was concluded that the dataset did not have a distributed skewness and kurtosis values and showed a normal distribution. Afterwards, Pearson Correlation Analysis was used for the bilateral relations between the variables. Table 1 shows the correlations between the variables.

Table 1. *Descriptive statistics and relations between variables*

	APNW	CPS	LSC	UTR	IPS	PR	NR	IU
APNW	1							
CPS	-.01	1						
LSC	.56**	-.03	1					
UTR	.42**	-.13**	.54**	1				
IPS	.13**	.61**	.03	-.06*	1			
PR	-.22**	.43**	-.17**	-.12**	.33**	1		
NR	.61**	-.10**	.44**	.35**	-.02	-.30**	1	
IU	.54**	.07*	.28**	.34**	.14**	-.11**	.51**	1
Mean	44.46	57.38	14.51	12.80	21.40	29.74	33.43	40.78
Sd	13.71	10.29	5.05	4.41	4.36	5.32	8.18	9.59

Note. **p<.01,*p<.05; APNW approaching problems in a negative way; CPS constructive problem solving; LSC lack of self-confidence; UTR unwilling to take responsibility; IPS insistent-persevering approach; PR positive rumination; NR negative rumination; IU intolerance of uncertainty

Findings Regarding the Mediation Model

When Fig. 2 is examined, it was observed that intolerance of uncertainty affected positive rumination significantly and negatively (b=-.060, 95% CI [-.0948, -.0257], t=-3.418, p<.01). Furthermore, intolerance of uncertainty affected negative rumination significantly and positively (b=.434, 95% CI [.3879,.4800], t=18.497, p<.001).

Positive rumination affected the approaching problems in a negative way significantly and negatively (b=-.148, 95% CI [-.2750, -.0217], t=-2.299, p<.05), constructive problem solving significantly and positively (b=.834, 95% CI [.7201,.9482], t=14.354, p<.001), insistent-persevering approach significantly and positively (b=.283, 95% CI [.2327,.3330], t=11.078, p<.001]. Moreover, positive rumination did not have a significant effect on lack of self-confidence (b=-.042, 95% CI [-.0976,.0140], t=-1.469, p=1422) and unwilling to take responsibility (b=-.024, 95% CI [-.0736,.0264], t=-.926, p=3547) (Fig. 2).

Negative rumination, on the other hand, affected the approaching problems in a negative way (b=.725, 95% CI [.6297,.8199], t=14.952, p<.001), lack of self-confidence (b=.241, 95% CI [.1993,.2831], t=11,294 p<.001] and unwilling to take responsibility (b=.124, 95% CI [.0864,.1616], t=6.473 p<.001]) significantly and positively. Moreover, negative rumination did not have a significant effect on constructive problem solving (b=-.047, 95% CI [-.1331,.0383], t=-1.0861, p=.2777) and insistent-persevering approach (b=-.002, 95% CI [-.0394,.0359], t=-.090, p=.9284) (Fig. 2).

In the absence of positive rumination and negative rumination, intolerance of uncertainty had a positive and significant effect on approaching problems in a negative way (b=.768 95% CI [.6923,.8435], t=19.945, p<.001); constructive problem solving (b=.078 95% CI [.0105,.1446], t=2,270, p<.05); lack of self-confidence (b=.148 95% CI [.1160,.1793], t=9.151, p<.001); unwilling to take responsibility (b=.157 95% CI [.1302,.1844], t=11.397, p<.001) and insistent-persevering approach (b=.065 95% CI [.0364,.0928], t=4.495, p<.001) (Fig. 2).

It was found that the indirect effect of intolerance of uncertainty on approaching problems in a negative way (b=.009 95% CI [.0009,.0200]), constructive problem solving (b=-.050 95% CI [-.0814,-.0200]), insistent-persevering approach (b=-.017 95% CI [-.0281,-.0067]) through the mediation of positive rumination was significant. This is because the bootstrap lower and upper confidence intervals obtained by the percentile method did not contain 0 (zero) value.

In addition, the indirect effect of intolerance of uncertainty on lack of self-confidence (b=.003 95% CI [-.0010,.0069]) and unwilling to take responsibility (b=.001 95% CI [-.0016,.0053] through the mediation of positive rumination was not significant. This is because the bootstrap lower and upper confidence intervals obtained by the percentile method contained 0 (zero) value.

In summary, positive rumination in college students mediated the correlation between intolerance of uncertainty and approaching problems in a negative way, constructive problem solving and insistent-persevering approach. If the effect size is close to .01, it is interpreted as low effect; if is close to .09, it is medium effect, and if it is close to .25, it is high effect (Preacher & Kelly, 2011). The fully-standardized effect sizes of the mediation effect were .006 (an effect size close to a low value), respectively; -.047 (an effect size close to the medium value), and -.038 (an effect size close to the low value).

It was found that the indirect effect of intolerance of uncertainty on approaching problems in a negative way (b=.315 95% CI [.2637,.3709]), lack of self-confidence (b=.105 95% CI [.0830,.1284]), and unwilling to take responsibility (b=.054 95% CI [.0369,.0708]) through the mediation of negative rumination was significant. This is because the bootstrap lower and upper confidence intervals obtained by the percentile method did not contain 0 (zero) value.

In addition, the indirect effect of intolerance of uncertainty on constructive problem solving (b=-.0206 95% CI [-.0587,.0178]) and insistent-persevering approach (b=-.001 95% CI [-.0175,.0155]) through the mediation of negative rumination was not significant. This is because the bootstrap lower and upper confidence intervals obtained by the percentile method contained 0 (zero) value.

In summary, negative rumination in university students mediated the correlation between intolerance of uncertainty and approaching problems in a negative way, lack of self-confidence and unwillingness to take responsibility. When interpreting effect sizes, if the effect size is close to .01, it is interpreted as low effect, if it is close to .09, it is interpreted as medium effect, and if it is close to .25, it is interpreted as high effect (Preacher & Kelly, 2011). Fully standardized effect sizes of the mediation effect were .220 (an effect size close to the highest value), .199 (an effect size close to the highest value) and .117 (an effect size close to a medium value), respectively.
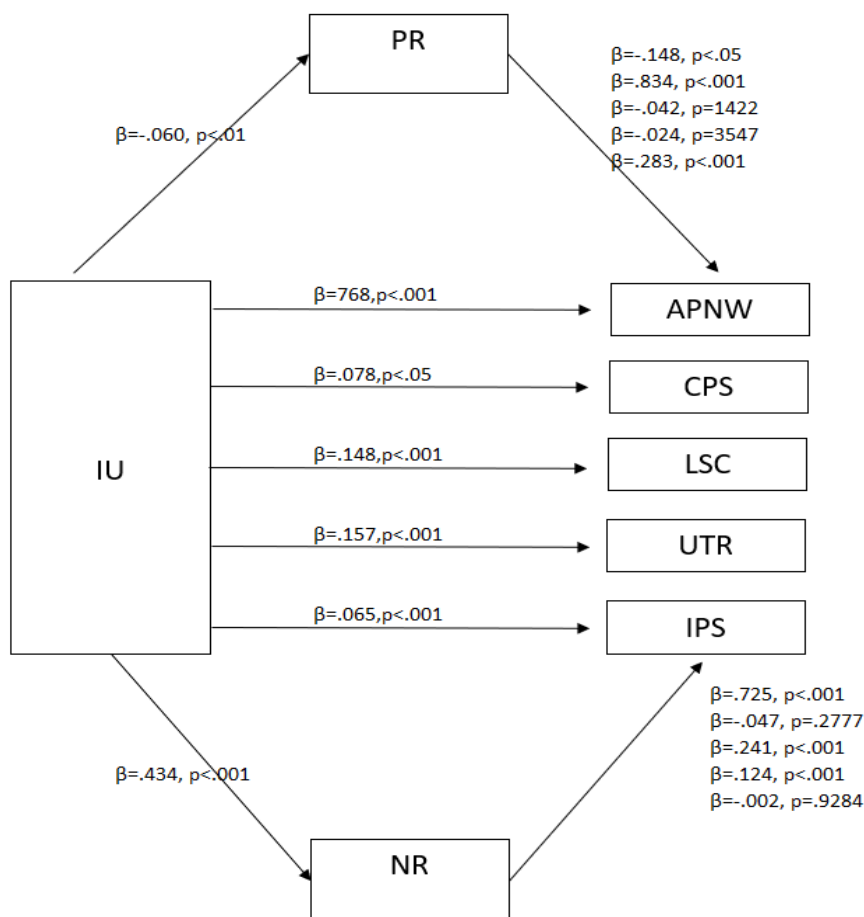
Note. **p<.01,*p<.05; APNW approaching problems in a negative way; CPS constructive problem solving; LSC lack of self-confidence; UTR unwilling to take responsibility; IPS insistent-persevering approach; PR positive rumination; NR negative rumination; IU intolerance of uncertainty

Figure 2. *The mediating role of positive and negative rumination in the relationship between intolerance of uncertainty and interpersonal problem solving.*

DISCUSSION, CONCLUSION, RECOMMENDATIONS

The findings of the study revealed that intolerance of uncertainty predicted the subscales of approaching problems in a negative way, constructive problem solving, lack of self-confidence, unwilling to take responsibility, and insistent-persevering approach significantly and positively, without mediating variables. Intolerance of uncertainty can directly affect problem-solving dynamics of individuals (Parmaksız, 2021). There are studies reporting a positive correlation between intolerance of uncertainty and negative problem orientation (Robichaud et al., 2003; Bottesi et al., 2016; Fergus & Wu, 2010; Fergus & Wu, 2011; Clarke et

al., 2017). One study found that there was a significant negative correlation between intolerance of uncertainty and confidence in problem solving (Patrick, 2016); another study reported a positive and significant correlation between lack of social self-confidence and intolerance of uncertainty (Erol, 2020). Furthermore, it was found that intolerance of uncertainty had a significant negative correlation with the feature of responsibility personality in the five-factor personality (Güvenç, 2019) in addition intolerance of uncertainty had a significant positive correlation with non-assertive behaviors (Erol, 2020). It can be asserted that similar study findings support the findings of the study. According to the results of the study, intolerance of uncertainty affected positive rumination significantly and negatively. Moreover, intolerance of uncertainty influenced negative rumination significantly and positively. In the literature, it is reported that intolerance of uncertainty is significantly and positively related to rumination (Satıcı et al., 2020; Yook et al., 2010). Armutlu (2019) determined that there was a significant positive correlation between intolerance of uncertainty and brooding and reflection subscales of rumination. The researcher stated a hypothesis that intolerance of uncertainty is negatively correlated with reflection, but as a result of the study, he concluded that there was a positive correlation between them. These studies indicated that intolerance of uncertainty was correlated with the rumination assessed using scales addressing rumination from various aspects. In the current study, the relationship between intolerance of uncertainty and rumination was investigated using a scale that deals with positive and negative rumination, and it was found that as expected, positive rumination levels lowered and negative rumination levels elevated as the intolerance of uncertainty increased.

As a result of the study, it was observed that positive rumination affected the approaching problems in a negative way significantly and negatively. Positive rumination significantly and positively affected the insistent persevering approach and constructive problem solving. In addition, the direct effect of positive rumination on lack of self-confidence and unwillingness to take responsibility was not significant. Negative rumination, on the other hand, affected approaching the problems in a negative way, lack of self-confidence and being unwilling to take responsibility significantly and positively. In addition, the direct effect of negative rumination on constructive problem solving and insistent-persevering approaches was not significant. Hasegawa et al., (2016) found that there was a significant positive correlation between approaching the problems in a negative way and the total score of the rumination scale and brooding subscale. In addition, while no significant correlation could not be found between reflection and negative orientation to the problem, a significant positive correlation was found between reflection and positive orientation to the problem. Based on these findings, the authors explained a positive correlation between reflection and positive orientation to the problem and rational problem solving, as an important part of active problem solving of reflection. As expected in the current study, it was determined that the approaching problems in a negative way may decrease with the increase of positive rumination and the approaching problems in a negative way may increase with the increase of negative rumination. Similarly, it can be thought that positive rumination is a part of active problem solving. Also, in their study, Hasegawa et al., (2016) observed that there was a significant positive correlation between rational problem-solving and rumination scale total score, brooding score and reflection score. The authors explained the positive correlation between reflection and positive problem-orientation and rational problem-solving in the way that reflection is an important part of active problem solving. Similarly, the positive correlation between positive rumination and constructive problem-solving in the current study can be interpreted as positive rumination, an important element of active problem-solving. Hasegawa et al., (2016) explained the positive correlation of brooding and rumination scale total score with negative orientation to the problem and avoidant style by saying that rumination is a cognitive behavioral set that works to avoid negative private events and environments. The result of the current study indicating that unwillingness to take responsibility may increase with the increase of negative rumination can be interpreted as the fact that negative rumination may be a cognitive behavioral set that works towards avoidance by being unwilling to take responsibility for negative events and environments.

When the indirect effects of the model were examined, it was found that the indirect effect of intolerance of uncertainty on approaching problems in a negative way, constructive problem solving, insistent-persevering

approach through the mediation of positive rumination was significant. In addition, the indirect effect of intolerance of uncertainty on lack of self-confidence and unwilling to take responsibility through the mediation of positive rumination was not significant. The indirect effect of intolerance of uncertainty on approaching problems in a negative way, lack of self-confidence, and unwilling to take responsibility through the mediation of negative rumination was significant. Moreover, the indirect effect of intolerance of uncertainty on constructive problem solving and insistent-persevering approach through the mediation of negative rumination was not significant.

Although there has been no study examining the mediation effect of intolerance of uncertainty, rumination and interpersonal problem-solving variables, the links between the information in the literature and the variables obtained from similar studies can be explained. In the literature, it can be seen that individuals may engage in rumination when they feel uncertainty (Liao & Wei, 2011), negative thinking caused by rumination may also appear in the problem-solving processes of individuals and may result in negative problem orientation, and these negative comments may lead to an avoidance style that prevents individuals from solving their problems and the problem-solving style may also work to create continuous rumination about the person's problems (Hasegawa et al., 2018).

When the studies in the literature are reviewed, it has been determined that intolerance of uncertainty has an indirect effect on mental well-being through rumination (Satıcı et al., 2020). In another study, it was found that brooding and reflection subscales and total score of rumination mediated the correlation between intolerance of uncertainty and depression (Huang et al., 2019). In another study, it was observed that the indirect effect of intolerance of uncertainty on anxiety through the mediation rumination was not significant, while rumination completely mediated the correlation between intolerance of uncertainty and depression (Yook et al., 2010). Yang et al. (2018) defined rumination as repetitive thoughts about both positive and negative effects and stated that these thoughts functioned positively or negatively in terms of psychological adjustment. Intolerance of uncertainty can cause preoccupation with positive and negative rumination -- both of which can have a positive or negative effect on how people deal with interpersonal issues. When these studies are reviewed, it is seen that the correlation between intolerance of uncertainty and depression, which is one of the negative indicators of psychological adjustment, is mediated by rumination (Huang et al., 2019; Yook et al., 2010). In addition, the indirect effect of intolerance of uncertainty on mental well-being, which is one of the positive indicators of psychological adjustment through rumination, is also significant (Satıcı et al., 2020).

The results of this study are important in terms of extending the literature on university students' interpersonal problem-solving skills. However, some limitations need to be taken into account when evaluating the results of the study. It is primarily limited to the sample group, the participants of the study. Therefore, it is not possible to generalize the results of the study to all university students. This study was conducted using self-report assessment tools for the variables of intolerance of uncertainty, positive and negative rumination, and interpersonal problem-solving. Participants may have acted haphazardly when answering these scales, ignored them, or given answers that did not reflect themselves in order to gain social approval. In this regard, further qualitative studies can be conducted through techniques such as interviews and observation in order to contribute to the pattern between these variables. As a result of the study, it was observed that as the intolerance of uncertainty increased, negative rumination increased and positive rumination decreased. As negative rumination increased, approaching problems in a negative way, lack of self-confidence, and unwillingness to take responsibility increased. In a study examining the effect of positive rumination training on mental health, it was found that positive rumination increased and negative rumination, depression and anxiety decreased significantly in participants who received positive rumination training. Results of the study showed that positive rumination group training can improve the wellness of mental health (Yang & Guan, 2022). As a result of the current study, it was determined that constructive problem-solving may increase with the increase of positive rumination in university students. In line with these findings, positive rumination training programs can be developed similar to the training program developed by Yang and Guan (2022) (which includes the

topics of thinking positively about negative events and learning to think positively about events, oneself, the past, the present and the future). In line with these findings, similarly positive rumination training programs can be developed. These programs can be applied in group counseling sessions by mental health professionals working in psychological counseling units within universities. The effects of these programs on the interpersonal problem-solving approaches and behaviors of university students can be investigated with experimental studies. The research was conducted by considering the positive and negative rumination dimensions of the Positive and Negative Rumination Scale. More detailed data can be obtained by conducting a similar study with the five subscales of the Positive and Negative Rumination Scale, which will cover rumination more comprehensively. Only university students were included in this study. For this reason, it is recommended to carry out similar studies in different age groups (such as adolescents and middle age groups).

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