International J. Soc. Sci. & Education
2015 Vol.5 Issue 3, ISSN: 2223-4934 E and 2227-393X Print

An Investigation of High School Students' Mathematics Fears According to Some Variables

By

Alattin Ural
Department of Mathematics Education, Faculty of Education,
Mehmet Akif Ersoy University, Burdur/Turkey.

Abstract

One of the aims of the research was to investigate whether high school students' fears of mathematics differ significantly based on the level of their parental education, gender, subject matter division (science-mathematics, Turkish-mathematics, social) and capabilities of the mathematics teachers' (from perspective of the students). Another aim was to investigate whether the grades of mathematics was the main factor of fear of mathematics (why division, parental education level, and capability of teacher made a significant difference on mathematics fear). In this study, 60 students have been included from Burdur Province of Turkey. "Demographic Information Form" and "Mathematics Fear of Secondary School Students" scales were used for the measurements. T-test and one way ANOVA were employed. According to the results presented, there is a significant correlation between the fear of mathematics fear and the other variables, except the gender variable. Considering the results of the analyses related to "how these factors have affected the fear of math", it was determined that the main factor affecting the fear of mathematics was the grades of math.

Keywords: *Fear of math, mathematics achievement*

1. Introduction

In the process of learning mathematics, emotional component has an important role (Zan, Brown, Evans, & Hannula, 2006; McLeod & Adams, 1989). Emotions and cognition affect each other (Hannula, 2002). The emotions such as anxiety and fear may become continuous and have negative effects on mathematical performance. Furthermore, they may also cause mathematics phobia in the adult ages (Tobias, 1978; Buxton, 1981). The research that was carried out by Pantziara and Philippou (2011) revealed that fear of failure in mathematics was a complicated affective factor based on several sources such as family context, students' characteristics and teachers' practices. The analysis carried out by Martino and Zan (2013) showed that fear of mathematics, which is often correlated to fear of failure, have a strong cognitive origin and at the same time, influenced the possibility of managing one's own cognitive resources in the best way. According to them, fear of mathematics was a possible factor of local failure, since it does not allow for the best use of one's competence and knowledge, but also a possible factor of global failure (since it might lead to give up engagement with mathematics).

While the term of fear is used for situations that the reason of fear is known; the term of anxiety is used as a vague fear without knowing what the matter is (Morgan, 1984). Anxiety is a psychological situation consisting of concern and tension (Parham, 1988). Fear comes out in a case of real danger or threat, and is a normal emotion to protect physical, psychological, social being (Köknel, 2004). Freud (1927) described fear as a reaction towards a real danger threatening the person from outside; and the anxiety as a reaction towards a danger treating the person from inside. According to Rogge (2001); while fear is related directly to an object; anxiety comes out generally with polysemy that teases a person and evokes a danger. Jersild (2005) describes fear to be aware of what scares him/her, and the anxiety to be unaware of what disturbs him/her which is usually not known. Anxiety is sort of an undercurrent experienced by every single person, and also sort of an emptiness waiting to be filled by content. When that content is

found, then anxiety turns into fear. The degree of the fear is directly depending on the importance that the person dedicated or related to the situation (Arıkam, 2004).
The anxiety of mathematics includes fear and the behaviors of avoidance of this course. In the case of progress, the person might believe that he/she is not going to be successful in overcoming the situation that he/she worries about. According to Ünlü (2007), the anxiety of failure towards mathematics causes the fear of mathematics. Some common statements such as "mathematics is so difficult", "mathematics is for gifted people", and "a good job is not possible without overcoming it" can be affective on the development of fear of mathematics since the years of childhood. Besides, the parents transmit their fear of mathematics and troubles to their children that can also cause anxiety of mathematics (Williams, 1988).

The attitude towards mathematics and mathematics teacher, mathematics achievement, parents' attitude, the fear and anxiety of mathematics experienced by the parents, attitude of the teachers, ineffectual teaching methods, personality, low mathematics self-efficacy are the major variables affecting the fear of mathematics (Solak, 2011; Başar, Ünal & Yalçın, 2002; Yüksel-Şahin, 2004, 2008; Mcleod, 1993; Keklikci & Yılmazer, 2013; Ma & Xu, 2004; Thomas & Furner, 1997; Hadfield & McNeil, 1994; Norwood, 1994; Williams, 1994; Townsend, Moore, Tuck, & Wilton, 1998; Arıkam, 2004; Dede & Dursun, 2008). On the other hand, improving mathematical capability of the students is also important in order to get over the fear and anxiety mathematics. There are personal, pedagogic and environmental factors affecting mathematics achievements of the students as follows: Mathematical intelligence, parental socio-economic status, the factor of teacher, teaching methods, learning environment, family contribution, the student's attitude towards mathematics, self-confidence, motivation, mathematics and exam anxiety, learning style, and time spent for studying mathematics (Öksüzler & Sürekçi, 2010; Azina & Halimah, 2012; Özer & Anıl, 2011; Skourasa, 2014; Savaş, Taş, & Duru, 2010; Mohammadpour, 2012; Al-Agili, Mamat, Abdullah, & Abd Maad, 2013; Demir & Kılıç, 2010; Pala, 2008; Gürsakal, 2012; Maat, Zakaria, Nordin, & Meerah, 2011).

Sewell (1981) suggested that at least half of the population, including many with high mathematical qualifications, had negative feelings towards mathematics, ranging from lack of confidence to anxiety and even fear. Studies have shown that the higher the level of anxiety of mathematics results in students to avoid mathematics-related tasks, courses or careers (Betz, 1978; Zettle & Houghton, 1998). Waldington, Austin & Bitner (1983) found that people who have poor mathematics attitudes are fearful of mathematics or have intense negative emotions about anything remotely dealing with mathematics (Sherman & Christian, 1999); whereas high achieving students in mathematics have low anxiety (Aiken, 1970, 1976; Clute, 1984; Crosswhite, 1972; Hendel, 1977; Richardson & Suinn, 1972). A positive attitude toward mathematics and higher mathematics achievement is related to lower anxiety of mathematics (Duru ve Savaş, 2005; Hembree, 1990). Poor performance in mathematics has been linked to an increase in mathematics anxiety (Furner & Duffy, 2002; Hopko et.al., 2003). Also, there is a negative correlation between mathematics anxiety and attitudes toward mathematics (Sherman & Christian, 1999; Fitzgerald, 1997).

There are many studies in the literature related to the variables affecting the fear of mathematics such as parental level of education, parental socio-economic status, gender of the students, type of school or class, level of class, mathematics performance, perception of the students about their mathematics teachers, gender of mathematics teacher, and learning environment (Keklikçi & Yılmazer, 2013; Yüksel-Şahin, 2008; Söylemez & Kinay, 2012; Başar, Ünal & Yalçın, 2002; Davarcıoğlu, 2008; Hlalele, 2012; Karimi & Venkatesan, 2009; Martino & Zan, 2010). The aim of this research was investigating whether the fear of mathematics differ significantly by the variables given in Table 1 and also investigating whether the grades of mathematics are the main reason affecting the fear of mathematics? In other words, what is the main factor (predictor variable) affecting the fear of mathematics? In this regard, the current research can be seen as a further research exploring the root of the fear of mathematics. At this point, it is important for educators to observe prevalence of fear of mathematics and to implement strategies toward the

alleviation of the effects of the anxiety of mathematics. In this study, the level of the students' fear of mathematics was also investigated. Therefore, the current research contributed to the related literature in terms of these three aspects, and the results of the study have some implications for students, teachers, counsellors, as well as parents in handling mathematics fear.

2. Method

The aim of this study is determining the relationship between the fear of mathematics and the variables that are given in Table 1 (Question 1); the students' level of mathematics fear (Question 2); if the grades of mathematics are the main factor of the students' fear of mathematics (Question 3). This is a quantitative research that relies on relational scanning model within the context of General Scanning Model. Relational Scanning Model is used to determine the relation among two or more variables (Karasar, 2006). The independent variables and the codes are given in the Table 1 at below.

Table 1. The independent variables and codes

Variables	Codes				
Parental education	Elemantary school (E)		High School (H)		University (U)
Gender	Female (F)	Male (M)			
Students' divisions	Science-mathematics (SM)		Turkish-mathematics (TM)		Social sciences (SS)
Mathematics teachers' capability	Hardly capable (H)	Partially capable (P)		Capable (C)	Completely capable (CC)
Mathematics lesson grades	1	2	3	4	5

Participants

There are 3 Anatolian high schools in the centre of Burdur, Turkey and 2 out of them were selected randomly and included in the study. Then, a total of 60 students were selected from 9^{th}, 10^{th}, 11^{th} grades randomly. The participants are given in Table 2 at below. In Turkey, the students are required to pass an exam to be accepted by Anatolian high schools. On the other hand, the students who are in the division of science-mathematics (SM) take more mathematics and science lessons and their ability of mathematics are better than the others. Those in the division of Turkish-mathematics (TM) take science lessons lesser and their ability of mathematics are lower than those in the science-mathematics classes. Besides, these students take more Turkish literature courses. The students in the division of social sciences (SS) take more social science courses and their ability of mathematics and science is lower compared to other students. The distribution of the students based on their division and gender is given in Table 2.

Table 2. The distribution of the students depending on division and gender

	F	M	Total
SM	5	20	25 (42%)
TM	9	10	19 (32%)
SS	10	6	16 (27%)
Total	24	36	60

The parental level of education is presented in Table 3.

Table 3. Parental level of education

	Elementary school (E)	High school (H)	University (U)
Mother	19 (32%)	25 (42%)	16 (27%)
Father	6 (10%)	28 (47%)	26 (43%)

The mathematics grades of the students' (over 5) are given in Table 4.

Table 4. The students' grades in mathematics

1	2	3	4	5
4 (7%)	5(8%)	7(12%)	22(37%)	22(37%)

Data collection

"Demographic Information Form" was used in order to get the data related to the variables affecting the fear of mathematics. In this form, the students were asked to give information about 5 variables given in Table 1. On the other hand, 30-item "Mathematics Fear of Secondary School Students" scale, which was developed by Davarcıoğlu (2008), was used to determine the students' fear of mathematics. The "Cronbach's alpha" reliability coefficient of the scale of was determined as 0.920 by Davarcıoğlu. This 5-point Likert scale consist of the items as "strongly agree", "agree", "neutral", "disagree", "strongly disagree", and the points are in the range of 1 to 5, in which higher score means higher level of fear. Considering the scales, the distribution can be categorized such as: "understanding the mathematical knowledge (9 items)", "teacher's attitude and teaching approach (9)", "attention to mathematics (6)", "to feel excluded and shame because of failure (2)", "prejudgment towards mathematics (1)", "to know how to study mathematics (1)", "family pressure (1)", and "exam anxiety (1)".

Data analyses

Independent-samples t-test and one-way ANOVA were employed to analyze the data. T-test was used to analyze the relation between the points of mathematics fear and gender. One-way ANOVA was used to analyze the relationship between the points of mathematics fear and the other variables. Besides, Scheffe test was used to determine the significance between the categories of independent variables (I). One-way ANOVA was conducted to see whether there is a significant relationship between the grades of mathematics and division, level of parental education, teacher's capability. In addition, Scheffe test was carried out to see the categories of the independent variables to find out which one or ones have caused this difference (II). Then, it was compared whether the categories (I) and (II) were the same to investigate whether grade of mathematics is the main factor affecting the mathematics fear.

3. Findings

Findings related to question 1

Average points of mathematics fear according to the divisions are given in Table 5.

Table 5. Average points of mathematics fear depending on the divisions

	N	Mean	Std. Deviation
SM	25	50,4	9,8
TM	19	83,6	25
SS	16	102,6	17,6

As it can be seen on Table 5, the students in the social sciences division have higher level of fear of mathematics followed by the students of Turkish-mathematics and science-mathematics respectively. The results of ANOVA test which was carried out to see whether there was any difference between the points of the fear of mathematics depending on the divisions are given in the Table 6.

Table 6. Results of ANOVA related to points of mathematics fear depending on the divisions

	Sum of squares	df	Mean square	F	Sig.	Groups
Between Groups	28746.865	2	14373.432	44.853	.000	SM-TM, SM-SS, TM-SS
Within Groups	18266.119	57	320.458			
Total	47012.983	59				

As it can be seen on Table 6, there is a significant correlation between the fear of mathematics of the students and their subject matter divisions [F(2-57)=44.85, p<.01]. According to Scheffe test, there is a significant difference between SS-TM, SS-SM and TM-SM.

Table 7. Average points of mathematics fear depending on the grades of mathematics

Grade	Frequency	Mean	Std. Deviation
1	4	110,5	8,9
2	5	115,2	17,1
3	7	99,1	15,5
4	22	76,6	21
5	22	49,6	12,8

Average points of mathematics fear according to the grades of mathematics are given in Table 7. It can be said that as the grades of mathematics increase, fear of mathematics decreases. The ANOVA test which was carried out to see whether there was any difference between mathematics fear points according to the mathematics lesson grades are given in the Table 8.

Table 8. ANOVA results of mathematics fear points depending on the grades of mathematics

	Sum of squares	df	Mean square	F	Sig.	Groups
Between Groups	31461,917	4	7865,479	27,818	,000	1-4, 1-5, 2-4, 2-5, 3-5, 4-5
Within Groups	15551,066	55	282,747			
Total	47012,983	59				

As it can be seen on Table 8, there is a significant correlation between the fear of mathematics of the students and their grades of mathematics [F(4-55)=27.818, p<.01]. According to Scheffe test, there is a significant difference between 1-4, 1-5, 2- 4, 2-5, 3-5, 4-5. Hereby, it can be stated that the students fall into those 3 groups respectively in terms of their fear of mathematics based on their grades as follows: 1,2,3 (group 1), 4 (group 2), 5 (group 3). Average points of mathematics fear according to education level of mother are given in Table 9.

Table 9. Average points of mathematics fear depending on education level of mother

	N	Mean	Std. Deviation
E	19	88,8	27,2
H	25	77,7	28,2
U	16	53,6	15,1

It can be said that as the education level of mother increase, fear of mathematics of the students decreases. The results of ANOVA test which was carried out to see whether there was any difference between the points of the fear of mathematics depending on education level of mother are given in the Table 10.

Table 10. ANOVA results of mathematics fear points depending on education level of mother

	Sum of squares	df	Mean square	F	Sig.	Groups
Between Groups	11133.667	2	5566.834	8.844	.000	E-U, H-U
Within Groups	35879.316	57	629.462			
Total	47012.983	59				

As it can be seen on Table 10, there is a significant correlation between the fear of mathematics of the students and education level of mother [F(2-57)=8.844, p<.01]. According to Scheffe test, there is a

significant difference between levels of elementary-university and high school-university. According to this, there is a significant difference between those whose mothers have university degree and the others in terms of the fear of mathematics. Average points of mathematics fear according to education level of father are given in Table 11.

Table 11. Average points of mathematics fear depending on education level of father

	N	Mean	Std. Deviation
E	6	107,5	27
H	28	81,8	26,4
U	26	59,8	20,9

It can be said that as the education level of father increase, fear of mathematics of the students decreases. The results of ANOVA test which was carried out to see whether there was any difference between the points of the fear of mathematics depending on education level of father are given in the Table 12.

Table 12. ANOVA results of the points of mathematics fear depending on education level of father

	Sum of squares	df	Mean square	F	Sig.	Groups
Between Groups	13612.195	2	6806.097	11.615	.000	E-U, H-U
Within Groups	33400.788	57	585.979			
Total	47012.983	59				

As it can be seen on Table 12, there is a significant correlation between the fear of mathematics of the students and education level of father [F(2-57)=11.615, p<.01]. According to Scheffe test, there is a significant difference between levels of elementary-university and high school-university. According to this, there is a significant difference between those whose fathers have university degree and the others in terms of the fear of mathematics. Average points of mathematics fear depending on capability of teacher are given in Table 13.

Table 13. Average points of mathematics fear depending on the capability of teacher

	N	Mean	Std. Deviation
N	8	114,9	13,3
P	14	92,4	21,4
C	31	63,2	20,1
CC	7	45,4	7,7

It can be said that as capability of teacher increase, fear of mathematics of the students decreases. The results of ANOVA test which was carried out to see whether there was any difference between the points of the fear of mathematics depending on capability of teacher are given in the Table 14.

Table 14. ANOVA results of the points of mathematics fear depending on capability of teacher

	Sum of squares	df	Mean square	F	Sig.	Groups
Between Groups	27378.341	3	9126.114	26.029	.000	H-C, H-CC, P-C, P-CC
Within Groups	19634.642	56	350.619			
Total	47012.983	59				

As it can be seen on Table 14, there is a significant correlation between the fear of mathematics of the students and capability of teacher [F(3-56)=26.029, p<.01]. According to Scheffe test, there is a significant difference between levels of H-C, H-CC, P-C, P-CC. Considering the results of Scheffe test, the students can be divided into 2 groups in terms of the fear of mathematics: those who perceive their mathematics teacher to be "hardly capable (H)" or "partially capable(P)" (group 1) and "capable (C)" or ''completely capable(CC)'' (group 2).

The independent samples of t-test which was carried out to see whether there was any difference between the fear of mathematics and the gender of the students are given in Table 15.

Table 15. Results of t-test depending on the points of mathematics depending on gender

Gender	N	$\bar{X}$	S	sd	t	p
Female	24	82	30.83	106	1.642	.238
Male	36	70	25.66			

As it can be seen on Table 15, there is no significant relation between fear of mathematics and the gender of the students.

In order to see the situtation generally, the disribution of the points of mathematics fear depending on the independent variables is presented in the Figure 1 below.\

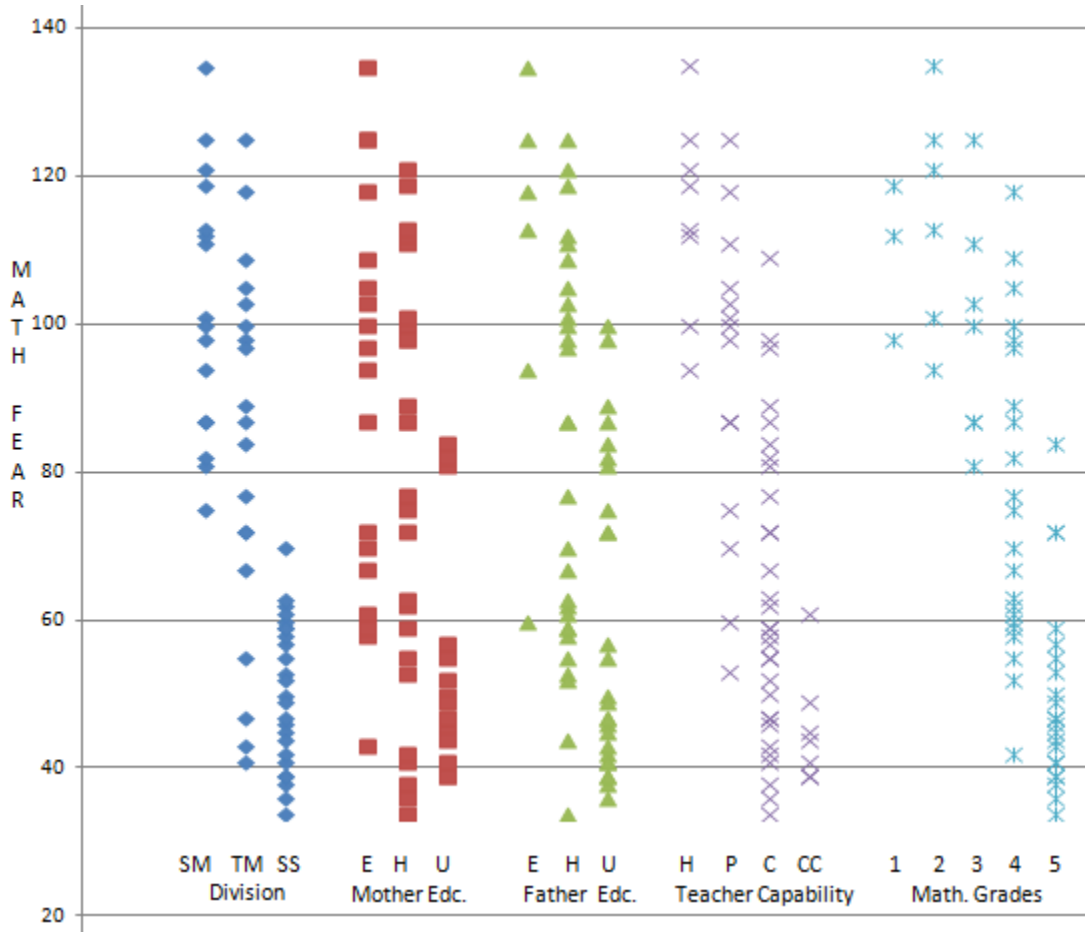

Figure 1. Distribution of the relation between fear of mathematics and the other variables

Findings related to question 2

The average scores of the students' on the fear of mathematics fear are given in Table 16.

Table 16. Points of Mathematics Fear

N	$\bar{X}$	sd	Min	Max
60	75	28	34	135

It can be seen from Table 16 that the students' average score is 75. The scale is 5-point and there are 30 items, therefore the score of the scale is in the range of 30-150. In this situation, it can be stated that the students' fear of mathematics is at a medium level.

Findings related to question 3

In order to answer the 3rd question of the research, firstly the ANOVA analysis was used to see whether the achievement of mathematics is affected significantly by the education level of the parents, the capability of the teacher and the division of the students and, if there was a significant difference, then Scheffe test was carried out to see the categories of this variable to find out which one or ones caused this difference. Afterwards, these categories and the categories of those variables mentioned above that created significant difference on fear of math, which were given on Tables 6, 10, 12, 14, have been compared with each other in terms of similarity. For example, there was a significant difference between the education level of the mother and the fear of mathematics (Table 10) and this difference was occurred between E-U and H-U. Thus, the fear of mathematics significantly differs between the students whose mother holding an undergraduate degree and other students. In table 18, it has been analyzed that whether the achievement of mathematics differs significantly depending on the education level of the mother and it has been determined that there is a significant difference between the E-U and H-U groups in terms of achievement of mathematics. In this situation, it has been observed that the groups that are differed in terms of the fear of mathematics and the groups that are differed in terms of mathematics achievement are the same groups. This finding has been interpreted as the main factor of fear of mathematics is the mathematics achievement rather than the education level of mother. In other words, the education level of mother is as important as it contributes to the mathematics achievement of the student in terms of the fear of mathematics. This approach was examined also in terms of the education level of the father, capability of the teacher and division of the student.

The results of ANOVA analyses, which were conducted to determine if there is meaningful correlation between mathematics achievements of the students and division, parental education level, and capability of mathematics teacher, are given in Tables 17-20.

Table 17. ANOVA results of the grades of mathematics depending on divisions

	Sum of squares	df	Mean square	F	Sig.	Groups
Between Groups	55.062	2	27.531	53.886	.000	SM-SS, TM-SS
Within Groups	29.122	57	.511			
Total	84.183	59				

According to Table 17, the grades of mathematics differ significantly depending on their divisions [$F(2\text{-}57)=53.886$, $p<.01$]. This difference came out between SM-S and TM-S. Considering the comparison of this result and the result given in Table 6, it seems that the difference between them is only SM-TM. In this case, it can be said that the major factor why the division made a significant difference over fear of mathematics is the mathematics achievement.

Table 18. ANOVA results of the grades of mathematics depending on education level of mother

	Sum of squares	df	Mean square	F	Sig.	Groups
Between Groups	16.838	2	8.419	7.126	.002	E-U, H-U
Within Groups	67.345	57	1.181			
Total	84.183	59				

According to Table 18, the grades of mathematics differ significantly depending on education level of mother [$F(2\text{-}57)=7.126$, $p<.01$]. This difference came out between E-U and H-U. When these results are compared with the results given in Table 10, it seems that the groups are the same. In this case, it can be said that the main reason why education level of mother made a significant difference over fear of mathematics is the mathematics achievement. In other words, as the mother's level of education has an impact over mathematics lesson grades, a significant difference appeared between mother's level of education and fear of mathematics.

Table 19. ANOVA results of the grades of mathematics depending on education level of father

	Sum of squares	df	Mean square	F	Sig.	Groups
Between Groups	29.529	2	14.765	15.399	.000	E-U, H-U
Within Groups	54.654	57	.959			
Total	84.183	59				

According to Table 19, the grades of mathematics differ significantly depending on education level of father [F(2-57)=15.399, p<.01]. This difference came out between E-U and H-U. When these results are compared with the results given in Table 12, it seems that the groups are the same. In this case, it can be said that the main reason why education level of father made a significant difference over fear of mathematics is the mathematics achievement. In other words, as the education level of father has an impact over mathematics achievement, a significant difference appeared between father's level of education and fear of mathematics.

Table 20. ANOVA results of the grades of mathematics depending on capability of teacher

	Sum of squares	df	Mean square	F	Sig.	Groups
Between Groups	56.934	3	18.978	39.003	.000	H-P, H-C, H-CC, P-C, P-CC
Within Groups	27.249	56	.487			
Total	84.183	59				

According to Table 20 the grades of mathematics differ significantly depending on the capability of teacher [F(3-56)=39.003, p<.01]. When these results are compared with the results given in Table 14, it seems that the difference between them is only H-P. In this case, it can be said that the major factor why the capability of teacher made a significant difference over fear of mathematics is the mathematics achievement**.**

In order to depict the findings above, the groups creating significant difference on the basis of mathematics fear and mathematics lesson grades are given in Figure 2 at below.

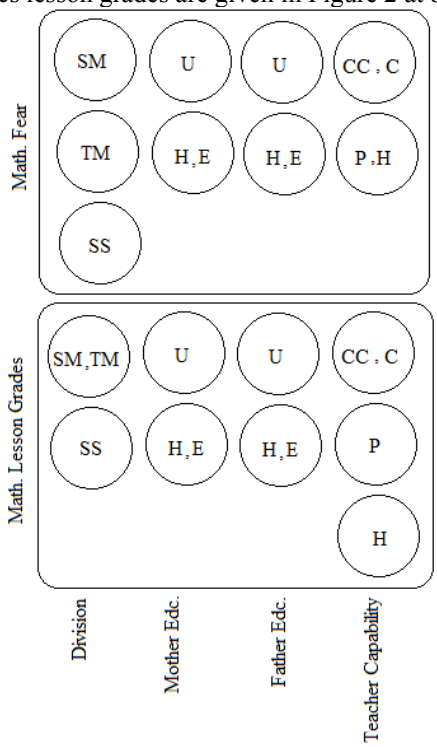

Figure 2. The groups creating significant difference on the basis of fear of mathematics and grades of mathematics.

As it can be seen on Figure 2, the groups differentiating by mathematics lesson grades and mathematics fear are nearly same.

4. Results and Discussion

The students' fear of mathematics is neither more nor less. On the other hand, while there is no significant relation between the fear of mathematics and gender of the students, there is a significant relation between the fear of mathematics and grades of mathematics, division, parental education level, and capability of teacher. At the end of the analyses which were conducted to investigate why division, parental education level, and capability of teacher had a significant impact on the fear of mathematics, it was understood that the major factor was the grades received from math class (math achievement). In other words, it can be said that these variables are effective factors to decrease the fear of mathematics as long as they increase the students' grades of mathematics.

Hlalele (2012) revealed that all learners sometimes, often, or always experienced mathematics anxiety in academic settings. According to the results of the study carried out by Kinay (2011) and Keklikci & Yılmazer (2013), it has been revealed that the fear of mathematics experienced by the elementary school students was is at a low level. Besides, Kinay (2011) revealed that the students' fears toward mathematics course have differed significantly depending on class level, mathematics lesson grades, gender of the mathematics teachers, parental education level, parental economic status, except the gender of the students. In his study, Davarcıoğlu (2008) found out that the 9th grade students' levels of mathematics fear have differed significantly depending on the level of education of their fathers. He expressed that the fear of mathematics has decreased as father's level of education increased; on the other hand, there was no relationship between gender and mother's level of education and students' gender. In his literature review, Baloğlu (2001) revealed that there was no consensus about the relationship between the fear of mathematics and gender. Yenilmez & Özbey (2006) and Konca (2008) indicated that there was a significant relationship between mathematics anxiety and education level of mother. In some other studies, it was determined that high achieving students in mathematics had low anxiety (Aiken, 1970; Clute, 1984; Crosswhite, 1972; Hendel, 1977; Richardson & Suinn, 1972), poor performance in mathematics had been linked to an increase in the anxiety of mathematics (Furner & Duffy, 2002; Hopko et.al., 2003). Fennema (1980) found that there is an undeniable relationship between mathematics anxiety and mathematics-related performance. In his research, Hembree (1990) said that "The higher the level of mathematics anxiety, the lower the performance level in mathematics". However, in this research it was determined that the direction of that relationship was from mathematics performance to the fear of mathematics.

Considering the scale of math fear, it has been seen that half of the items are based on mathematics achievement, understanding mathematics, being successful in mathematics. Therefore, it can be understood that why as the grades of students received from math class increase, their fear of math decreases. Considering the main factor reducing the fear of mathematics was achievement in mathematics course; therefore, the teachers and families should try to increase the student's achievement in mathematics if the student had a considerable fear towards mathematics. Besides, in the curriculum of the math class, the objectives must be chosen in accordance with the cognitive level of children and the math teachers encourage their students to be successful in the math class. On the other hand, as those parents transmit their fear of mathematics to their children might cause a fear of mathematics for children too (Williams, 1988). Therefore, the families should pay more attention to prevent such situation. Additionally, teachers should create such a classroom environment that the students feel comfortable to ask whatever they don't understand. Dursun and Peker (2003) determined that only 25% of the students could ask questions comfortably to their teachers.

References

Aiken, L. R., Jr. (1970). Attitudes toward mathematics. *Review of Educational Research, 40*, 551–596.

Al-Agili, M.Z.B., Mamat, M.B., Abdullah, L., & Maad, H.A. (2013). Path analysis of the factors influencing students' achievement in mathematics. *Australian Journal of Basic and Applied Sciences, 7(4),* 437-442.

Arıkam, G. (2004). *Kırşehir ilköğretim II. kademe öğrencilerinin matematik kaygı düzeyleri ile matematik başarıları arasındaki ilişki* (The relationship between mathematics level of anxiety of middle school students in Kırşehir and their mathematics achievements) (Unpublished master's thesis). Gazi University, Ankara.

Azina, I.N. & Halimah, A. (2012). Student factors and mathematics achievement: Evidence from TIMSS 2007. *Eurasia Journal of Mathematics Science & Technology Education 8(3),* 249-255.

Baloğlu, M. (2001). Matematik korkusunu yenmek (overcoming mathematics fear). *Kuram ve Uygulamada Eğitim Bilimleri Dergisi, 1(1),* 59-76.

Başar, M., Ünal, M., & Yalçın, M. (2002, October). *İlköğretim kademesiyle başlayan matematik korkusunun nedenleri* (Reasons of mathematics fear from elementary school). Paper presented at the meeting of V. Fen Bilimleri ve Matematik Eğitimi Kongresi, Ankara.

Betz, N. E. (1978). Prevalence, distribution, and correlates of mathematics anxiety in college students. *Journal of Consulting Psychology*, 25:151–157.

Buxton, L. (1981). *Do you panic about maths? Coping with maths anxiety*. London: Heinemann.

Clute, P. (1984). Mathematics anxiety, instructional method, and achievement in a survey course in college mathematics. *Journal for Research in Mathematics Education, 5*, 50-58.

Crosswhite, F. J. (1972). *Correlates of attitudes toward mathematics* (Report NLSMA Reports No. 20): Ohio State University.

Davarcıoğlu, P. (2008). Orta öğretim dokuzuncu sınıf öğrencilerinin matematik korkusu (Mathematic fear of secondary high school ninth class students) (Unpublished master's thesis). Abant İzzet Baysal Üniversitesi, Bolu.

Demir, İ. & Kılıç, S. (2010). Öğrencilerin matematík başarısına etkileyen faktörlerin PISA 2003 kullanılarak incelenmesi (Using PISA 2003, examining the factors affecting students' mathematics achievement). *Hacettepe Üniversitesi Egitim Fakültesi Dergisi, 38,* 44-54.

Dede, Y. & Dursun, S. (2008). İlkoğretim II. kademe öğrencilerinin matematik kaygı düzeylerinin incelenmesi (An investigation of Primary School Students' Mathematics Anxiety Levels). *Uludağ Universitesi Eğitim Fakültesi Dergisi, 21(2),* 295-312.

Dursun, Ş. & Peker, M. (2003). İlköğretim altıncı sınıf öğrencilerinin matematik dersinde karşılaştıkları sorunlar (problems of sixth grade students in primary school for mathematics). *Cumhuriyet Üniversitesi Sosyal Bilimler Dergisi 27(1),* 135-142.

Duru, A. & Savaş, E. (2005). Matematik Öğretiminde Cinsiyet Farklılığı. *Erzincan Eğitim Fakültesi Dergisi,* 7(1), 35-46.

Fennema, E. (1980). Sex-related differences in mathematics achievement: Where and why. In L. H. Fox, L. Brady & D. Tobin (Eds.), *Women and the mathematical mystique*. Baltimore, MD: The Johns Hopkins University Press.

Fitzgerald, S. M. (1997). The relationship between anxiety and statistics achievement: a meta–analysis (Unpublished Doctorate thesis), University of Toledo, Toledo.

Freud, S. (1927). *Inhibition symptom and anxiety*. Stanford Co. Psychoanalytic Institute.

Furner, J.M. & Duffy, M.L. (2002). Equity for all students in the new millennium. Disabling mathematics anxiety. *Intervention in School and Clinic*, 38, 67-74.

Gençöz, T. (1998). Korku: Sebepleri sonuçları başetme yolları (Fear: reasons, consequences, ways of coping). *Kriz dergisi, 6(2),* 9-16.

Güner, O. (2006). *Hani okulu sevecektim!* (I'd like school) İstanbul: Morpa Kültür Yayınları.

Güngör, A. (1990, September). *Ana-baba tutumlarının çocuğun özsaygı düzeyine etkisi (Effect of parent's attitudes on child's level of self esteem).* Paper presented at the meeting of 1. Eğitim Bilimleri Sempozyumu, İstanbul.

Gürsakal, S. (2012). PISA 2009 öğrenci başarı düzeylerini etkileyen faktörlerin değerlendirilmesi (Evaluating of the factors affecting levels of students' achievement in PISA 2009). *Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 17(1),* 441-452.

Hadfield, O.D. & McNeil, K. (1994). The relationship between myers-briggs personality type and mathematics anxiety among preservice elemantary teachers. *Journal of Instructional Psychology, 21(4),* 375-385.

Hannula, M.S. (2002). Goal regulation: Needs beliefs and emotions. In A. D. Cockburn & E. Nardi (Eds.) *Proceedings of the 26th Conference of the International group for the Psychology of Mathematics Education* (Vol. 4 pp. 73-80). Norwich UK: University of East Anglia.

Hendel, D. D. (1977). *The Mathematics Anxiety Program: Its genesis and evaluation in continuing education for women* (Report ERIC Document Reproduction Service No. ED 156 727). Minneapolis: Measurement Services Center, University of Minnesota.

Hembree, R. (1990). The nature, effect and relief of mathematics anxiety. *Journal for Research in Mathematics Education*, 21, 33-46.

Hlalele, D. (2012). Exploring rural high school learners' experience of mathematics anxiety in academic settings. *South African Journal of Education, 32,* 267-278.

Hopko, D. R., McNeil, D. W., Lejuez, C. W., Ashcraft, M. H., Eifert, G. H. & Riel, J. (2003). The effects of anxious responding arithmetic and lexical decision task performance. *Journal of Anxiety Disorders,* 17(6), 647-665.

Jersild, A.T. (2005). *Öğretmenin kendisiyle yüzleştiği an* (Çev. A. Kaplan). İstanbul: Dem Yayınları.

Karimi, A. & Venkatesan, S. (2009). Mathematics anxiety mathematics performance and academic hardiness in high school students. *Int J Edu Sci, 1(1),* 33-37.

Keklikci, H. & Yılmazer, Z. (2013). İlköğretim öğrencilerinin matematik korku düzeyleriyle matematik öğretmenlerine yönelik görüşleri arasındaki ilişkinin belirlenmesi (Determining the relationship between primary students' level of maths fear and views about their mathematics teachers). *Eğitim ve Öğretim Araştırmaları Dergisi 2(3),* 198-204.

Kinay, İ. (2011). İlköğretim II. Kademe öğrencilerinin matematik dersine yönelik korkuları (Diyarbakır İli Örneği) (Mathematics fear of primary school second grade students: A Sample of Diyarbakir Province) (Unpublished master's thesis). Dicle Üniversitesi, Diyarbakır.

Konca, Ş. (2008). 7. sınıf öğrencilerinin matematik kaygısının nedenlerinin bazı değişkenler açısından incelenmesi (A research on mathematics anxiety of 7th grade students in the view of some variables) (Unpublished master's thesis). Yüzüncü Yıl Üniversitesi, Van.

Köknel, Ö. (2004). *Korkular takıntılar saplantılar (Fears and obsessions)*. İstanbul: Altın Kitaplar Yayınevi.

Ma, X. & Xu, J. (2004). The causal ordering of mathematics anxiety and mathematics achievement: a longitudinal panel analysis. *Journal of Adolescence, 27(2),* 165-179.

Maat, S.M., Zakaria, E., Nordin, N.M., & Meerah, T.S.M. (2011). Confirmatory factor analysis of the mathematics teachers' teaching practices instrument. *World Applied Sciences Journal, 12(11),* 2092-2096.

Martino, P.D. & Zan, R. (2013). Where does fear of maths come from? Beyond the purely emotional. Paper presented at the meeting of *Eighth Congress of European Research in Mathematics Education (CERME 8),* Antalya.

Martino, P.D. & Zan, R. (2010). 'Me and maths': towards a definition of attitude grounded on students' narratives. *Journal of Mathematics Teacher Education, 13(1),* 27–48.

Mcleod, D.B. (1993). *Research on affect in mathematics education: A reconceptualisation*. London: Macmillan Publishing.

McLeod, D.B. & Adams, V.M. (Eds.) (1989). *Affect and mathematical problem solving. A new perspective.* New York: Springer Verlag.

Mohammadpour, E. (2012). Factors accounting for mathematics achievement of Singaporean eighth-graders. *The Asia-Pacific Education Researcher, 21(3),* 507-518.

Morgan, C.T. (1984). *Psikolojiye giriş*. Ankara: Meteksan Yayınları.

Norwood, K.S. (1994). The effect of instructional approach on mathematics anxiety and achievement. *School Science and Mathematics, 94(5),* 248-254.

Öksüzler, O. & Sürekçi, D. (2010). İlköğretimde başarıyı etkileyen faktörler: bir sıralı lojit yaklaşımı (Determinants of success in Turkish primary schools: an ordered logit approach). *Finans Politik & Ekonomik Yorumlar, 47(543),* 93-103.

Özer, Y. & Anıl, D. (2011). Öğrencilerin fen ve matematik başarılarını etkileyen faktörlerin yapısal eşitlik modeli ile incelenmesi (Examining the factors affecting students' science and mathematics achievement with structural equation modelling). *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 41,* 313-324.

Pala, N.M. (2008). Pisa 2003 sonuçlarina göre öğrenci ve sınıf özelliklerinin matematik okuryazarlığına ve problem çözmeye etkisi (The effect of student and class characteristics on mathematical literacy and problem solving in accordance with Pisa 2003 results) (Unpublished master's thesis). Balıkesir Üniversitesi, Balıkesir.

Pantziara, M. & Philippou, G. (2011, February). Fear of failure in mathematics. What are the sources? In M. Pytlak T. Rowland & E. Swoboda (Eds.). *Proceedings of the Seventh Congress of the European Society for Research in Mathematics Education,* Rzeszow.

Parham, C. (1988). *Psychology.* Ohio: South-Western Publishing Co.

Richardson, F.C. & Suinn, R.M. (1972). The mathematics anxiety rating scale: psychometric data. *Journal of Counseling Psychology*, 19, 551-554.

Rogge, J.U. (2001). *Çocukların korkuları vardır*. (Çev. İ. Çağlıdil). İstanbul: Rota Yayın.

Savaş, E., Taş, S., & Duru, A. (2010). Factors affecting students' achievement in mathematics. *İnönü University Journal of Faculty of Education, 11(1),* 113-132.

Sewell, B. (1981). *Use of mathematics by adults in daily life*. Leicester: Advisory Council for Adult Continuing Education (ACACE).

Sherman, H. J., & Christian, M. (1999). *Mathematics attitudes and global selfconcept: an investigation of the relationship*. *College Student Journal*, 33(1), 95-101.

Skourasa, A.S. (2014). Factors associated with middle-school mathematics achievement in Greece: the case of algebra. *International Journal of Mathematical Education in Science and Technology,* 45(1), 1-24.

Solak, S. (2011). İlköğretim beşinci sınıf öğrencilerinin matematik korkusu (Primary 5th grade students' mathematics fear) (Unpublished master's thesis). Uşak üniversitesi, Uşak.

Söylemez, Y. & Kinay, İ. (2012). The investigation of mathematics fear of primary scool second grade students according to some variables. *Electronic Journal of education Sciences 1(1),* 76-86.

Thomas, H. & Furner, J.M. (1997). Helping high ability students overcome mathematics anxiety through bibliotherapy. *Journal of Secondary Gifted Education, 8(4),* 164-179.

Tobias, S. (1978). *Overcoming mathematics anxiety*. New York: Norton.

Townsend, M., Moore, D.W., Tuck, B.F., & Wilton, K.M. (1998). Self concept and anxiety in university students studying social science statistics within a co-operative learning structure. *Educatioanal Pschology, 18(1),* 41-55.

Ünlü, E. (2007). İlköğretim okullarındaki üçüncü dördüncü ve beşinci sınıf öğrencilerinin matematik dersine yönelik tutum ve ilgilerinin belirlenmesi (Determining of 3rd, 4th and 5th grade students attitudes and interests towards mathematics lesson). *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi, 19,* 129-148.

Wadlington, E., Austin, S. & Bitner, J. (1983). The treatment of mathematics anxiety and negative mathematics self-concept in college students. *College Student Journal*, 26(1), 61-64.

Williams, J. (1994). Anxiety measurement construct validity and test performance. *Measurement and Evaluation In Counseling And Development, 27(1),* 302-308.

Yenilmez, K. & Özbey, N. (2006). Özel Okul ve Devlet Okulu Öğrencilerinin Matematik Kaygı düzeyleri Üzerine Bir Araştırma (A research on mathematics anxiety levels of the students of private school and the other schools). *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 19(2), 431-448.

Yüksel-Şahin, F. (2004). Orta öğretim öğrencilerinin ve üniversite öğrencilerinin matematik korku düzeyleri (Levels of the mathematics worry of high school students and university students). *Eğitim Bilimleri ve Uygulama, 3(5),* 57-74.

Yüksel-Şahin, F. (2008). Mathematics anxiety among 4th and 5th grade Turkish elementary school students. *International Electronic Journal of Mathematics Education, 3(3),* 179- 192.

Zan, R., Brown, L., Evans, J., & Hannula, M. (2006). Affect in Mathematics Education: an introduction. *Educational Studies in Mathematics Special Issue, 63(2),* 113-121.

Zettle, R. D., & Houghton, L. L. (1998). *The relationship between mathematics anxiety and social desirability as a function of gender*. *College Student Journal*, 32(1), 81-86.