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

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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.
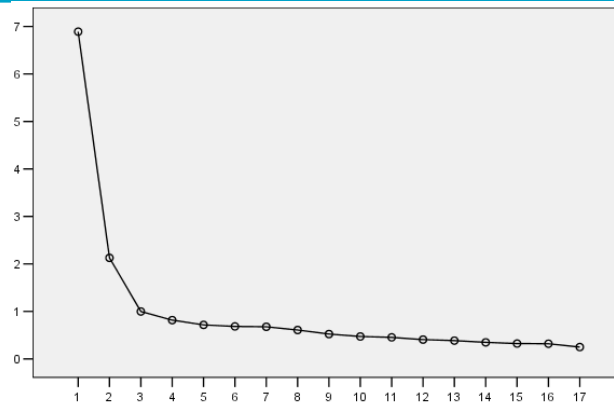
RESULTS

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= $\chi2$= 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

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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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Conflict of interest

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