

## Relationship Between Prospective Mathematics Teachers' Attitudes Toward Mathematics Courses and Mathematics Education Courses

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### Abstract

*The aim of this study is to examine the relationship between the attitudes of the prospective mathematics teachers taking education at the Mathematics Education Department of a State University toward the mathematics courses and the mathematics education courses. In addition to this, answers were sought to the questions of "Does the prospective teachers' attitudes toward the mathematics courses and the mathematics education courses change according to the different variables". The sample of the study was consist of 261 prospective mathematics teachers taking undergraduate education at the Education Faculty during the 2018-2019 academic year. The study was both a descriptive one carried out in the general survey model and a correlational one examining the relationship between the prospective teachers attitudes toward the mathematics courses and the mathematics education courses. In order to find the mathematics prospective teachers' levels of attitudes toward mathematics education courses, the "Attitude Scale for Mathematics Education Courses" developed by Türker and Turanlı (2008) was used and to determine the prospective teachers' attitudes toward the mathematics courses, the "Attitude Scale for Mathematics Courses" developed by Turanlı, Türker and Keçeli (2008) was used. As a result of the study, it was obtained that the means of the total scores of the prospective teachers related to the mathematics courses and the mathematics education courses were very close to each other. It was found that there was a positive significant relationship between the prospective teachers' attitudes toward the mathematics education courses and the mathematics courses.*

**Keywords:** *Prospective mathematics teacher, mathematics courses, attitude, mathematics education.*

## Matematik Öğretmen Adaylarının Matematik Eğitimi ve Matematik Alan Derslerine Yönelik Tutumlarının İlişkisi

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### Öz

*Bu araştırmanın amacı bir Devlet Üniversitesinin Matematik Eğitimi Ana Bilim Dalında öğrenim görmekte olan matematik öğretmen adaylarının matematik alan dersleri ve matematik eğitimi derslerine yönelik tutumlarının ilişkisini incelemektir. Bununla birlikte bu öğretmen adaylarının matematik alan dersleri ve matematik eğitimi derslerine yönelik tutumları cinsiyet ve aylık gelir, kaldıkları yer gibi sosyal imkanlara göre değişmekte midir sorularına cevap aramaktır. Araştırmanın örneklemini 2018-2019 eğitim öğretim yılında bir Eğitim Fakültesinde lisans öğrenimi görmekte olan toplam 261 matematik öğretmen adayı oluşturmaktadır. Çalışma genel tarama modelinde yapılmış betimsel aynı zamanda da öğretmen adaylarının matematik alan ve matematik eğitimi derslerine yönelik tutum düzeylerinin ilişkisini inceleyen korelasyonel bir çalışmadır. Matematik öğretmen adaylarının matematik eğitimi derslerine yönelik tutum düzeylerini belirlemek için Türker ve Turanlı (2008) tarafından geliştirilen "Matematik Eğitimi Derslerine Yönelik Tutum Ölçeği", Öğretmen adaylarının matematik alan derslerine yönelik tutumlarını belirlemede Turanlı, Türker ve Keçeli (2008) tarafından geliştirilen "Matematik Alan Derslerine Yönelik Tutum Ölçeği" kullanılmıştır. Araştırmanın sonucunda öğretmen adaylarının matematik alan ve matematik eğitimi derslerine yönelik tutum puan ortalamaları birbirine çok yakın bulunmuştur. Öğretmen adaylarının matematik eğitimi dersleri ile matematik alan derslerine yönelik tutumları arasında, pozitif yönde anlamlı bir ilişkinin olduğunu tespit edilmiştir.*

**Anahtar Kelimeler:** Öğretmen adayı, matematik alan dersleri, tutum, matematik alan eğitimi.

## Introduction

Teachers are at the center of teacher competences. A teacher's "teaching competences" are defined as knowledge, skills and attitudes required to support teaching processes (Reinmann, 2011). NTCM (2008) emphasizes the fact that change in education actually covers change in teacher education. It is a non-ignorable fact that the acquisition of teacher competences should start in pre-service education, which is a very important process completed within the course of time. In their study, Dursun & Dede (2004) found that the mathematics teachers' competences affected students' success at mathematics positively. Teacher competences are very important not only for learning all subjects and the subject of mathematics (NCTM, 2000) but also for student success (Bütün, 2011). Shulman (1986) defined the knowledge of a teacher having these competences as "Pedagogical Content Knowledge". Shulman (1986) describes the types of knowledge which teachers are required to have as content knowledge, knowledge of curriculum and knowledge of teaching the content. According to Grossman (1990), teachers are required to have 4 types of knowledge, namely content knowledge, pedagogical knowledge, knowledge of teaching the content and context knowledge. However, in our country, the types of knowledge, which a teacher is required to have, are divided into three groups, namely content knowledge, professional teaching knowledge and general knowledge (Erden, 1998). In their study, Nakiboğlu and Karakoç (2005) emphasize that knowledge of content teaching was added to this knowledge and included in the teaching training programs in the following years. In his study, Baki (2010) mentions three different kinds of knowledge, namely content knowledge, general knowledge and knowledge of teaching the content. When all these are considered, it can be stated that the content knowledge and the content education knowledge are the common types of knowledge which a teacher to be trained is required to acquire basically. The importance started to be attached to these basic types of knowledge in the 1980's and has reached today. Shulman (1986) maintains in his study that content knowledge and content education knowledge are different from each other. In addition to this, he also emphasizes that only content knowledge is not enough to become a teacher. The importance of the

quality of mathematics courses which a mathematics teacher is required to have is unignorable in terms of determining the curricula of the institutions training mathematics teachers. Schoenfeld (2010) states that mathematics teachers' content knowledge is the most fundamental source for them. Shulman (1986) emphasizes the necessity of mathematics teachers' knowing mathematics both operationally and conceptually. According to Blömeke & Delaney (2012), mathematical content knowledge covers both basic mathematical knowledge and conceptual knowledge related to the principles of mathematics. Shulman (1986) emphasizes in his study that the content knowledge, which teachers are required to have, is necessary for both learning information for themselves and comprehending it in a way to teach students and know what to do and also the kinds of problems which they are likely to encounter while doing this. When these requirements are taken into consideration, teachers are obliged to be experts at their own subject areas. Teachers should know the subjects of courses which they give well and be able to follow developments in their content areas. Moreover, if necessary, they should develop their knowledge by doing some research to be able to answer questions from students. When the fact that a person cannot teach a subject which s/he does not know is considered, the importance of teachers' most primarily having a good level of knowledge related to the subject area which they teach is unignorable (Bayazit and Aksoy, 2010). However, it is stated that a teacher's knowing a certain subject very well does not mean that this subject will be taught very well by that teacher (Kahan, Cooper & Bethea, 2003). In this direction, teachers or prospective teachers are required to have subject area knowledge and in addition to this pedagogical content knowledge to be able to be a good mathematics teacher (Ball, 1990b). In their study, Blömeke & Delaney (2012) draw attention to the intensity of knowledge during teaching. How a teacher will teach that intensive knowledge which s/he has during teaching takes us to the content teaching' importance and, at this point, it is an undeniable fact it is necessary that content knowledge is required to be together with content teaching knowledge. Erden (1998) expresses that a teacher is required to have the skill of teaching. For, no matter how well a teacher knows, if he cannot transfer his/her knowledge to students, it is clear that she/he will not be successful. In his study, Baki (2012) emphasizes that a teacher's

mathematical knowledge level comes in the lead of the factors affecting his/her content teaching knowledge. In addition to this the importance of content knowledge is emphasized, but on the other hand there is the thought that a teacher's having good content education knowledge is an indication of his/her being a good teacher (Wilson, Floden & Ferrini-Mundy, 2001). All these indicate the importance of content knowledge courses and content education courses in the profession of teaching. Baki (2010) describes content teaching knowledge as knowing what and how to teach, having a command of curriculum together with acquisitions, knowing prospective teachers' developmental characteristics and preparing materials accordingly. It is also important to know what materials to use while teaching students. As it is seen, it is not possible to mention its characteristics clearly because of the things which a teacher is required to know in the content education knowledge not only for themselves but also for others to understand. When all these are considered, it is possible to imply that teachers and prospective teachers' attitudes toward content knowledge courses and content education courses affect their teaching competences. It can be stated that the existence of studies on this subject in the literature indicates the importance of the subject. In her study, Türnüklü(2005) aimed to examine the relationship between the prospective mathematics teachers' mathematical content knowledge and pedagogical content knowledge. As a consequence of the study, it was concluded that the prospective teachers' having mathematical knowledge was necessary but not enough for mathematical pedagogical content knowledge. In his study Ay (2004) wanted to find the elementary prospective mathematics teachers' thoughts about the subject area courses and the pedagogical courses and their contributions to their professions. At the end of the study, it was determined that while the prospective teachers had negative thoughts about mathematics content courses, they had positive thoughts about the mathematics education courses. In their study, Baumert et al. (2010) examined the relationship between the teachers' mathematics content knowledge and pedagogical content knowledge and the importance of them in terms of students' improvement and a high level of relationship was determined between the pedagogical content knowledge and the mathematics content knowledge consequently it was observed that the foreseen power of the

content knowledge was high for the improvement of students. In their study, Turanlı, Türker and Keçeli (2007) aimed to develop an attitude scale in order to determine the mathematics education students' attitudes about the mathematics content courses. In the study which they made with 432 prospective mathematics teachers, a scale of 20 items was developed and its validity and reliability studies were carried out. However, it was found that the prospective teachers had positive attitudes toward the mathematics content courses. In their study, Türker and Turanlı (2008) aimed to develop an attitude scale for the mathematics education courses given at Education Faculties. The scale of 40 items prepared by the researchers was administered to 450 students from two different universities and its validity and reliability studies were made. Toluk-Uçar (2011) determined as a result of the study in which they aimed to reveal the relationship between the prospective teachers' content knowledge and their pedagogical explanations that the prospective teachers' mathematical content knowledge about some subjects were not sufficient; their pedagogical explanations were at operational level; moreover, it was determined that the prospective teachers had insufficient mathematical content knowledge to teach mathematics. In their study, Özgen and Obay (2017) aimed to find the secondary education prospective mathematics teachers' attitudes toward the content courses and the content education courses and examine them according to such variables as gender and class levels. At the end of the study, it was obtained that the prospective teachers' attitudes toward the mathematics courses and the mathematics education courses were at similar level. It was determined that the attitude scores related to the content courses and the content education courses did not differ significantly according to the different variables. It is emphasized that the prospective teachers' attitudes and approaches toward the courses may affect not only their knowledge levels and interests but also their desires (NCTM, 2000). When all these are taken into consideration, it was found very important to determine the relationship between the prospective teachers' attitudes toward the mathematics courses and the mathematics education courses. For this reason, it was aimed to find if the attitudes of the prospective mathematics teachers taking education at the Education Faculty toward the mathematics courses and the mathematics education courses change according to gender, monthly income and

accommodation type and reveal the relationship between their attitudes toward the courses. In the direction of this purpose, answers were found to the following questions.

1. At what level are the prospective mathematics teachers' attitudes toward the mathematics courses and the mathematics education courses?
2. Do the prospective mathematics teachers' levels of attitudes toward the mathematics courses and the mathematics education courses differ significantly according to the prospective teachers' monthly income levels?
3. Do the prospective mathematics teachers' levels of attitudes toward the mathematics courses and the mathematics education courses differ significantly according to the accommodation type?
4. Do the prospective mathematics teachers' levels of attitudes toward the mathematics courses and the mathematics education courses differ significantly according to the gender of the pre-service teachers?
5. Is there a relationship between the prospective mathematics teachers' levels of attitudes toward the mathematics courses and the mathematics education courses?

### **Aim and Importance**

It is a non-ignorable fact that the subject which needs emphasizing carefully about the matter of training mathematics teachers is the quality of the teacher. In the study made by Bukova-Güzel et al. (2006), it was determined that the mathematics teachers had teacher qualities at a low level and not distributing normally. When the qualities of the mathematics teachers are the matter of discussion, their knowledge and experiences should be carried to the top level. To achieve this, it is necessary that the prospective teachers under training should develop themselves both cognitively and affectively in mathematics education courses and the mathematics courses. Prospective teachers' having a high level of positive attitudes toward the mathematics content courses and the mathematics education courses is the basic element for their developing themselves. No

matter how well teachers know their subject areas, if they cannot achieve to transfer knowledge to his/her students, teachers may not become successful at their professions. For this reason, it is necessary that a teacher should have the skill of teaching in addition to a good knowledge of field (Erden, 1998). Therefore, it has a big importance to have prospective teachers feel the relationship of the mathematics courses with the mathematics education courses completely. Our study is of great importance in terms of having prospective teachers feel that the mathematics courses and the mathematics education courses are complementing each other and there are dynamic relationships between them and raising their awareness about this matter. Within the framework of all these, it was aimed to examine the mathematics prospective teachers' attitudes toward the mathematics courses and the mathematics education courses were related with each other and examine their attitudes toward the mathematics courses and the mathematics education courses in terms of various variables.

## **Methodology**

This study examining the prospective mathematics teachers' attitudes toward the mathematics courses or mathematics education courses was a descriptive comparison study carried out in the general screening model and, at the same time, a correlational study determining the relationship between the mathematics courses and the mathematics education courses' attitudes level of the prospective teachers'.

## **Participants**

The population of the study was consist of prospective teachers taking education at a State University during the 2018-2019 academic year. Since it was not possible to arrive the all of the population under existing conditions, it was decided to choose a sample from among the prospective teachers via the purposeful sampling method. Since 39 of 300 participant prospective teachers had not filled the questionnaire willingly, they were not evaluated and 261 prospective teachers composed the sample of the study.

## Data Collection Tools

In this section, data collection tools used in this study "The Attitude Scale for Mathematics Courses" and "The Attitude Scale for Mathematics Education Courses" are given in detail.

### *The Attitude Scale for Mathematics Courses*

In order to determine the Mathematics Education Division prospective teachers' attitudes toward the mathematics courses, the "Attitude Scale for Mathematics Courses" developed by Turanlı, Türker and Keçeli (2008) was used. This Likert type scale was composed of a total of 20 items. 11 of the items in the questionnaire were positive and 9 of them were negative. The alternatives of the items included in the scale ranged from the alternative "I totally agree" to the alternative "I never agree". Moreover, the Cronbach's Alpha coefficient obtained by the researchers for the reliability of the scale was found as 0.93. As a result of the factor analysis made for the validity, it was observed that the items of the questionnaire gathered under a single dimension. The measurement reliability coefficient of the scale was calculated as 0.827 in this study.

### *The Attitude Scale for Mathematics Education Courses*

In order to determine the Mathematics Education Division preservice teachers' attitudes toward the mathematics education courses, the "Attitude Scale for the Mathematics Education Courses" developed by Türker and Turanlı (2008) was used. The scale was in the five-point Likert type and composed of 18 items. The alternatives of the items included in the scale ranged from the alternative "I totally agree" to the alternative "I never agree". The Cronbach's Alpha coefficient obtained by the researchers for the reliability of the scale was found as 0.928 and as a result of the factor analysis made for the validity of the scale, it was observed that the items of the scale gathered under a single dimension. Moreover, the measurement reliability was found as 0.883 in this study. These sets of data indicated that the scales were both valid and reliable measurement

tools in the determination of the preservice teachers' attitudes toward the mathematics courses and the mathematics education courses.

## Data Analysis

In order to determine the relationship between the mathematics prospective teachers' attitudes toward the mathematics courses and the mathematics education courses, the descriptive statistics such as standard deviations and arithmetic means were calculated; and for not normal distribution' data, the Mann Whitney-U test was used; in order to reveal the inter-attitude relationships, the correlation statistics were made. The pre-condition for the significance tests of the independent group means is the scale data's being sparse or proportional and distributing normally (Büyüköztürk, 2010). When these pre-conditions were examined, it was observed that the data sparsely distributed. Moreover, in order to see if the data distributed normally or not, the skewness and the kurtosis coefficients of the attitude scores related to the mathematics courses and the mathematics education courses and the Kolmogorov-Smirnov values were calculated. The data values not showing normal distribution were given in Table 1.

*Table 1. Kolmogorov-Smirnov test results*

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Mathematics Courses	,076	261	,001	,982	261	,002
Mathematics Education Courses	,116	261	,000	,874	261	,000

a. Lilliefors Significance Correction

## Findings and Interpretations

### *Findings related to the First Sub-Problem*

The first sub-problem of the study was stated as "At what level are the prospective mathematics teachers' attitudes toward the mathematics courses and the mathematics education courses?". In order to answer this

sub-problem, the sets of descriptive statistical data were examined and given in Table 2.

*Table 2. Descriptive statistical values related to the scores of the prospective teachers' attitudes toward the mathematics courses and the mathematics education courses*

Attitude	n	X	sd
The final attitude toward the mathematics education courses	261	3,21	,30
Attitude toward the mathematics courses	261	3,04	,24

The "attitude toward the mathematics education courses" mean score of the prospective mathematics teachers was found as 3,21 and the standard deviation was found as ,30; the "attitude toward the mathematics courses" mean score was found as 3,04 and the standard deviation was found as ,24. Since the mean score evaluation scale of the prospective teachers' attitude toward the mathematics education courses and the mathematics courses corresponded to the interval of 2.60-3.39, the prospective teachers' attitudes toward the mathematics courses and the mathematics education courses were at moderate level. It can be said that the prospective teachers' final attitudes toward the mathematics education courses ( $x=3,21$ ) were slightly higher than their attitudes toward the mathematics courses ( $x=3,04$ ).

That the mean scores of the mathematics prospective teachers' attitudes toward the mathematics courses and the mathematics education courses were found very close to each other indicated that the prospective teachers showed almost equal interest in both courses.

### *Findings related to the Second Sub-Problem*

The second sub-problem of the study was stated as "Do the prospective mathematics teachers' attitudes toward the mathematics courses and the mathematics education courses differ significantly according to their monthly income levels?". The data gotten as a consequence of the Kruskal Wallis test made with the data not showing normal distribution to test our hypothesis within the scope of the effects of the prospective teachers'

social experiences on their interests in the course and showing the interest scores of the prospective mathematics teachers related to the mathematics courses and the mathematics education courses according to the variable of monthly income level were given in Table 3.

*Table 3. Kruskal Wallis test results of the prospective teachers' attitude scores related to the mathematics courses and the mathematics education courses according to their monthly income levels*

Factor	Level of income	N	Mean rank	sd	Chi-square	p	Significant difference
Attitude toward the mathematics education courses	1000-1600	37	154,41	3	0,237	,971	-
	1600-2600	78	121,03				
	2600-4000	89	132,83				
	4000 and above	57	126,60				
Attitude toward the mathematics courses	1000-1600	37	133,57	3	5,192	,158	1000-1600, 1600-2600
	1600-2600	78	129,06				
	2600-4000	89	133,24				
	4000 and above	57	128,49				

When the mean attitude scores of the prospective mathematics teachers related to the mathematics education courses were compared according to the variable of monthly income level, it was seen that the prospective teachers with a monthly income level of 1000-1600 Turkish Lira ( $x=154,41$ ) had the highest interest level and this was followed in order by the ones with a monthly income level of 2600-4000 Turkish Lira ( $x=132,83$ ), the ones with a monthly income level of 4000 Turkish Lira ( $x=126,60$ ) and the ones with a monthly income level of 1600-2600 Turkish Lira ( $x=121,03$ ). These mean differences were found statistically insignificant at the significance level of 0,05 ( $X=0,237$ ,  $p>0,05$ ).

The mean interest scores of the prospective mathematics teachers related to the mathematics courses were compared according to the variable of monthly income level, it was found that the prospective teachers with a monthly income level of 1000-1600 Turkish Lira ( $x=133,57$ ) had the highest interest score and this was followed by the ones with a monthly income level of 2600-4000 Turkish Lira ( $x=133,24$ ), the ones with a monthly income level of 1600-2600 Turkish Lira ( $x=129,06$ ) and the ones

with a monthly income level of 4000 Turkish Lira ( $x=128,49$ ). These mean differences were found statistically insignificant at the level of 0,05 ( $X=5,192$ ,  $p>0,05$ ). In the comparison between the sub-groups, while the difference between the mean scores of the ones with a monthly income level of 1000-1600 Turkish Lira and the ones with a monthly income level of 1600-2600 Turkish Lira was found significant, the difference between the other sub-groups was found insignificant.

The attitude mean scores of the prospective mathematics teachers related to the mathematics courses and the mathematics education courses yielded close results according to their income levels and they did not cause a very big difference between their attitudes. That the prospective teachers with the lowest income level obtained the highest attitude scores might have resulted from their desire to finish the university without losing time by learning the lesson better and begin to work early.

### *Findings related to the Third Sub-Problem*

The third sub-problem of the study was said as "Do the attitude levels of the prospective mathematics teachers toward the mathematics courses and the mathematics education courses differ significantly according to the accommodation type?". The data found as a consequence of the Kruskal Wallis test made with the data not showing normal distribution to test our hypothesis and showing the mathematics teachers' attitudes toward the mathematics education courses and the mathematics courses according to the accommodation type were given in Table 4.

When the mean attitude scores of the prospective teachers related to the mathematics education courses were compared according to the variable of the type of accommodation, it was observed that the "Other" alternative ( $x=154,09$ ) had the highest interest score and this was followed by the ones staying with family ( $x=137,94$ ), the ones staying in the dormitory ( $x=127,25$ ) and the ones staying with friends ( $x=110,37$ ). These mean differences were found as statistically insignificant at the significance level of 0,05 ( $X=4,177$ ,  $p>0,05$ ).

**Table 4. Kruskal Wallis test results of the prospective teachers' attitude scores related to the mathematics education courses and the mathematics courses according to the accommodation type**

Factor	Where they stayed	N	Mean rank	sd	Chi-square	P	Significant difference
Attitude toward the mathematics education courses	With family	105	137,94	3	4,177	,243	-
	With friends	26	110,37				
	At the dormitory	119	127,25				
	Other	11	154,09				
Attitude toward the mathematics courses	With family	105	126,86	3	4,744	,192	-
	With friends	26	112,21				
	At the dormitory	119	140,68				
	Other	11	110,18				

When the mean attitude scores of the prospective teachers related to the mathematics courses were compared according to the variable of accommodation type, it was observed that the ones staying in the dormitory ( $x=140,68$ ) had the highest interest score and this was followed by the ones staying with family ( $x=126,86$ ), the ones staying with friends ( $x=112,21$ ) and the "Other" alternative ( $x=110,18$ ). These mean differences were found as statistically insignificant at the significance level of 0,05 ( $X=4,744$ ,  $p>0,05$ ). Moreover, the differences appearing in the comparison of the sub-groups were also found as insignificant.

The mean attitude scores of the prospective mathematics teachers related to the mathematics courses and the mathematics education courses yielded close results according to the variable of accommodation type and they did not cause very big differences between their attitudes. That the prospective teachers staying in the dormitory had the highest attitude scores in relation to the mathematics courses and the ones marking the "other" alternative had the highest attitude score in relation to the mathematics education courses is worth examining.

### ***Findings related to the Fourth Sub-Problem***

The fourth sub-problem of the study was said as "Do the attitude levels of the prospective teachers toward the mathematics courses and the mathematics education courses differ significantly according to the

gender of the pre-service teachers?". The data related to the attitude scores obtained as a result of the Mann Whitney-U test made with the data not showing normal distribution to test our hypothesis in relation to the mathematics education courses according to the gender of the prospective mathematics teachers were given in Table 5.

*Table 5. Mann Whitney-U test results of the attitude scores of the prospective mathematics teachers related to the mathematics courses and the mathematics education courses according to the variable of gender*

Factor	Level of Income	N	Mean rank	d	Mann-Whitney U	P
Attitude toward the mathematics courses	Female	198	135,30	1	5385,500	,102
	Male	63	117,48			
Attitude toward the mathematics education courses	Female	198	136,53	1	5141,500	,035
	Male	63	113,61			

When the mean attitude scores of the prospective mathematics teachers in relation to the mathematics courses were compared according to the variable of gender, it was obtained that the female prospective teachers had higher attitude scores ( $x=135,30$ ). The mean attitude score of the male prospective mathematics teachers in relation to the mathematics courses was found as ( $x=117,48$ ). These mean differences were found statistically insignificant at the significance level of 0,05 ( $X=5385,500$ ,  $p>0,05$ ).

When the mean attitude scores of the prospective mathematics teachers in relation to the mathematics education courses were compared according to the gender variable, it was obtained that the female prospective teachers had higher attitude scores ( $x=136,53$ ). The mean attitude score of the male prospective teachers in relation to the mathematics education courses was ( $x=113,61$ ). These mean differences were found statistically significant at the significance level of 0,05 ( $X=5141,500$ ,  $p<0,05$ ).

### *Findings related to the Fifth Sub-Problem*

The fifth sub-problem of the study was given as "Is there a relationship between the mathematics prospective teachers' attitudes toward the mathematics courses and the mathematics education courses?". The correlation results of the data obtained as a result of the Spearman's rank correlation test made with the data not showing normal distribution to test our hypothesis related to the attitude scores of the prospective mathematics teachers related to the mathematics education courses and the mathematics courses were given in Table 6.

**Table 6. Correlation results of the prospective mathematics teachers' attitudes toward the mathematics courses and the mathematics education courses**

		Mathematics courses	Mathematics education courses
Mathematics courses	Correlation Coefficient	1,000	,469**
	Sig. (2-tailed)	.	,000
	N	261	261
Mathematics education courses	Correlation Coefficient	,469**	1,000
	Sig. (2-tailed)	,000	.
	N	261	261

\*\**. Correlation is significant at the 0.01 level (2-tailed).*

The Spearman's rank correlation procedure made to reveal the relationship between the prospective mathematics teachers' attitudes toward the mathematics courses and mathematics education courses indicated that there was a positive significant relationship between their attitudes ( $r=0,469$ ,  $p<0,00$ ). According to this result, it can be stated that a unit of increase in the prospective teachers' attitudes toward the mathematics education courses or mathematics courses resulted in an attitude increase of 46% toward the other.

### **Conclusion and Discussion**

It was determined that the prospective mathematics teachers' attitudes toward both the mathematics courses and the mathematics education courses were at the moderate level and very close to each other. The finding that the mean attitude scores of the prospective mathematics

teachers related to the mathematics courses and the mathematics education courses were found very close to each other can be interpreted in the way that the prospective teachers showed equal interest in the courses included in both groups. However, it can be said that the prospective teachers' final attitudes toward the mathematics education courses were slightly higher than their attitudes toward the mathematics courses. As a result of their study, Özgen and Obay (2016) determined that the mean attitude scores of the prospective teachers in relation to the mathematics courses and the mathematics education courses were at similar level. In the study made by Turanlı et al. (2007), it was obtained that the prospective teachers had positive attitudes toward the mathematics courses. These studies seem to support our study with their findings that the students had similar and positive attitudes toward both the mathematics courses and the mathematics education courses. Ay (2004) obtained that the prospective teachers had quite positive opinions about the mathematics education courses. However, it was determined that the prospective teachers had negative thoughts about the mathematics courses. The findings reached in the study made by Ay (2004) are not in line completely with those of our study. However, what is expected in the training of mathematics teachers is that prospective teachers should have parallel and positive attitudes toward both the mathematics courses and the mathematics education courses.

When the mean attitude scores of the prospective mathematics teachers in relation to both the mathematics courses and the mathematics education courses were compared according to the variable of monthly income level, it was examined that there was a statistically insignificant difference between them; however, in the between sub-groups comparisons, a significant difference was obtained between the prospective teachers with a monthly income level of 1000-1600 Turkish Lira and the with a monthly income level of 1600-2600 Turkish Lira. When the attitude scores related to both the mathematics courses and the mathematics education courses were examined, it was determined that the group with the lowest income level had the highest attitude score. The finding that the prospective teachers with the lowest income level obtained the highest attitude scores can be interpreted in the way that they

were the individuals who desired to learn the lesson and finish the university without losing time.

The difference between the mean attitude scores of the prospective mathematics teachers related to the mathematics courses and the mathematics education courses was found statistically insignificant according to the variable of accommodation type. These prospective teachers' mean attitude scores related to the mathematics courses and the mathematics education courses yielded close results according to the variable of accommodation type and it did not cause very big differences between their attitudes. That the prospective teachers staying in the dormitory had the highest attitude score mean related to the mathematics courses and the prospective teachers marking the alternative "other" had the highest attitude score mean toward the mathematics education courses was found worthy of researching. It can be stated that the prospective teachers' accommodations type did not affect significantly their attitudes toward the mathematics courses and the mathematics education courses.

The mean attitude scores of the prospective mathematics teachers in relation to the mathematics courses did not differ significantly according to the variable of gender, but their mean attitude scores related to the mathematics education courses were found statistically significant. Therefore, it was seen that the female prospective teachers had positive attitudes toward the mathematics courses. That is to say, it can be implied that the gender factor was not an effective variable in attitudes toward the field education courses in the profession of teaching. In their study, Özgen and Obay (2016) determined that the prospective teachers' attitudes toward the mathematics courses and the mathematics education courses did not differ according to their gender.

The Spearman's rank correlation procedure made to reveal if there was a relationship between the mathematics prospective teachers' attitudes toward the mathematics courses and the mathematics education courses indicates a significant positive relationship between the prospective teachers' attitudes toward the mathematics courses and the mathematics education courses. It can be stated that this is an indication of the fact that the mathematics education courses and the mathematics courses should be taught by associating them with one another. According to this result,

it should be stated that prospective teachers regard these concepts as related with one another. In their study, Bukova-Güzel, Elçi and Alkan (2006) emphasize the necessity of attaching required importance to mathematics education without putting the mathematics knowledge aside in teacher training. This contradicts with the study of Özgen and Obay (2016), in which they found a low level of relationship between them.

### Suggestions

- Comprehensive studies should be made especially to reveal the role and the function of the field education in the training of mathematics teachers.
- Awareness should be raised by emphasizing the relationship between the field courses and the field teaching when giving courses.

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