

Pre-Service Teachers' Attitudes towards Mathematics in Turkey

Dilek Sezgin Memnun, Ph.D.

College of Education
Georgia State University
United States of America

Recai Akkaya, Ph.D.

Faculty of Education
Abant İzzet Baysal University
Turkey

Abstract

The aim of the study is to examine the attitudes towards mathematics of mathematics, science and elementary school pre-service teachers and to investigate the differences among gender, grades and teaching fields. A total of 456 pre-service teachers, who were studying in the Education Faculty of Abant İzzet Baysal University in Turkey in the 2011-2012 fall semester, including 141 mathematics, 163 science and 152 elementary school pre-service teachers participated in the research. The data of this research have been obtained as a result of the application of the Attitudes towards Mathematics Instrument on the mathematics, science and elementary school pre-service teachers that participated with the research. In conclusion, it has been understood that majority of the pre-service teachers have high level of positive attitudes towards mathematics, but some pre-service teachers' attitudes need to be developed. There is a significant difference between attitudes towards mathematics of sophomores and seniors pre-service teachers and there is not a significant difference between average points of female and male pre-service teachers in relation to their attitudes towards mathematics.

Key Words: Attitude, Attitudes towards mathematics, pre-service teachers.

Introduction

It is nowadays accepted that developing a positive attitude towards any kind of field or towards the learning is at least important during education as much as it is so for teaching about that field or the knowledge itself, at least. It can be said that learning and teaching of mathematics through affective variables are in close relationship in many ways for these fields and especially for the mathematics field. There is also a common opinion for this field, where individuals with positive attitudes towards mathematics would be more successful than the individuals with negative attitude (Reyes, 1984; Ma, 1997).

It is thought that attitudes towards mathematics have longer back ground for the mathematics education than other educational fields. From the definitions about the attitude notion, it could be seen that a common definition of this notion could not have been made but at the same time. None of these definitions could have been renounced (Hannula, Evans, Philippou & Zan, 2004). Attitude has been expressed as an inclination or as a pre-disposition that had been learned to respond in the individual sense in a positive or negative way towards an object, a situation, a notion or a person by Aiken (1970). Positive and negative affects of the individual about the issues of modevalue intensity and reasonable stability of the individual have been included on this definition, which has been put forward by Aiken, as cited in McLeod (1992).

Attitude has also been expressed by Petty and Cacioppo (1986) as general evaluations of individuals with regards to themselves, others or with regards to other objects, events or problems that rely on many different cognitive, affective and behaviour constitutive and has effect on development, change and formation of these. In similar fashion, attitude has also been expressed by Özgüven (1999) as the affective state of readiness or the inclination of individuals, which is observed in a form where individuals accept or refuse a certain person, group, an institution or a thought. It has also been expressed by Kağıtçıbaşı (1999) as the intellectual, emotional and behavioural response inclination that the individual has towards himself/herself or towards any kind of facts or objects being present around.

Although there is not any common definition that had been made with regards to the attitude, the common ground of many different definitions is the fact that attitude can be thought as a preparative behaviour or as a preparative inclination that includes cognitive, affective and behavioural components (Alkan, Bukova-Güzel & Elçi, 2004; Özlü, 2001). Thus, the notion of attitude, which varies according to the example and to the situation that has been studied, can be accepted in *general terms* as the positive or negative behaviour of a person towards an object, a situation or towards an event that had been handled. Behaviour towards mathematics can distinctively be defined as the inclination of the individual towards mathematics whether to like it or not, towards dealing with the mathematical activities or to run away from them and as the total measurement of the beliefs about being successful in the mathematics field or not and of the beliefs about mathematics being beneficial or not (Neale, 1969).

Attitude contains three components as the cognitive, emotional and the behavioural. The whole of the knowledge and thoughts with regards to mathematics being beneficial for the life, being able to contribute for technological developments and being helpful for reasoning can be considered as the cognitive components about the attitude in relation to the mathematics (Özlü, 2001). The emotional element on the other hand, depends on the previous experiences of the individual (Baysal, 1981). Positive affects like the pleasure the student gets by attending the mathematics grades, like the student finding the mathematics pleasurable. The negative affects like the student is afraid of the mathematics, hates mathematics homework, gets bored in mathematics grades can be considered as the cognitive components about the attitudes towards mathematics (Özlü, 2001). The behavioural element reflects observable behaviour tendencies of the individual towards the issue of the attitude. These behavioural tendencies are under the effects of attitudes that are not directly related with the habits, norms of the individual and not with the attitude object in question (Baysal, 1981). Behaviours of students, like giving priority for mathematics homework and studying, like continuing with the lessons, can be said to constitute the behavioural components of the student for the attitude towards the mathematics (Ertem & Alkan, 2003). In other words, attitudes of the individual towards mathematics are directly related to the liking of the individual the mathematics, to the fear of the mathematics, to getting pleasure from it, to valuing of it and being involved with the mathematics. Under the light of these definitions and explanations, these differing components about the attitudes towards mathematics have also been dealt as *liking, profession, fear, pleasure, materiality, interest and confidence* by Duatepe & Çilesiz (1999).

Attitudes towards mathematics is an important variable, which steers the behaviours of students about mathematics lesson as how they should be and which have contribution for their motivation, in other words, it can be considered as the determinant of personal emotions (Bayturan, 2004). There are also many researches (Aiken, 1970; Aşkar, 1976; Enemark & Wise, 1981; Maye & Kishor, 1997; Saracaloğlu, 2000; Suydam & Weaver, 1975; Uysal, 2007), where these state that the attitudes towards mathematics course. It is important for the success in mathematics (Enemark & Wise, 1981), has a important role for explaining mathematic successes of students. It is stated in researches that have been performed by Aiken (1970) and Enemark and Wise (1981) amongst others that there is rather strong relationship between mathematical success and the attitude even though this is not at very high level. In another research, which has been performed by Suydam and Weaver (1975), it has been stipulated that teachers generally believe students would be more successful in mathematics if they like the mathematics. They also believe that students learn in more effective way if they show interest in what they learn. In other words, attitudes of students towards mathematics are rather important for learning and for the education both in the classroom and outside of it (Royster, Haris & Schoeps, 1999). Therefore, creation of positive attitude by the students, development of their existing attitudes, keeping and strengthening of their positive attitudes should always be regarded (Suydam & Weaver, 1975). However, there is to be a great mission for teachers at this stage. In other words, teachers have a great role for the students as to their display of either positive or negative attitude (Başer & Yavuz, 2003).

Individuals exhibit negative attitudes towards mathematics lessons since they can not understand mathematics in full. Factors of *confidence, anxiety and teacher* are amongst the most important factors, which are exhibited towards mathematics by the students as negative attitude. One of these is the confidence, where the individual feels about his/her problem solving skills (Yıldızlar, 2001). The other one is the anxiety, where the students have about the success of mathematics. It is also known that there is a negative relationship between mathematics anxiety and attitudes towards the mathematics.

Anxiety about the mathematics is also affected by factors like psychological and emotional characters of individuals, like personalistic reasons as well as by reasons related to the mathematics education like the methods and the mathematical terms used for the mathematics education (Baloğlu, 2001). One of the most important factors for the development of attitudes is the teacher factor. This is because; teachers are the persons, who are active for the success of students during the education process (Başer & Yavuz, 2003). When the students have positive attitude about the mathematics, this will affect their academics success in the positive way in the future. Teachers are also the most important factor for the students for them to have this success (Çelik & Bindak, 2005). In addition, the teaching methods that the teachers use during mathematics lessons and the connections they create between the mathematics lesson and the daily life is also rather important for attitudes of students towards mathematics (Özgün-Koca & Şen, 2006).

It is a requirement that teachers should know teaching field well, should take pleasure from it, should love their profession and should have self confidence in order that students could develop their attitudes towards mathematics. For teachers to be able to provide contribution for students to have positive attitude, this can only be possible when teachers lecture the mathematics in explanatory way and in a form that it would cater for their requirements, when they create good relationship with students and when they provide means for students to like the mathematics lessons and themselves as teachers. It is also important that teacher should express the liking of the mathematics for his/her pupils and should convey the thought, where mathematics is exploring the human genius (Yılmaz, 2006: 242). All of these issues make it a requirement that teachers at first and the pre-service teachers should have positive attitudes towards mathematics.

Some of studies that have been performed in Turkey with respect to this field are about primary schools (Çankaya & Karamete, 2008; Köğce, Yıldız, Aydın & Altındağ, 2009; Şengül & Öz, 2008; Taşdemir, 2008 etc.) and some about elementary schools (Çelik & Ceylan, 2009; Peker & Mirasyedioğlu, 2003; Yıldız & Turanlı, 2010 etc.). Beside these, there are also studies in recent years that have been performed with pre-service teachers (Akay & Boz, 2011; Başer & Yavuz, 2003; Çelik & Bindak, 2005; Kızıloğlu & İpek, 2001; Özgen & Pesen, 2008). Amongst these studies, attitudes of mathematics, science and elementary school pre-service teachers towards mathematics have been studied within the research that have been carried out by Başer and Yavuz (2003) and the attitudes of elementary school pre-service teachers have been studied within the research that have been carried out by Çelik and Bindak (2005) and by Akay and Boz (2011). In the research that has been carried out by Başer and Yavuz (2003), differences between attitudes of pre-service teachers, who have their education in different teaching fields, have been found. It had been understood from the surveys made that the attitude points of mathematics pre-service teachers were the highest and the elementary school pre-service teachers had the lowest attitude points amongst pre-service teachers. Significant differences have not been found between attitudes of male and female pre-service teachers towards mathematics in researches that have been carried out by Çelik and Bindak (2005) and by Akay and Boz (2011). However, it has been reported in the research that have been carried out by Çelik and Bindak (2005) that female pre-service teachers had more positive attitudes towards mathematics than male pre-service teachers.

It is aimed in this research to determine attitudes of mathematics, science and elementary school pre-service teachers towards mathematics and shortcomings of pre-service teachers with regards to their attitudes and to manifest from which of the components these shortcomings arise out. It is aimed to examine whether pre-service teachers' attitudes towards mathematics change or not as being depended on the gender, level of their class and teaching field they are educated in. In this respect, response is sought for the research problems indicated below:

1. What are the attitudes towards mathematics of mathematics, science and elementary school pre-service teachers?
2. What are the points about sub-dimensions (*like, occupation, fear, pleasure, materiality, interest and confidence*) of the attitudes towards mathematics of mathematics, science and elementary school pre-service teachers?
3. Do the attitudes towards mathematics of the mathematics, science and elementary school pre-service teachers show significant difference according to gender?
4. Do the attitudes towards mathematics of the mathematics, science and elementary school pre-service teachers show significant difference according to grades?
5. Do the attitudes towards mathematics of the pre-service teachers show significant difference according to teaching fields they are educated in?

Methodology

Attitudes towards mathematics of mathematics, science and elementary school pre-service teachers have been examined and the differences among gender, grades and teaching fields have been investigated in this study.

Research Method

This research has been executed by using the general screening model of the descriptive research methods. The screening model is the research approach, which intends to describe a state that has been available in the past or in the present time. The event, the individual or an object, which is the subject of the research, is tried to be defined in this model within its own conditions and as it stands and the important issue here is to be able to observe the existing (Karasar, 2005: 77-78).

Participants

A total of 456 pre-service teachers, who were studying in the Education Faculty of Abant İzzet Baysal University in Turkey in the 2011-2012 fall semester, including 141 mathematics, 163 science and 152 elementary school pre-service teachers participated in the research. 117 of these students were freshmen, 119 of them were sophomores, 106 of them were juniors and 114 of them were seniors. The percentage and frequency values with regards to the teaching fields and to grades of pre-service teachers are included Table 1.

Table 1. The percentage and frequency values with regards to teaching fields and to grades of pre-service teachers

Grade	Teaching Fields							
	Mathematics		Science		Elementary		Total	
	f	%	f	%	f	%	f	%
Freshmen	40	34.2	37	31.6	40	34.2	117	100
Sophomores	36	30.3	42	35.3	41	34.5	119	100
Juniors	38	35.8	41	38.7	27	25.5	106	100
Seniors	27	23.7	43	37.7	44	38.6	114	100
Total	141	30.9	163	35.7	152	33.3	456	100

Data Collection Instrument

The data of this research have been obtained as a result of the application of the *Attitudes towards mathematics Instrument*, which has been developed by Duatepe and Çilesiz in 1999, on the mathematics, science and elementary school pre-service teachers that participated with the research. Attitudes towards mathematics instrument, which have been prepared in five point likert scale, contains 38 items. The highest point that can be obtained from this scale is 220 and the lowest point is 44. The highest point that could be obtained from the instrument is accepted as the attitudes towards mathematics of mathematics, science and elementary school pre-service teachers being high. In addition to this, a conclusion can be reached about the attitudes towards mathematics levels of individuals by dividing the total points obtained from the instrument to the number of items.

The instrument consists of 4 dimensions. 13 items in first dimension measure *like, interest and enjoyment* to mathematics, 9 items in second dimension measure *confidence and anxiety*. Third dimension includes 8 items and measure occupational and daily importance of mathematics and 8 items in the last dimension reflect *interest, like and enjoyment*. The factor loads of 38 items that are included in the scale are arranged between 0.48 and 0.80. Smallest item-scale correlation value for first dimension is 0.55, for the second dimension is 0.62, for the third dimension is 0.48 and for the last dimension is 0.51. To reliability analysis Cronbach Alfa coefficient is 0.96. The correlation values between *like and interest, confidence and anxiety, occupational and daily importance of mathematics* dimensions are respectively 0.82, 0.80 and 0.72. The test split-half reliability coefficient as .923 through the Spearman-Brown correction (Duatepe & Çilesiz, 1999).

Data Collection and Analysis

It took a total of 20 minutes to complete the *Attitudes towards mathematics Instrument* for volunteer pre-service teachers. The group interval coefficient value has been calculated by dividing the difference between the greatest value and the smallest value of the progression of the measurement results by the determined number of groups in the study (Kan, 2009: 407).

Therefore, the average arithmetical reference interval, which has been calculated as being related to the responses provided by pre-service teachers, has been calculated as to be $(5-1)/5=0.80$ in the study. The data have been analysed using the SPSS 17.0 program. Descriptive statistics methods, independent two samples t-test, One-way ANOVA and Tukey test have been applied for the analysis of data. For all of the statistical decoding, .05 significance level has been taken as the base.

Findings

It is aimed to determine attitudes of pre-service teachers towards mathematics and shortcomings of pre-service teachers with regards to their attitudes and to manifest from which of the components these shortcomings arise out in this research. In additionally, it is aimed to study whether attitudes of pre-service teachers change or not as being depended on the gender, level of their class on the teaching field they are educated in. In this respect, percentage and frequency values have been calculated as the result of the descriptive statistics that had been applied in order to determine attitudes of mathematics, science and elementary school pre-service teachers towards mathematics. The results, which had been reached at after the statistics have been performed, are included in Table 2.

Table 2. Average points related to attitudes towards mathematics of pre-service teachers

	Average Points of Attitudes towards mathematics							
	Between 5.00-4.21 points		Between 4.20-3.41 points		Between 3.40-2.61 points		Between 2.60-1.81 points	
	f	%	f	%	f	%	f	%
Total	138	30.3	217	47.6	77	16.8	24	5.3

It has been understood from the surveys performed that majority of pre-service teachers (77.9%) have obtained points of 3.41 and above, which corresponds to choices of *I agree* and *I definitely agree*. This situation shows that majority of pre-service teachers have high level of positive attitudes towards mathematics. The fact of percentage values of pre-service teachers being rather low (2.2%, 6.2% and 7.2%), whose points related to their responses for questions included in the instrument are between 2.61 and 3.40 as this corresponds to *I do not agree* choice has the supporting nature as to majority of pre-service teachers have positive attitudes towards mathematics. Descriptive statistics have been used to determinate of the sub-dimensions (*like, occupation, fear, pleasure, materiality, interest ve confidence*) of the attitudes towards mathematics of pre-service teachers (Table 3).

Table 3. Average points related to sub-dimensions about attitudes towards mathematics of pre-service teachers

Sub-Dimensions	Average Points									
	Between 5.00-4.21 points		Between 4.20-3.41 points		Between 3.40-2.61 points		Between 2.60-1.81 points		Between 1.80-1.00 points	
	f	%	f	%	f	%	f	%	f	%
Like	243	53.3	122	26.8	53	11.6	26	5.7	12	2.6
Occupation	254	55.7	114	25.0	68	14.9	15	3.3	5	1.1
Anxiety	114	25.0	185	40.6	115	25.2	35	7.7	7	1.5
Enjoyment	204	44.7	137	30.0	52	11.4	54	11.8	9	2.1
Materiality	149	32.7	196	43.0	80	17.5	26	5.7	5	1.1
Interest	18	3.9	205	45.0	168	36.8	62	13.6	3	0.7
Confidence	176	38.6	151	33.1	88	19.3	29	6.4	12	2.6

When the percentage values as being related to the average points mathematics, science and elementary school pre-service teachers have obtained from the sub-dimensions of their attitude instrument about mathematics are examined, it is seen that the percentage points of pre-service teachers (80.1%, 80.7%, 65.6%, 74.7%, 75.7% and 71,7% respectively for sub-dimensions), who have received average points between 3.41 and 5.00 as this corresponds to *I definitely agree* and *I agree* choices, where they have obtained from sub-dimensions except for *interest*, have been rather high. This situation points out that the sub-dimensions about the attitudes of pre-service teachers towards mathematics are at respectively high level.

It has been understood that the percentage value of pre-service teachers (3.9%), who have obtained points between 4.21 and 5.00 as this corresponds to *I definitely agree* choice related to the *interest* sub-dimension of the instrument has been rather low. However, the percentage values of pre-service teachers, who have obtained points between 3.41 and 4.20 as this corresponds to *I agree* choice related to this sub-dimension or obtained points between 2.61 and 3.40 as this corresponds to *I am uncertain* choice being high are also striking.

Percentage and frequency values about the average points, which had been obtained by the pre-service teachers from attitude instrument about mathematics as being related, have first been examined in terms of the gender in order to find out whether there has been significant difference between the average points mathematics science and elementary school pre-service teachers have obtained from *attitude instrument* about mathematics and their genders and the results obtained are included below.

Table 4. Average points related to attitudes of pre-service teachers according to gender

Gender	Average Points							
	Between 5.00-4.21 points		Between 4.20-3.41 points		Between 3.40-2.61 points		Between 2.60-1.81 points	
	f	%	f	%	f	%	f	%
	Female	99	30.8	159	49.5	49	15.3	14
Male	39	28.9	58	43.0	28	20.7	10	7.4

When the average points of pre-service teachers for their attitudes towards mathematics have been examined in terms of the gender, it can be seen that the percentage values of female and male pre-service teachers, who have gained points within the same point interval, are rather close to each other. This situation, in turn makes one to think that there is not a significant difference between average points of female and male pre-service teachers in relation to their attitudes towards mathematics. Independent two sample t-test has been applied for these independent groups and the result for this test is included in Table 5.

Table 5. Results of the Independent Two Sample t-test in relation to differentiation of attitudes according to gender

Gender	N	\bar{x}	sd	df	t	p
Female	321	3.85	0.59	454	1.628	.104
Male	135	3.75	0.67			

It has been determined that there is not a significant difference between the average points of attitudes towards mathematics of female and male pre-service teachers who participated in this research ($t_{(454)}=1.628$; $p>.05$). The average points of the attitudes towards mathematics of the male pre-service teachers ($\bar{x}=3.85$) and the average of the attitude points of the female pre-service teachers ($\bar{x}=3.75$) are at a similar level. Pre-service teachers' average points in both of the groups show homogeneous distribution with regard to standard deviation values.

Descriptive statistics and One-way ANOVA test have been used to test whether there is a significant difference between attitudes towards mathematics and grades of pre-service teachers or not. Percentage and frequency values have been given especially for each of the teaching fields in Table 6 and One-way ANOVA test result related with the attitudes and grades has been given in Table 7.

Table 6. Distribution of average points related to attitudes of pre-service teachers according to their grades

Grades	Average Points							
	Between 5.00-4.21 points		Between 4.20-3.41 points		Between 3.40-2.61 points		Between 2.60-1.81 points	
	f	%	f	%	f	%	f	%
Freshmen	30	25.6	63	53.8	20	17.1	4	3.5
Sophomores	29	24.4	56	47.1	28	23.5	6	5.0
Juniors	35	33.0	45	42.5	17	16.0	9	8.5
Seniors	44	38.6	53	46.5	12	10.5	5	4.4

When the average points of pre-service teachers for their attitudes towards mathematics have been examined in terms of their grades, it has been understood that the percentage values about attitude average points of pre-service teachers, where this has been 4.21 and above as this corresponds to *I definitely agree* choice (25.6% - 24.4% - 33.0% - 38.6% respectively for Freshmen, Sophomores, Juniors and Seniors), have been rather close for freshmen and sophomores but it have showed progressive increment for the juniors and seniors. It has been understood that percentage and frequency values of pre-service teachers, whose attitude average points are 3.41 and above as this corresponds to *I definitely agree* and *I agree* choice and their percentages (respectively 79.4% - 71.5% - 75.5% and 85.1%) has dropped down from the freshmen to the sophomores, it but has seen that this has increased again from sophomores onwards and has reached at the highest level at the final year for seniors. One-Way ANOVA test has been applied with the aim of finding out whether these differences between grades are significant or not and the data with regards to the result of this test is included below.

Table 7. Results of One-Way ANOVA test in relation to variation of the attitude points according to their grades

	Sum of Squares	df	Average of Squares	F	p	Significant Difference
Inter-Groups	3.927	3	1.309	3.48	.016	Sophomores-Seniors
Within Groups	169.905	452	0.376			
Total	173.832	455				

The results of the analysis indicate a significant difference has been found between the grades of the pre-service teachers and their attitudes average points ($F_{(3,452)}=3.48$, $p<.05$). In other words, attitudes towards mathematics of pre-service teachers change significantly according to grades. It has been understood as the result of the Tukey test that has been performed that this significant difference between grades, has taken place amongst sophomores and seniors pre-service teachers. After that, One-way ANOVA test has been used to test whether there is a significant difference between attitudes towards mathematics and grades of pre-service teachers.

Table 8. Distribution of average points about attitudes of pre-service teachers according to teaching fields

Grades	Average Points							
	Between 5.00-4.21 points		Between 4.20-3.41 points		Between 3.40-2.61 points		Between 2.60-1.81 points	
	f	%	f	%	f	%	f	%
Mathematics	53	37.6	70	49.6	15	10.6	3	2.2
Science	47	28.8	89	54.6	17	10.4	10	6.2
Elementary	38	25.0	58	38.2	45	29.6	11	7.2

When the percentage values of pre-service teachers, whose attitude points are 3.41 and above as this correspond to I definitely agree and I agree (respectively 87.2% - 83.4% - 63.2%), are examined, the percentage values of mathematics and science pre-service teachers have been rather high as compared to the elementary school pre-service teachers. This situation makes one to think that there are significant differences between attitude points of elementary school pre-service teachers towards mathematics and the average points of mathematics and science pre-service teachers. Because of that, One-way ANOVA test has been used to test whether there is a significant difference between attitudes towards mathematics and teaching fields of pre-service teachers or not.

Table 9. Results of One-Way ANOVA in relation to variation of the attitudes points according to teaching fields

	Sum of Squares	df	Average of Squares	F	p	Significant Difference
Inter-Groups	9.186	2	4.593	12.64	.00	Tüm gruplar
WithinGroups	164.646	453	0.363			
Total	173.832	455				

The results of the analysis indicate a significant difference has been found between the teaching fields of the pre-service teachers and their average points attitudes towards mathematics ($F_{(2,453)}=12.64$, $p<.05$). In other words, attitudes towards mathematics of pre-service teachers change significantly according to teaching fields they are educated in. It has been understood as the result of the Tukey test that has been performed that significant differences have been present between all of the mathematics, science and elementary school pre-service teacher groups. In other words, attitude average points of mathematics pre-service teachers towards mathematics have been at rather high level as compared to the average points about attitudes of science and elementary school pre-service teachers. Besides, the average points about attitudes towards mathematics of science pre-service teachers have been at rather high level as compared to the attitude points of elementary school pre-service teachers.

Conclusion

Attitudes towards mathematics of mathematical, science and elementary school pre-service teachers have been determined in this research and it has been examined whether their attitudes towards mathematics have changed with respect to gender, grades and to the teaching field or not. In this respect, *Attitudes towards Mathematics Instrument* has been applied on a total of 456 pre-service teachers.

It has been understood from the analysis of the data that majority of the pre-service teachers have high level positive attitudes towards mathematics. However, it has been understood that some of the pre-service teachers' positive attitudes towards mathematics could still be developed. It has been understood that the attitudes towards mathematics of mathematics and science pre-service teachers have been at better level than the attitudes of elementary school pre-service teachers in terms of the teaching fields. It is thought that this result, which is similar to the results of the study performed by Başer and Yavuz (2003), arises out of the fact that the mathematics and science pre-service teachers have received more of the mathematics lectures during their educations as being compared to the elementary school pre-service teachers and that they have been more successful in mathematics. This situation makes one to think that it is important especially for elementary school pre-service teachers, where they should develop their attitudes towards mathematics. It should be provided for pre-service teachers that they should appreciate the importance of mathematics for the life and its contribution for other sciences and they should also know that mathematics is a universal language. Besides, when it is provided for them to gain the required skills for teaching of the mathematics like, technology and student oriented teaching methods, then this could make them to feel more secure themselves and hence to support them to develop their attitudes towards mathematics.

It has been understood from the examination of mathematics, science and elementary school pre-service teachers average points about the *Attitudes towards Mathematics Instrument* sub-dimensions that the average points about sub-dimensions have been respectively high. However, the average points that have been obtained from the *interest* sub-dimension show that the interests of pre-service teachers for the mathematics is low and this points out that this aspect of pre-service teachers should be developed. It has been understood as the results of the examination about pre-service teachers' attitudes towards mathematics in terms of their gender and grades that there is significant difference between attitudes towards mathematics of sophomores and seniors.

Besides, there is not significant difference between average points of female and male pre-service teachers in relation to their attitudes towards mathematics. This result, where it shows that there is not any significant difference between the attitudes towards mathematics of female and male pre-service teachers, is also similar with the researches that had been performed by Çelik and Bindak (2005) and by Akay and Boz (2011). It has been understood from the average points of pre-service teachers about their attitudes towards mathematics, where this has risen to its highest level during the final year, which their university education has a positive effect on their attitudes towards mathematics, even though this has been in low amounts. At the same time, it has been understood that the attitudes towards mathematics of pre-service teachers differ significantly according to their teaching field. Besides, the attitudes of mathematics pre-service teachers towards mathematics has been better than the attitudes of science and elementary school pre-service teachers and the attitudes of science pre-service teachers towards mathematics has been better than the attitudes of elementary school pre-service teachers. This situation makes one to think that the number of lectures pre-service teachers receive in relation to mathematics has positive effect on their attitudes towards mathematics.

When it is thought that qualified manpower, that is to say, individual, who can think and question, who can communicate easily, who has gained analytic thinking ability and problem solving habits, could be successful in the global world, is seen important that the pre-service teachers, who will educate the next generation, should have sufficient and high level of mathematical skills. Development of attitudes towards mathematics of pre-service teachers during their education process in universities could be examined in more detailed form in the studies that will be performed. It could be tried to be examined whether differing educations to be provided for pre-service teachers would have any effect on their attitudes towards mathematics or not and solution suggestions with regards to the development of their attitudes could be manifested.

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