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SCIENTIFIC CREATIVITY OF PRESCHOOL TEACHER CANDIDATES*

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Abstract

This study was conducted to determine the level of scientific creativity of preschool teacher candidates and to investigate whether there is a meaningful difference between the scientific creativity of the teacher candidates and some demographic characteristics. The study group of the research group constitutes 149 teacher candidates who are studying at Ahi Evran University Faculty of Education Elementary Education Department Preschool Education Department in Kırşehir. The "Scientific Creativity Test (BYT)" developed by Hu and Adey (2002) and adapted to Turkish by Kadayıfçı (2008) used data collection tool in the research. Moreover, "Personal Information Form" has been applied to determine personal characteristics. In the analysis of the data, arithmetic mean, standard deviation, maximum and minimum values of average scores of teacher candidates taken to determine scientific creativity levels were calculated and t-test and ANOVA were used to determine differences between groups. In research findings, when the scientific creativity of teacher candidates is examined, it is concluded that scientific creativity levels are moderate. Besides this, the average scores of the scientific creativity of the teacher candidates and with respect to the income monthly in level of the family income have been reached to significant difference.

Keywords: Creativity, Scientific Creativity, Scientific Creativity Test, Preschool Education

OKUL ÖNCESİ ÖĞRETMEN ADAYLARININ BİLİMSEL YARATICILIKLARI

Özet

Bu çalışma, okulöncesi öğretmen adaylarının bilimsel yaratıcılığın düzeyini belirlemek ve öğretmen adaylarının bilimsel yaratıcılığı ile bazı demografik özellik arasında anlamlı bir farklılık olup olmadığını araştırmak amacıyla yürütülmüştür. Araştırma grubunun çalışma grubu, Kırşehir'deki Ahi Evran Üniversitesi Eğitim Fakültesi İlköğretim Bölümü Okulöncesi Eğitimi Bölümü'nde okuyan 149 öğretmen adayı oluşturmaktadır. Hu and Adey (2002) tarafından geliştirilen ve Kadayıfçı (2008) tarafından Türkçe'ye uyarlanan "Bilimsel Yaratıcılık Testi (BYT)" araştırmada veri toplama aracı olarak kullanılmıştır. Ayrıca kişisel özelliklerini belirlemek için "Kişisel Bilgi Formu" uygulanmıştır. Verilerin analizinde, bilimsel yaratıcılık düzeylerini belirlemek için alınan öğretmen adaylarının ortalama puanlarının aritmetik ortalama, standart sapma, maksimum ve minimum değerleri hesaplandı ve gruplar arasındaki farkları belirlemek için t testi ve ANOVA kullanıldı. Araştırma bulgularında, öğretmen adaylarının bilimsel yaratıcılığı incelendiğinde bilimsel yaratıcılıkları orta düzeyde olduğu sonucuna varılmıştır. Bunun yanı sıra, öğretmen adaylarının bilimsel yaratıcılığın ortalama puanı ile ailenin gelir düzeyi aylık gelirine göre anlamlı farklılığa ulaşılmıştır.

Anahtar Kelimeler: Yaratıcılık, Bilimsel Yaratıcılık, Bilimsel Yaratıcılık Testi, Okul Öncesi Eğitimi.

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1. INTRODUCTION

It is impossible to transfer only through education and training to the students of the information which has increased together with the existing and developed technology at the present time. It turns out that it is necessary to solve the problems that are encountered, to gain knowledge and to give the ability of creative thinking in daily life. For this reason, education should be given importance to creative thinking and creativity (Yontar,1993).

Creativity is to look critically and present new proposals. It is the connection between ideas and objects that have not been connected before. To see a new and original problem outside of what is always known, to by going through various solutions, to be original, to bring new results to the stage. Creativity can be defined as the act of changing the world and ourselves. Different from the subjective inner life, the outward expression takes place in the stage of artistic creation and exchange (Çellek, 2002).

Creativity in everyday life, art, sports, politics and education has become even more important. Developed countries are moving towards becoming an information society through industrial society. In order to become an information society, should be applied an education system where are used more creative thinking methods to our society (Eriç, 1998).

Creative thinking is the process of creating multiple (fluid) problems or problems (elastic) and ideas that are unimaginable (original) by most people, dealt with in various ways. Previous experiences in the production ideas of people are based on untouched material, and are often unfamiliar (often new) the components that constitute previous experiences while combined with creative ideas (Swartz, Fischer and Parks 1998). In the developing world, it is increasingly important to educate individuals who are thinking, researching, and who are sensitive to their surroundings. Because the fast, scientific and technological developments that come to the ranks of people; be open to innovation, be constructive, productive and creative (Yıldız, Özkal and Çetingöz, 2003).

Aktamış and Ergin (2006) point out that creativity related to science is described as "scientific creativity" and that it is necessary to distinguish from general creativity scientific creativity in many researches. Creativity is a very wide-ranging phenomenon. There are differences in the way creativity is handled in the context of arts literature, social sciences, and science, although it is originally thought of as being in a large number of diverse and original productions. For example, in artistic creativity, emotional and subjective thoughts are in the foreground; human needs are preliminary in scientific creativity, often requiring knowledge to apply to new situations (Can, 2007).

1.1. Hu and Adey's Scientific Creativity Model

The model revealed by Hu and Adey (2002) constitute the theoretical basis for this research. Creativity model in the science proposed by Hu and Adey (2002) is examined in three dimensions as creative process, creative character and creative product. This three-dimensional scientific creativity model of Hu and Adey (2002) is as in figure 1.

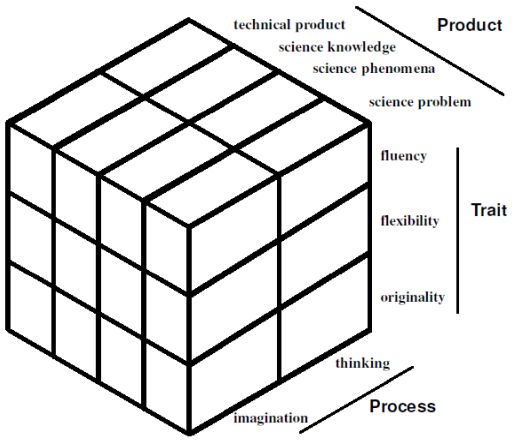


Figure 1. Scientific structure creativity model (Hu and Adey, 2002).

1.1.1. Creative process (1st dimension)

Process dimension is the starting point of scientific creativity. The creative thinking process involves divergent thinking and imagination. Divergent thinking that is first a sub-dimension of this creative thinking process; Instead of finding the best possible solution to a problem situation, mind is free from pre-established methods, be able to offer numerous, diverse, different ways and untested solutions. According to Hu and Adey (2002), creative thinking or creative product often arises with divergent thinking. In creative thinking, first of all a multi-faceted, divergent way of thinking must take place. Creativity can not be achieved using convergent thinking styles and general patterns (Akçum, 2005).

The second sub-dimension of the creative thinking process is imagination; The most important feature of creative individuals is strong of their imagination. New and original products are just the result of an active imagination. Imagination plays many important roles in creativity (LeBoutillier and Marks, 2003). Einstein's vision of "imagination is more important than knowledge" shows the importance of imagination in scientific discoveries.

1.1.2. The character of creative thoughts (2nd dimension)

People put creative ideas in situations where they are trying to solve a particular problem or when it is necessary to make a decision. While they can express their thoughts both as verbally or writing, as well as can shows illustrations or models. It is understandable whether the product of creative thinking, the three characteristics (fluency, flexibility and originality) which define the character of creative thoughts. The ability to think creatively in the minds of an individual; these three characteristics can be measured by searching the person Hu and Adey (2002). The first of the characters of creative thinking is **fluency.**

A probing can produce many ideas that may be the answer. For example, to find different uses of a brick or to find titles suitable for a short story. Creative people can present a great deal of thought as a solution of the problem Hu and Adey (2002). For example; It is understood that the student who produces 10 different solutions in 5 minutes for a problem situation has more fluency and higher creativity than the student who produces 5 solutions in the same period (Rıza, 1999). The second of the characters of creative thinking is **flexibility.**

Generating ideas in different categories, approaching a situation from different angles, bringing different dimensions to the square, different approaches in the face of any problem. In order to understand that your flexibility is high, it is necessary to look at how many generated ideas deal with different ideas the problem. The creative people offer from different ways of solving the problem (Hu and Adey, 2002).

The last from the characters of creative thinking is **originality**. The state of being original yourself is also maintained in thought and action. Few people need to come to mind to accept that thought produced is unique. Due to original ideas emerge from creative people (Hu and Adey, 2002). According to Fisher, (1995); the fact that a child has a high level of intellectual energy means that he also has a high score on the level of originality. It moves away from the traditional way of thinking, with arise from original responses, immediate needs and postponement of satisfaction. The questions that have measured originality are often related to the different areas of usage of objects.

1.1.3. Creative product (3rd dimension)

Technical products should be products that will come to fruition in a result of creative thinking in science, to reveal scientific knowledge, solve a scientific problem and should be designed to be related a scientific phenomenon (Hu and Adey, 2002). The child's sensory organs are influential in creative thinking, which is a large-scale work of imagination. The child's surroundings better perception, hearing and feeling are due to the higher sensitivity of sensory organs (Aydin, 1997).

Every child has the ability to be creative. In order to improve this ability, it is first necessary to educate children's senses, it is very important for the development of the creativity of the full life of each moment that the child is as clear as possible to all the sensory organs and coming stimulies from own within and without. Because the child who is open to internal and external stimuli, on the one hand it tends to recognize its own nature, its structure and its creation; on the other hand, finds out alone the cause-effect relations and connections in the events around it (Ulcay, 1985).

Parents and educators need to know the characteristics of children well, to better understand children, build relationships with them and give them better education. However, it should be noted that the creativity development in the child's own characteristics must be evaluated and that the creativity of each child is a unique feature (Ömeroğlu, 1990).

It is necessary to start training at an early age, to develop the potential of creativity in children, and to educate and develop the senses that have been involved actively in creativity. It is through the senses of exploring and perceiving the child's surroundings. Opportunities should be given to discuss, discuss, perceive, observe, and assess the observations of the environment to help develop the child's creativity (Gürsoy, 2001). In order to educate the creative individuals of the future, work should be done to develop the creative direction of the students by starting from preschool period. The first educational step that the child acquires with systematic education is preschool education. A creative preschool education and a creative preschool teacher are needed to improve creative potential existing the child's. It is very important that preschool education teachers that will create this creative environment can be creative individuals as well as they can know and effectively apply the creative activities (Çetingöz, 2002).

1.2. The Importance of Research and Its Purpose

The ability to grasp the innate creativity and the false ideas that can not be creative after are no longer considered important. It may be true that creativity is born in every individual, but the creativity

that individuals have is; talent and intelligence development activities, family and education can be enhanced by positive effect direction. Environmental influence also has a great influence on creativity. For this reason, creativity is becoming an increasingly popular phenomenon. The tendency to believe that creativity can be improved by appropriately organizing the environment and providing appropriate training is gaining momentum (Doğan, 2007).

There are many studies on the effect of the concept of scientific creativity in the field of domestic and foreign literature. When the studies done in this research are examined; Hu and Adey, (2002) developed a scientific creativity test for junior high school students and applied the test on the scientific creativity building model to 160 middle school students in the UK.

Kadayıfçı, (2008) investigated creative thinking supporting a teaching model by comparing the image of the 9th grade, 64 chemistry students with the separation of materials, concepts, scientific creativity and the impression of divergent thoughts compared to the traditional teaching approach. Kılıç, (2011) investigated the relationship between scientific creativity and scientific attitude by comparing the demographic characteristics of 912 elementary school students with their scientific creativity and scientific attitudes. Akkanat, (2012) examined the scientific creativity levels of 300 elementary school seventh graders. In the study, the relationship between scientific creativity and gender differences, opinions about the nature of science, and attitudes towards science lessons were examined.

Within the scope of this research, it is aimed to determine the levels of scientific creativity of preschool teacher candidates on science and to determine the differentiation levels according to some variables (classes, education of parents and monthly income situation) of these levels In this framework, answers to the following research questions are sought.

- What are the scientific creativity levels of preschool teacher candidates?
- Is there a statistically significant difference between the level of scientific creativity of pre-primary teacher candidates and the educational status of parents?
- Is there a statistically significant difference between the level of scientific creativity of preschool teacher candidates and the monthly incomes of their families?
- Is there a statistically significant difference between pre-school teacher candidates' levels of scientific creativity and their class?

2. METHOD

In research model, it is a screening model, which is one of the quantitative research methods, was chosen in order to determine the distribution of scientific creativity according to some demographic characteristics of preschool teacher candidates who are studying in Ahi Evran University Faculty of Education Primary Education Department Preschool Education Department.

2.1. Working Group

The study group of the study constitutes 149 preschool teacher candidates who are studying at Ahi Evran University Faculty of Education in the academic year 2015-2016. The distribution of the study group, according to the universe and the demographic characteristics of the sample are shown in table 1.

Table 1. Demographic Characteristics of the Sample

Feature	Number	Percent %
Gender		
Female	125	83.90
Male	24	16.10
Class		
1. Class	40	26.85
2. Class	34	22.82
3. Class	38	25.50
4. Class	37	24.83
Mother's Education Status		
Primary school	90	60.40
Middle School	38	25.50
High school	14	9.40
University	7	4.70
Father's Education Status		
Primary school	51	34.23
Middle School	36	24.16
High school	44	29.53
University	18	12.08
Family monthly income situation		
Less than TL 800	11	7,38
TL 801-1000	32	21,48
TL 1001-1500	19	12,75
TL 1501-2000	32	21,48
More than 2000 TL	55	36,91
Total	**149**	**100,00**

2.2. Data Collection Tool

For the collection of data which contained in the study; "Scientific Creativity Test" and "Personal Information Form" were applied to determine personal characteristics. The Scientific Creativity Test (BYT) was developed Hu and Adey (2002) and the adaptation of the test to Turkic was done by Kadayıfçı, (2008). The test comes from the open-ended seven questions. Scientific Creativity the structural model of the character, which is the main dimension (fluency, flexibility, originality), process (thinking, imagination) and product (science, technical product, science phenomenon, science problem) all subdimensions and each question in the test measure multiple subdimensions.

The scoring of the questions is scored by evaluating in terms of fluency, flexibility and originality in the direction of these given answers. The reliability coefficient of the test developed by Hu and Adey (2002) is 0,89 and the reliability coefficient of the test adapted by Kadayıfçı, (2008) have been found as 0,73. In the study done, The reliability coefficient have been determined as 0,737.

2.3. Analysis of Data

In the data analysis, statistical techniques were used to observe the mean scores of the test, their standard deviations, and the point differences between the groups. Before using these statistical techniques, it was examined whether pre-school teacher candidates had a normal distribution of their total scores on scientific creativity. The Kolmogorov-Smirnov test was done for this. Since the Kolmogorov-Smirnov test results are $p > .05$, the data show a normal distribution (Can, 2013).

For this reason, when the data are analyzed, the data are used to determine whether the students are different in terms of their scientific creativity and personal characteristics, and which

groups are favorable for the differences; t-test, one-way analysis of variance (ANOVA), arithmetic mean and standard deviation calculations. The statistical significance value was 0.5 in the analysis of the constructed data and these analyzes were performed in SPSS 22.0 package program. Grouping of data to be used in analyzes which will be do to determine the level of scientific creativity of preschool teacher candidates has been undertaken. For this;

$$\text{Estimated Range Coefficient} = \frac{\text{Largest Metage - Smallest Metage}}{\text{Number of Groups Requested}}$$

Formula used (Akt. Tay, 2007). The group number was set to three. Accordingly, the first group was considered "low", the second group "middle" and the third group "high". They had the highest score of 91 and the lowest score of 11 in the Scientific Creativity Test of the preschool teacher candidates. When going to the group interval over the scores received; 91-11 / 3 = 29,66 the group interval was found to be 30. The group values corresponding to this group interval are shown in table 2.

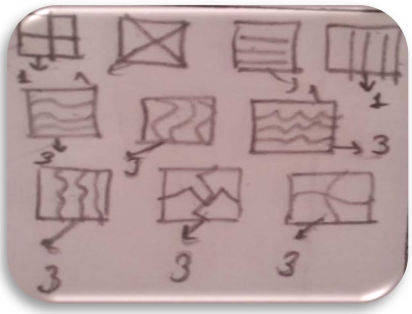
Table 2. Values Corresponding to Group Interval of Scientific Creativity Total Scores of Teacher Candidates

Group Interval	Group Value
11-41	Low
42-72	Middle
73-91	High

Preschool teacher candidates' answers for each question were written one by one and the fluency, flexibility and originality scores they received in response to these answers were also collected and a single score was obtained. Example of Points Obtained from Fluency, Flexibility and Originality Scores shown in table 3.

Table 3. Example of Points Obtained from Fluency, Flexibility and Originality Scores

	ANSWERS	FLUENCY SCORE	FLEXIBILITY SCORE	ORIGINALITY SCORES
1.QUESTİON: Unusual Uses	-Glasses can be used in experiments. -Making examples about light. -Can be used for reflection.	3	-Physics -Glass types 2	0
2.QUESTİON: Discover The Problem	-Do you have life? -Do you have animal? -How hot is it? -Which planet are we close to? -Can I settle?	5	-Living space -Utilization -Planet Structure 3	0
3.QUESTİON: Product Development	-I made a two-person bike for single-seater -Facilitator chains. -Whichever in danger, can stop sensor.	3	-Comfort -Functionality 2	0

4.QUESTİON: Scientific İmagination	-Everything was flying in the air. -We flew where we want -But situation would have been a little more difficult.	3	-Human and Life -General life and laws of physics 2	0
5.QUESTİON: Problem Solving		10	22	0
6.QUESTİON: Science Experiment	-Test with water. -Look at the durability. -Open the floor and look.	3	-Tools x3 -Principle x3 -Procedure x3 9	0
7.QUESTİON: Product Design	-Moving arms. -Moving legs. -Buttons that let you operate. -The collector tip. -Sensing sensors	5	15	-Visuality -Make a statement -Functionality -Assimilate to 4
Total			**91**	

3. FINDINGS

In this section, the level of scientific creativity in the direction datas in relation to the scientific creativity of preschool teacher candidates, the mean scores obtained from the mother education status, father's education status, family income, scientific magazines read, tools and equipment used, and whether or not the teacher candidates has his or her own room datas have been shown. These data were evaluated and interpreted between groups and within groups.

3.1. Findings and Comments related to on Scientific Creativity Levels of Pre-school Teacher Candidates

Teacher candidates' average scores regarding their scientific creativity were found the smallest and largest values by looking at each question. The minimum, maximum, mean and standard deviation results regarding this data are shown in table 4.

Table 4. Minimum, Maximum, Mean and Standard Deviation Results of Pre-School Teacher Candidates' Scientific Creativity Levels

	Question Content	N	Minimum	Maximum	$\bar{x}$	SS
Question-1	Unusual Uses	149	0,00	11,00	3,64	2,18
Question-2	Discover The Problem	149	0,00	11,00	4,56	2,31
Question-3	Product Development	149	0,00	10,00	3,79	2,13

Question-4	Scientific Imagination	149	0,00	9,00	4,05	1,95
Question-5	Problem Solving	149	0,00	32,00	4,86	3,89
Question-6	Science Experiment	149	0,00	14,00	6,65	3,32
Question-7	Product Design	149	0,00	37,00	15,89	6,52
Total		**149**	**11,00**	**91,00**	**43,44**	**12,90**

When examined according to table 4, the general average of the scientific creativity scores of preschool teacher candidates was determined as 43,44. According to the total score group interval table (Table 2) the Scientific Creativity test, is fall into in the intermediate group of 43,44 values found. The scientific creativity of preschool teacher candidates appears to which it is in moderate level.

3.2. Findings and Comments regarding to Mother's Education Status of Mean Score Scientific Creativity of Pre-school Teacher Candidates'

The standard deviations and the arithmetic average results according to their mother's educational status of the mean scores scientific creativity of pre-primary teacher candidates are given in table 5.

Table 5. The arithmetic average results and the standard deviations regarding to their mother's educational status of the mean scores scientific creativity of pre-primary teacher candidates

	Mother's Education Status	**N**	$\bar{x}$	**SS**
Scientific Creativity	Primary school	90	44,64	12,53
	Middle School	38	42,60	12,93
	High school	14	41,07	14,73
	University	7	37,14	13,75
	Total	**149**	**43,43**	**12,90**

According to the Table 5, there are teacher candidates' who are 90 elementary school graduates, 38 secondary school graduates, 14 high school graduates and 7 university graduates their mother's educational status. It is seen that the average level of scientific creativity is x = 37.14 of 7 teacher candidates whose is university mother education status, while the average score of scientific creativity of 90 teacher candicates' who are elementary school graduates their mother graduated from elementary school is x = 44.64. One-way analysis of variance (ANOVA) have been conducted for unrelated measures in order to test whether or not the differences between the mean scores regarding their mother's educational status of the pre-primary teacher candidates, and the results are given in table 6.

Table 6. One-way Analysis of Variance (ANOVA) Results Related to Mother Learning Status of Mean Score Scientific Creativity of Pre-School Teacher Candidates'

Source of Variance	**Sum of Squares**	**df**	**Squares Average**	**F**	**p**	**Significant Difference**

Between Groups	513.157	3	171.052	1.028	.382	
Inside Groups	24127.487	145	166.396			**NONE**
Total	**24640.644**	**148**				

***p<0,05**

When the results in Table 6 are examined, it is seen whether or not is statistically a difference between mother education status of average scores for scientific creativity of the preschool teacher candidates in the one-way ANOVA analysis which do between groups and within group ($F_{(3-145)}$ = 1.028, p> .05). According to this result, it can be said that the average scores for scientific creativity of the teacher candidates did not change according to mother education status.

3.3. Findings and Comments regarding to the Father education Situation Mean Score Scientific Creativity of Pre-School Teacher Candidates'

The arithmetic average and standard deviation results are given in table 7 when the average scores scientific creativity of preschool teacher candidates are examined according to father's education status.

Table 7. Arithmetic Mean, Standard Deviation Results Regarding to Father education status of Mean Score Scientific Creativity of Pre-school Teacher Candidates'

	Father's Education Status	**N**	$\bar{X}$	**SS**
Scientific Creativity	Primary school	51	46.25	14.88
	Middle School	36	42.52	9.52
	High school	44	41.56	13.19
	University	18	41.83	11.56
	Total	**149**	**43.43**	**12.90**

According to table 7, there are teacher candidates who are 51 elementary school graduates, 36 secondary school graduates, 44 high school graduates and 18 university graduates university graduates father edication status. It is seen that the 18 teacher candidates who is university father education status is 41.83 the average of the scientific creativity score while 46.25 the average scientific creativity score of 51 teacher candidates whose father is a primary school graduate.

One-way analysis of variance (ANOVA) was conducted for unrelated measures to test whether or not the differences between the mean scores regarding to the father's educational statusof the pre-primary teacher candidates were significant, and the results are given in table 8.

Table 8. One-way analysis of variance (ANOVA) Results Regarding to Father Edication Status of Average Score Scientific Creativity of Pre-School Teacher Candidates'

	Sum of Squares	**df**	**Squares Average**	**F**	**p**	**Significant Difference**
Between Groups	634.690	3	211.563	1.278	.284	**NONE**
Inside Groups	240005.954	145	165.558			

Total	**24640.644**	**148**

***p<0,05**

According to the results in table 8, there is no statistically significant difference between the average scores of scientific creativity of the preschool teacher candidates and the father education status ($F_{(3-145)} = 1.278$, $p > .05$). When this research result is examined, it can be said that the father education situation does not affect the scientific creativity average scores of the teacher candidates.

3.4. Findings and Comments Regarding to Family Income Status of Mean Score Scientific Creativity of Pre-School Teacher Candidates'

When analyzed according to the family income situatio of the mean scores scientific creativity of preschool teachers candidates are the standard deviation and arithmetic average results are given in table 9.

Table 9. Arithmetic Mean, Standard Deviation Results regarding to Family Income Status of Scientific Creativity Average Scores of Pre-School Teacher Candidates

	Family Income Status	**N**	$\bar{x}$	**SS**
Scientific Creativity	Less than TL 800	11	45.09	11.16
	TL 801-1000	32	44.09	12.69
	TL 1001-1500	19	43.05	15.16
	TL 1501-2000	32	37.93	13.56
	More than 2000 TL	55	46.05	11.51
	Total	**149**	**43.43**	**12.90**

According to table 9, there are teacher candidates 11 which is less than 800 TL the family income situation 32, is 801-1000 TL 19, is 1001-1500 TL 32, is 1501-2000 TL and 55, is more than 2000 TL. It is seen that average score scientific creativity of teacher candidate whose is more than 2000 TL family income status is 46.05 while 45.09 average score scientific creativity the of teacher candidate with less than 800 TL family income status. One-way analysis of variance (ANOVA) was conducted for unrelated measures to test whether or not the differences between the mean scores regarding the family income status of the pre-service teacher candidates were significant, and the results are given in table 10.

Table 10. One-way Analysis of Variance (ANOVA) Results regarding to Family Income status of Mean Score Scientific Creativity of Pre-School Teacher Candidates'

Source of Variance	**Sum of Squares**	**df**	**Squares Average**	**F**	**p**	**Significant Difference**
Between Groups	1391.358	4	347.839	2.154	.043	
Inside Groups	23249.287	144	161.453			**5-4**
Total	**24640.644**	**148**				

***p<0,05; Groups 1 = less than 800 TL, 2 = 801-1000, 3 = 1001-1500, 4 = 1501-2000, 5 = 2000 from is too large.**

When the results in Table 10 were examined, statistically significant differences were found between the groups when examined according to the scientific creativity test (F = 2.154, p <0.05). The mean scores of the prospective according to the scientific creativity test of teachers candidates; depending on the family income situation, it seems that the difference between the income of 2000 TL and between the income of 1501-2000 TL, which is more than 2000TL, is different. In this case, it was understood that the teacher candidates whose was more than 2000 TL family income had higher scientific creativity than the other teacher candidates.

3.5. Findings and Comments regarding to Classes Mean Score Scientific Creativity of Pre-School Teacher Candidates'

According to the class situations where the scientific creativity average scores of pre-school teacher candidates have learned; arithmetic mean, standard deviation results are given in table 11.

Table 11. Arithmetic Mean, Standard Deviation Results Regarding Classes of where Mean Score Scientific Creativity of Pre-School Teacher Candidates' have learned.

	Classes	**N**	$\bar{x}$	**SS**
Scientific Creativity	1.Class	40	41.50	14.36
	2. Class	34	41.26	10.20
	3.Class	38	47.36	14.26
	4.Class	37	43.48	11.46
	Total	**149**	**43.43**	**12.90**

According to Table 11, there are 40 first grade students, 34 second grade students, 38 third grade students and 37 teacher candidates who are studying in the fourth grade. When the average of scientific creativity points of teacher candidates are examined, it is seen that the third highest grade (x= 47.36) and the lowest second grade (x= 41.26) is. One-way analysis of variance (ANOVA) was conducted for unrelated measures to test whether or not the differences regarding to the classes learning of science creativity average scores of pre-primary teachers were significant, and the results are given in table 12.

Table 12. Results of One-way analysis of variance (ANOVA) Regarding to Learning Classes of Average Scores Scientific Creativity of Pre-School Teacher Candidates'

Source of Variance	**Sum of Squares**	**df**	**Squares Average**	**F**	**p**	**Significant Difference**
Between Groups	897.941	3	299.314	1.828	.145	**NONE**
Inside Groups	23742.703	145	163.743			
Total	**24640.644**	**148**				

***p<0,05**

When the results in table 12 is looked, there is no statistically significant a difference between the mean scores with the grades classes for scientific creativity in the one-way analysis of variance (ANOVA) analysis which do between within groups and groups of pre-school teacher candidates ($F_{(3-145)} = 1.828$, $p>.05$). According to this result, it can be said that the classes in which the teacher candidates have learned, did not whichever contribute to their scientific creativity average scores.

4. RESULTS AND RECOMMENDATIONS

General average of average score scientific creativity in our research was calculated as 46.00. Then the maximum and minimum values of average score were taken and 3 groups were separated. These were considered as "low" in the first group, "middle" in the second group and "high" in the third group, and the point interval table was created. 46.00 value, which is in general average of the total scores is in the middle level group. That is, pre-school teacher candidates seem to have moderate scientific creativity.

In the study, variables that are considered to be effective on the scientific creativity of preschool teacher candidates are the parental education status, the family income status and the class in which they are educated. When the findings of the investigation are examined; it is seen that the level of scientific creativity of the students is not significantly different according to the education level of mother and father. However, when the average scores of creativity related to these learning situations are compared, it is seen that difference between the average of the scores is very little even though that the difference between number of people whose is university graduates the educational status of the mother and father of the teachers' candidates and graduates of primary school the parents is much more.

As a result of this, it is understood that the teacher candidates who are university graduates the education level of the mother and the father influence more scientific creativity according to other teacher candidates more influenced, even if the number of teacher candidates is small who is the university graduate the education status of the mother and the father. In the investigations Özben and Argun, (2005) examined the creativity levels of Buca Education Faculty students according to some variables in comparing creativity dimensions. When you look at the results of the study; there was no significant difference between parental education level and creativity level of students. Similarly, Mangir and Aral, (1990) conducted research on the influence of children who attend kindergarten on their creativity, according to some factors. In the results of the research, it has been determined that the educational status of the parents is not effective on the creativity dimensions of the children.

Dinçer, (1993) found that children of university graduates who were five-year-olds in primary school were more creative than their fathers in their study of the relationship between parents' attitudes towards child-raising and family life and creative thinking. In comparison of the scientific creativity of the teacher candidates according to the family income situation, it was determined that the families were significantly different in monthly income according to the scientific creativity levels of the teacher candidates. This difference was found to be in favor of teacher candidates who had a higher monthly income than those who had monthly income between 2000 and 1500-2000. When it is pointed out that families with high incomes can offer a richer environment or environment to their children, this result is achieved that the scientific creativity of these teacher candidates is high.

Similarly, Aral and Yaşar, (2011) found that six-year-olds were doing to determine the effect of socio-economic level and parental education level on children's creative thinking skills; the children's creative thinking skills, and the socio-economic level of their families were statistically

significant. Children in the upper socio-economic level were found to have the highest creative thinking skills followed by children with moderate and lower socio-economic levels.

When the results were examined, it was found that the teachers' candidates whose was high income level of the family supported scientific endowment with high scientific creativity, in this non-supporting research; As a result of the research, Biber, (2006) examined this method in terms of the creativity levels of elementary second-tier mathematics students, the effect of the learning discovery method and the educational usability. It was seen that the students participated in the research did not significantly affect income of the families the level of creativity.

According to the findings obtained from the research, there was no statistically significant difference when examiningthe class levels status that they had studied the level of scientific creativity of the teacher candidates. According to the results obtained, it was seen that there was no effect on the level of scientific creativity of the class in which the teacher candidates had studied. As a result of the findings, the following suggestions can be made in order to increase the level of scientific creativity of preschool teacher candidates.

- In the scope of the research, it is seen that the studies that investigated the effect of the socio-economic circle on the level of scientific creativity have obtained different results. For this reason, pre-school teacher candidates in universities representing the lower, middle and upper socio-economic level can also include a study examining the scientific creativity.
- Further training on creativity can be given to educate individuals with creative thinking, problem solving, and critical thinking from high-level thinking skills who are able to use knowledge, transform, research, and question in pre-school teacher education.
- A good educational environment can be provided for preschool teacher candidates to develop multi-faceted thinking skills.

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