

# The Relationship Between Pre-Service Class Teachers' Self-Efficacy in Mathematical Literacy and Their Attitudes towards Mathematics

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## Abstract

Teachers' perceptions of self-efficacy in mathematical literacy and their attitudes are influential in the development of cognitive and affective skills of students during the educational process. The research aims to examine the relationship between pre-service class teachers' self-efficacy in mathematical literacy and their attitudes towards math and to determine the relationship between them. The research was designed in relational screening model. The sample of the research is composed of 274 pre-service class teachers who were determined purposefully. Non-parametric analyzes were used because the scores were not normally distributed during the analysis phase of the data. In conclusion of the research class teachers' self-efficacy in mathematical literacy and their attitudes towards math were found to be at a medium level. There was a significant difference between self-efficacy in mathematical literacy and attitude towards mathematics and grade level, and no significant difference was found between gender and academic average. There was a high positive and significant relationship between self-efficacy in mathematical literacy and attitude towards mathematics.

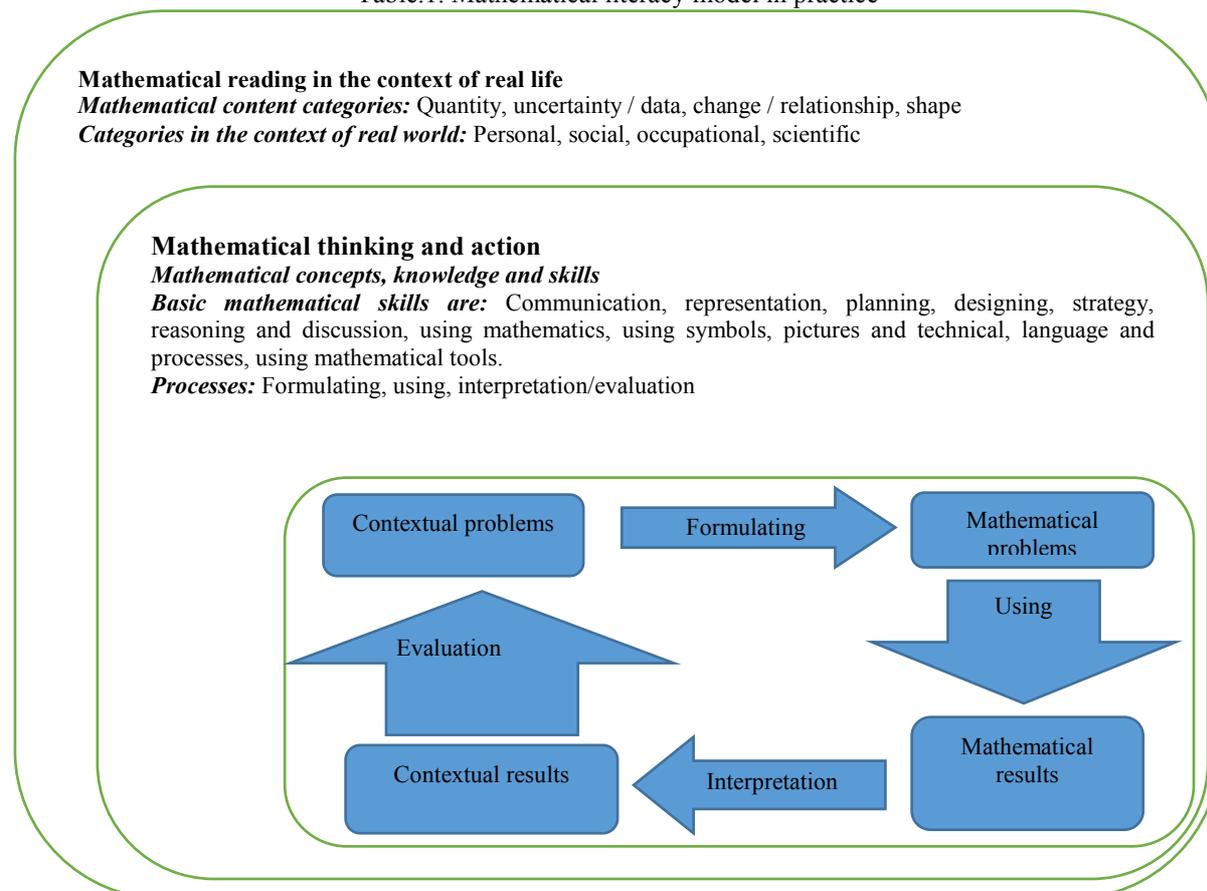
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## 1. Introduction

Conceptual and operational knowledge about mathematics education is integrated by using effective tools in problem solving process and it is necessary for the individual to take responsibilities in lifelong learning activities, to take effective roles and tasks and to acquire new skills in line with the realities of the business world. Therefore, everyone is required to have mathematical literacy and be strong in mathematics by acquiring sufficient knowledge and skills during the basic education period (Ersoy, 2003). Mathematical literacy is a concept that has emerged with the reform movements made in the field of mathematics as a result of the changes in today's living conditions and the qualities expected from individuals. The necessity and importance of being competent in the mathematical contexts, processes and situations individuals meet in their daily life and work-school life can be seen as the reasons for the emergence of mathematical literacy (Özgen and Bindak, 2011). Mathematical literacy is based on the fact that the students are ready to use their mathematical knowledge in their daily lives and it tries to measure the extent to which students have achieved this readiness. Mathematical literacy depends on the nature of intraclass relationships and the positioning of communication in every level. Therefore, it is necessary for students to be motivated by their own experiences, to reflect and discuss their experiences, to put forth suggestions and experience difficulties (Altun, 2014, Solomon, 2009). Teachers have great responsibilities in students' experiencing these experiences.

Mathematical literacy goes beyond mathematics, and it evokes mathematical operations such as recognizing mathematical situations and interpreting graphics, exploring and understanding abstract structures and patterns, using problem-solving strategies, connecting with other mathematical situations, using symbols, linking abstract and real world phenomena, making decisions based on both and understanding these situations (McCrone and Dossey, 2007, Stacey and Turner, 2015). OECD (2013) defines "*Mathematical literacy is the capacity of the individual to formulate, use and interpret the mathematics in various settings.*" *Mathematical literacy involves the use of mathematical reasoning and mathematical concepts, methods, phenomena, and tools to describe, explain, and predict phenomena. Mathematical literacy is defined as "it helps individuals to become aware of the role of mathematics in the world, and to make decisions and take decisions in judgments based on justifications"*. In this context, the following model was proposed by the OECD (2013) in order for mathematical literacy to be implemented in practice.

Table.1. Mathematical literacy model in practice



One of the indicators that an individual has gained a skill is the achievement of that skill. One of the concepts that have significant effects on achievements is self-sufficiency (Tarım, Baypınar and Keklik, 2015). Self-efficacy, which is one of the basic concepts of social learning theory, is the judgment of people's own capacities / competencies to organize and carry out the activities necessary to perform people's performances in specific areas. " (Bandura, 1997). Self-efficacy is the person's thinking about what he or she is capable to do. In mathematics, self-efficacy is defined as one's belief in one's own ability to successfully complete a task related to mathematics (Ural, Umay and Argün, 2008). If pre-service teachers become aware of their self-efficacy in mathematical literacy and if this awareness is examined and raised to the level of consciousness, it will be easier for pre-service teachers to contribute to the development and teaching of mathematical literacy skills and processes to the students (Özgen and Bindak, 2008).

Neale (1969) mathematics attitudes; I didn't like math or aversion, avoidance, or take part in mathematical activities in mathematics, good or bad, useful or useless as the determination of the faith that (Larsen, 2013). It can be said that the attitude is a concept that should be taken into account by educators. In the learning environment, students will have a positive or negative attitude towards the subject that is being taught. Considering that the positive or negative attitude has an influence on learning, determining and evaluating the conditions affecting the attitude and taking measures according to the results obtained are necessary for attaining the desired aim in the education (Avcı, Çoşuntuncel and İnandı, 2011). The perception of mathematics as a difficult subject causes the students to develop negative attitudes towards mathematics lesson and thus a decrease in their successes. Teachers' attitudes are influential in the positive development of students' attitudes. Therefore, the attitudes of the pre-service teachers, who receive training in the teacher training programs, towards mathematics are at the forefront.

It is of utmost importance that the teaching of mathematics and other courses is initiated at a young age and that class teachers have their students like it. Therefore, certain qualifications that classroom teachers should possess need to be revised, self-efficacy perceptions (beliefs), attitudes, and academic achievement for specific areas of teachers have an important influence on the development of cognitive and affective skills of students in the educational process, therefore, it is necessary to investigate the relations between these concepts and to take measures and make suggestions within the framework of the results (Akay and Boz, 2011). In this context, this research aims to examine the relationship between pre-service class teachers' self-efficacy in mathematical literacy and their attitudes towards mathematics. To this end, solutions were sought for the following problems.

1. Is there a significant difference between pre-service class teachers' self-efficacy in mathematical literacy and their gender, class level, and academic achievements?
2. Is there a significant difference between pre-service teachers' attitudes towards mathematics and the gender, class level and academic achievement variables?
3. Is there a significant relationship between pre-service teachers' self-efficacy in mathematical literacy and their attitudes towards mathematics?

## 2. Method

### 2.1. Research Model

Correlation research method was used in the research. The relationship between pre-service teachers' self-efficacy in mathematical literacy and their attitudes towards mathematics was examined in the research.

### 2.2. Working Group

The working group of the research consists of 286 pre-service teachers who were enrolled at the 1st and 4th grades of Class Education Department at Marmara University Atatürk Education Faculty during the spring semester of 2014-2015 academic year. The reason why the working group was chosen from the 1st and 4th grades is to demonstrate the change in the pre-service teachers who are at the beginning and at the end of their education. Data collection tool was applied to all the pre-service teachers in the sample and 274 questionnaires were evaluated after missing and incomplete forms were eliminated. Descriptive statistics for sampling are given in Table 1.

Table 1. Descriptive Statistics For The Working Group

Variables		Frequency (f)	Percentage (%)
Gender	Female	202	73.7
	Male	72	26.3
Grade-Level	Grade 1	109	39.8
	Grade 4	165	60.2
Academic achievement	2.00 and below	28	10.2
	2.01-2.50	73	26.6
	2.51-3.00	97	35.4
	3.01-3.50	65	23.7
	3.51 and above	11	4.0

### 2.3. Data Collection Tools

*Personal Information Form:* In this form, there is information about the gender, class level and academic achievement variables of the pre-service class teachers participating in the research.

*Scale of Self-efficacy in Mathematical Literacy:* The "Scale of Self-efficacy in Mathematical Literacy" developed by Özgen and Bindak (2008) was used to measure pre-service class teachers' self-efficacy in mathematical literacy. The scale consists of one dimension and 25 items, 4 negative and 21 positive. The internal consistency coefficient of the scale during the development phase was found to be .94. The grading of the items in the scale is "(5) I strongly agree, (4) I agree, (3) I am not sure, (2) I disagree (1) I strongly disagree". Items 6, 9, 18, 22 on the scale were scored inversely since they are negative. The highest score that can be taken from this scale is 125 and the lowest score is 25. The relatively high score to be obtained from the scale indicates that belief of self-efficacy in mathematical literacy is relatively high. In conclusion of the analyses made, the internal consistency coefficient of our scale was found to be .91.

*Scale of Attitude towards Mathematics:* "Scale of Attitude towards Mathematics" developed by Tapia (1996) and adapted to Turkish by Tabuk and Hacıömeroğlu (2015) was used to measure the attitudes of pre-service class teachers towards mathematics. The scale of attitude towards mathematics is composed of two sub-dimensions, "Self-confidence" 18 items and "The value of Mathematics" 14 items. The internal consistency coefficient during the adaptation of the scale was found to be .78. The items were answered in five grades "(1) Never, (2) Rarely, (3) Sometimes, (4) Often, (5) Always". The lowest score that can be taken from the scale is 32, the highest score is 160. The high score indicates that the attitude toward math is high and the low score indicates that the attitude toward math is low. In conclusion of the analyses made, the internal consistency coefficient of our scale was found to be .96, .94 for the self-confidence, and .92 for the value of mathematics.

### 2.4. Data Analysis

IBM SPSS 21.0 was used in the analysis of the data. According to the average scores obtained from the scales, "1.00 -2.33" indicates low, "2.34-3.67" medium and "3.68-5.00" high. It was analysed whether there was a significant difference between the scores of Class Teachers' Self-efficacy in Mathematical Literacy and Attitudes

towards Mathematics according to gender, class level and academic achievement. The Kolmogorov-Smirnov test was used to determine whether the data showed a normal distribution and since the data did not show a normal distribution ( $p < .05$ ), Mann-Whitney U and Kruskal-Wallis H test from the non-parametric tests were used. Spearman's rank correlation analysis was conducted to examine the relationship between pre-service class teachers' self-efficacy in mathematical literacy and their attitudes towards mathematics. The correlation values between 0 and  $\pm .29$  were interpreted as low level of relationship, between 30 and  $\pm .59$ , medium level of relationship and between 60 and  $\pm 1$  as high level of relationship (Büyüköztürk, 2011).

### 3. Findings

This section includes the findings and interpretations that were determined within the framework of the questions in the research.

Table 2 shows the results of the analysis carried out to determine pre-service class teachers' levels of perceptions of self-efficacy in mathematical literacy.

Table 2. Scores of Scale of Pre-service Class Teachers' Self-efficacy in Mathematical Literacy

	N	Mean	Standard Deviation	Minimum	Maximum
Self-efficacy in Mathematical Literacy	274	3.48	.56	1.56	4.88

Table 2 shows that the mean of scores of pre-service class teachers' self-efficacy in mathematical literacy is 3.48. Thus, it can be said that the level of pre-service class teachers' perceptions of self-efficacy in mathematical literacy is "medium" level.

The results of the Mann-Whitney U test analysis on whether the mean scores of self-efficacy perceptions of pre-service class teachers in mathematical literacy differ significantly in terms of the gender variable are given in Table 3.

Table 3. The Results of the Mann-Whitney U Test Analysis to Compare the Scores of Pre-service Class Teachers' Self-efficacy in Mathematical Literacy in Terms of Gender

Group	N	Mean Rank	Rank Sum	U	Z	p
Female	202	133.40	26946.50	6443.50	-1.436	.151
Male	72	149.01	10728.50			

When Table 3 is examined, it can be seen that the mean scores of male pre-service teachers' self-efficacy perception in mathematical literacy is ( $X = 149.01$ ) while the mean scores of female pre-service teachers' self-efficacy perception in mathematical literacy ( $X=133.40$ ). In addition, as a result of the Mann-Whitney U test applied to determine whether pre-service teachers' scores of self-efficacy in mathematical literacy differ significantly in terms of the gender variable, it was found that the difference between the arithmetic mean of the groups for the scale total scores was not statistically significant ( $U=6443.50$ ,  $z=-1.436$ ,  $p>.05$ ). In other words, gender variable does not make a difference in pre-service class teachers' self-efficacy perceptions in mathematical literacy.

The results of the analysis of the Mann-Whitney U test on whether the mean scores of self-efficacy perceptions of pre-service class teachers in mathematical literacy differ significantly in terms of the grade level variable are given in Table 4.

Table 4. The Results of the Mann-Whitney U Test Analysis to Compare the Scores of Pre-service Class Teachers' Self-efficacy in Mathematical Literacy in Terms of Grade Levels.

Group	N	Mean Rank	Rank Sum	U	Z	p
Grade 1	109	114.02	12428.50	6443.50	-3.988	.000
Grade 4	165	153.01	25246.50			

When Table 4 is examined, it was found that the average scores of 1st grade pre-service class teachers' self-efficacy perceptions in mathematical literacy is ( $X=114.02$ ), while the average scores of 4th grade pre-service class teachers' self-efficacy perceptions in mathematical literacy is ( $X=153.01$ ). In addition, as a result of the Mann-Whitney U test applied to determine whether pre-service teachers' scores of self-efficacy in mathematical literacy differ significantly in terms of the grade level variable, it was found that the difference between the arithmetic mean of the groups for the scale total scores was statistically significant ( $U=6443.50$ ,  $z=-3.988$ ,  $p<.05$ ). In other words, it can be said that pre-service class teachers' self-efficacy perceptions in mathematical literacy differed in terms of the grade level variable and that this significant difference is in favour of 4th grade pre-service teachers.

The results of analysis of the Kruskal-Wallis H test on whether the mean scores of self-efficacy perceptions of pre-service class teachers in mathematical literacy differ significantly in terms of the academic average variable are given in Table 5.

Table 5. The Results of the Kruskal-Wallis H Test to Compare the Scores of Pre-service Class Teachers' Self-efficacy in Mathematical Literacy in Terms of Academic Average

Groups	N	Mean Rank	Sd	X <sup>2</sup>	p	Significant Difference
2.00 and below	28	130.38	4	4.198	.380	-
2.01-2.50	73	123.02				
2.51-3.00	97	145.99				
3.01-3.50	65	142.62				
3.51 and above	11	146.64				

When Table 5 is examined, it is seen that there is no significant difference between rank average scores of pre-service class teachers' self-efficacy in mathematical literacy in terms of academic average variable ( $X^2=4.198$ ,  $sd=4$ ,  $p>.05$ ). Thus, pre-service teachers' self-efficacy in mathematical literacy does not change significantly in terms of the academic average.

The results of the analysis conducted to determine the perception levels of pre-service teachers' attitude towards mathematics are given in Table 6.

Table 6. Scores of Pre-service Class Teachers' Attitude Towards Mathematics Scale

	N	Mean	Standard Deviation	Minimum	Maximum
Attitude Towards Mathematics	274	3.61	.79	1.03	4.97
Self-Confidence	274	3.46	.87	1.00	5.00
The Value of Mathematics	274	3.80	.79	1.00	5.00

In Table 6, it is seen that the average score of pre-service class teachers' attitudes towards mathematics is 3.61. Thus, it was concluded that the attitudes of pre-service class teachers towards mathematics were generally "moderate". Among the answers given by the respondents, the lowest average was found to be 1.03 while the highest average was found to be 4.97. In addition, the mean scores of "Self-confidence" and "Value of Mathematics", which are sub-scales of attitude towards Math, were found as "3.46" and "3.80" respectively. It was concluded that self-confidence was "medium" while the value of mathematics was "low".

The results of the analysis of the Manny-Whitney U test on whether the mean scores of pre-service class teachers' attitude towards mathematics differ significantly in terms of the gender variable are given in Table 7.

Table 7. Manny-Whitney U Test Results to Compare the Scores of Pre-service Class Teachers' Attitude towards Mathematics in Terms of Gender

Sub-scales	Group	N	Mean Rank	Rank Sum	U	Z	p
Self-Confidence	Female	202	135.08	27286.00	6783.00	-.847	.397
	Male	72	144.29	10389.00			
Value of Mathematics	Female	202	131.68	26599.50	6096.50	-2.037	.042
	Male	72	153.83	11075.50			
Attitude Towards Mathematics	Female	202	133.37	26940.50	6437.50	-1.446	.148
	Male	72	149.09	10734.50			

When Table 7 is examined, it can be seen that the mean scores of male pre-service teachers' attitude perception towards mathematics is ( $X=149.09$ ) while the mean scores of female pre-service teachers' attitude perception towards mathematics is ( $X=133.37$ ). In addition, as a result of the Manny-Whitney U test applied to determine whether pre-service teachers' scores of attitude perception towards mathematics differ significantly in terms of the gender variable, it was found that the difference between the arithmetic mean of the groups for the scale total scores was not statistically significant ( $U=6437.50$ ,  $z=-1.446$ ,  $p>.05$ ). In other words, it can be said that the scores of pre-service class teachers' attitudes towards mathematics do not differ in terms of the gender variable. In addition, it was concluded that there was not a significant difference between the "Self-confidence", sub-scale of pre-service teachers' attitude towards mathematics, and gender ( $U=6783.00$ ,  $z=-.847$ ,  $p>.05$ ), while there was a significant difference between perception score of "Value of Mathematics" and gender ( $U=6096.50$ ,  $z=-2.037$ ,  $p<.05$ ). Thus, it was found that the difference between gender and value of mathematics, a sub-scale of attitude towards mathematics, was in favour of male pre-service class teachers.

The results of the analysis of the Manny-Whitney U test on whether the mean scores of pre-service class teachers' attitude towards mathematics differ significantly in terms of the grade level variable are given in Table 8.

Table 8. Manny-Whitney U Test Results to Compare the Scores of Pre-service Class Teachers' Attitude towards Mathematics in Terms of Grade Levels

Sub-scales	Group	N	Mean Rank	Rank Sum	U	Z	p
Self-Confidence	Grade 1	109	113.85	12410.00	6415.00	-4.016	.000
	Grade 4	165	153.12	25265.00			
Value of Mathematics	Grade 1	109	122.80	13385.50	7390.50	-2.497	.013
	Grade 4	165	147.21	24289.50			
Total	Grade 1	109	116.03	12647.00	6652.00	-3.646	.000
	Grade 4	165	151.68	25028.00			

When Table 8 is examined, it can be seen that the mean scores of 4th grade pre-service teachers' attitude towards mathematics is ( $X=151.68$ ) while the mean scores of 1st grade pre-service teachers' attitude towards mathematics is ( $X=116.03$ ). In addition, as a result of the Manny-Whitney U test applied to determine whether pre-service teachers' scores of attitude perception towards mathematics differ significantly in terms of the grade level variable, it was found that the difference between the arithmetic mean of the groups for the scale total scores was statistically significant ( $U=6652.00$ ,  $z=-3.646$ ,  $p<.05$ ). In other words, it can be said that the scores of pre-service teachers' attitude towards mathematics is dependent on the grade level and that this significant difference is in favour of the 4th grade pre-service teachers. In addition, it was found that there was a significant difference ( $U=6415.00$ ,  $z=-4.016$ ,  $p<.05$ ;  $U = 7390.50$ ,  $z = -2,497$ ,  $p <.05$ ) between the scores of "Self-confidence" and "Value of Mathematics" from the sub-dimensions of pre-service class teachers' attitudes towards mathematics. Thus, it was found out that the difference between "Self-confidence" and "Value of Mathematics", which are sub-dimensions of attitude towards mathematics, is in favour of 4th grade pre-service teachers.

The results of analysis of the Kruskal-Wallis H test on whether the mean scores of pre-service class teachers' attitudes towards mathematics differ significantly in terms of the academic average variable are given in Table 9.

Table 9. Kruskal-Wallis H Test Results to Compare Pre-service Class Teachers' Attitudes Towards Mathematics in Terms of Academic Average

Sub-scales	Groups	N	Mean Rank	Sd	$X^2$	p	Significant Difference
Self-Confidence	2.00 and below	28	128.77	4	4.991	.288	-
	2.01-2.50	73	124.66				
	2.51-3.00	97	149.98				
	3.01-3.50	65	135.00				
	3.51 and above	11	149.68				
Value of Mathematics	2.00 and below	28	149.04	4	1.281	.865	-
	2.01-2.50	73	131.18				
	2.51-3.00	97	139.23				
	3.01-3.50	65	135.55				
	3.51 and above	11	146.32				
Total	2.00 and below	28	135.57	4	2.869	.580	-
	2.01-2.50	73	127.36				
	2.51-3.00	97	146.76				
	3.01-3.50	65	134.05				
	3.51 and above	11	148.41				

When Table 9 is examined, it is seen that there is no significant difference between average scores of pre-service class teachers' attitude towards mathematics in terms of academic average variable ( $X^2=2.869$ ,  $sd=4$ ,  $p>.05$ ). In addition, there was no significant difference between the average scores of the sub-scales of attitudes toward mathematics, "Self-confidence" and "Mathematics value", and rank average scores in terms of academic average variable. ( $X^2=4.991$ ,  $sd=4$ ,  $p>.05$ ;  $X^2=1.281$ ,  $sd=4$ ,  $p>.05$ ).

Whether or not there is a relationship between pre-service teachers' self-efficacy in mathematical literacy and their attitudes towards mathematics was determined by the Sperman Rank Differences analysis and presented in Table 10.

Table 10. Results of Sperman Rank Differences Correlation Analysis Between the Scales and Sub-scales Applied to the Pre-service Class Teachers

	Self-efficacy in Mathematical Literacy	Self-Confidence	Value of Mathematics	Attitude Towards Mathematics
Self-efficacy in Mathematical Literacy	1	.651**	.486**	.628**
Self-Confidence	-	1	.747**	.959**
Value of Mathematics	-	-	1	.900**
Attitude Towards Mathematics	-	-	-	1

\*\*0.01 significance level

A significant positive correlation between scales and sub-dimensions was found as a result of Sperman Rank Differences Correlation analysis conducted to determine the relationship between the pre-service class teachers' perceptions of self-efficacy in mathematical literacy and their attitudes towards mathematics. Accordingly, it was concluded that there is a high, positive and significant relationship between self-efficacy in mathematical literacy perceptions and attitude perceptions towards mathematics ( $r=.638, p<.001$ ). Thus, it can be said that as the attitudes of pre-service class teachers towards mathematics increase positively, so will the average scores of self-efficacy in mathematical literacy.

#### 4. Discussion and Conclusion

According to the results of the research, it is seen that the average scores of pre-service class teachers' self-efficacy in mathematical literacy is 3.48. Thus, it can be said that the level of pre-service class teachers' perceptions of self-efficacy in mathematical literacy is "medium" level. In their research, Akkaya and Sezgin Memnun (2012) aimed to reveal the levels of pre-service mathematics, science and class teachers' self-efficacy beliefs in mathematical literacy. The results of the research show that a significant proportion of pre-service class teachers have a self-efficacy belief in mathematical literacy at a good level, but some have a self-efficacy belief in mathematical literacy at a moderate level and they still need improvement. In their research, Zehir and Zehir (2016) found the arithmetic average of scores of pre-service elementary school mathematics teachers' self-efficacy belief in mathematical literacy as 3,62 and found that pre-service teachers' self-efficacy beliefs in mathematical literacy had a value above the average. In their research examining the levels of pre-service elementary and secondary schools mathematics teachers' self-efficacy in mathematical literacy, they found the self-efficacy levels of pre-service teachers in mathematical literacy "high" with an average of 96,06. In their research determining the influence of optional mathematical literacy course on the levels of self-efficacy of pre-service teachers in mathematical literacy, Yenilmez and Ata (2013) found that the average score of pre-service teachers' self-efficacy in mathematical literacy as 87,7 and stated that pre-service teachers' self-efficacy in mathematical literacy is generally at a "medium" level. In their research examining whether the self-efficacy beliefs of elementary school mathematics, science and class teachers in mathematical literacy differ in terms of gender, age, institution type, branch, seniority, graduation and high school type, Tarım, Baypınar and Keklik (2015) found that self-efficacy of teachers in mathematical literacy was generally "high" when compared to the mean scores of the scale.

As a result of the research, it was seen that the pre-service class teachers' self-efficacy perceptions in mathematical literacy did not depend on the gender variable. Koyuncu and Haser (2012) found a statistically significant difference between the scores of self-efficacy of pre-service class teachers in mathematical literacy in terms of genders. Male's self-efficacy in mathematical literacy was found to be higher than females'. In their research determining the pre-service class teachers' attitudes towards mathematics, self-efficacy perceptions towards mathematics and teacher self-efficacy beliefs and examining the relationships between them, Akay and Boz (2011) stated that pre-service class teachers' self-efficacy perceptions in mathematical literacy did not depend on the gender variable. In their research examining the roles of emotional intelligence and emotional self-efficacy in mathematical literacy of undergraduate students, Tariq, Qualter, Roberts, Appleby and Barnes (2013) revealed significant gender differences. Men achieved a higher average test score than women. In their research, Akkaya and Sezgin Memnun (2012) found that there was no significant difference between the averages of the scores of female and male pre-service teachers' self-efficacy belief in mathematical literacy. Altıntaş, Özdemir and Kerpiç (2012) found that there was not a significant difference between the scores of female pre-service teachers' self-efficacy in mathematical literacy and the scores of male pre-service teachers' self-efficacy in mathematical literacy when the pre-service teachers' scores of self-efficacy in mathematical

literacy are compared in terms of gender. Dinçer, Akarsu and Yılmaz (2016) found that there was not a significant relationship between self-efficacy in mathematical literacy and gender. In addition, Chen, 2003, Goodwin, Ostrom and Scott, 2009 concluded that there was no relationship between the self-efficacy in mathematics and gender. Yenilmez and Turgut (2012) found that pre-service teachers' levels of self-efficacy in mathematical literacy did not differ significantly in terms of gender. Zehir and Zehir (2016), Pajares and Miller (1994) and Schulz (2005) revealed that there was a significant relationship between self-efficacy belief in mathematical literacy and gender. Males' self-efficacy beliefs in mathematical literacy are higher than that of females.

As a result of the research, it was seen that the pre-service class teachers' self-efficacy perceptions in mathematical literacy depended on grade level variable and that this significant difference was in favour of 4th grade pre-service teachers. When the percentage rates (64.5% -55.0% -65.2% -71.8% from the first year to the last year respectively) of pre-service teachers' average scores of self-efficacy in mathematical literacy is examined, Akkaya and Sezgin Memnun (2012) found that there was significant decreases in the percentage of second graders but it was at a good level in the third grade and that the most increase is seen in the final grades. This suggests that pre-service teachers' belief average scores differ according to class levels. In the research carried out by Altıntaş, Özdemir and Kerpiç (2012), when the scores of teachers' self-efficacy in mathematical literacy are compared in terms of grade level, it is seen that there is not a significant difference between the scores of 1st grade pre-service teachers' self-efficacy in mathematical literacy and 4th grade pre-service teachers' self-efficacy in mathematical literacy. Zehir and Zehir (2016) stated that the self-efficacy of 4th graders was statistically and significantly higher than the 2nd graders. Dinçer, Akarsu and Yılmaz (2016) found that the lowest score of self-efficacy in mathematical literacy belonged to the 2nd graders while the highest to the 4th graders. It was determined that there is a significant difference between elementary school pre-service mathematics teachers' self-efficacy in mathematical literacy in terms of grade level. According to this result, it can be said that self-efficacy in mathematical literacy increases as the grade level increases. Koyuncu and Haser (2012) concluded that there were differences between the scores of self-efficacy in mathematical literacy in terms of grade levels. According to the results of the research, scores of self-efficacy in mathematical literacy increased as the grade level increased.

When the results of the research are examined, it is seen that there is no significant difference between class teachers' average scores of self efficacy perception in mathematical literacy according to the academic average variable. Similarly, Koyuncu and Haser (2012) did not find a statistically significant difference between the scores of class teachers' self- efficacy in mathematical literacy and general academic grade average. Yenilmez and Turgut (2012) stated that pre-service teachers' levels of self-efficacy in mathematical literacy did not differ significantly in terms of academic achievement. Multon, Brown and Lent (1991) revealed positive and statistically significant relations between self-efficacy beliefs and academic performance when the results of meta analysis related to the influence of self-efficacy beliefs on academic performance. Ayatola and Adedeji, (2009) did not obtain a significant difference between mathematical self-efficacy and mathematical achievement in their research examining the relationship between mathematical self-efficacy and mathematical achievement.

As a result of the research, it was found that the average score of pre-service class teachers' attitudes towards mathematics is 3.61. Thus, it can be said that the attitudes of pre-service class teachers towards mathematics were generally "good". This finding shows parallelism with the results of Kandemir (2007), Gökçek and Güneş (2011), Boran, Aslaner and Çakan (2013). In this context, it was revealed that the good attitude of pre-service class teachers towards mathematics will affect their attitude towards lessons in a positive way (Warwick, 2008). For this reason, students will also change their perspectives for the lesson and they will be interested in the lesson.

As a result of the research, it was found that pre-service class teachers' perceptions of attitudes towards mathematics do not depend on the gender variable. In addition, it was concluded that there is no significant difference between "Self-confidence", one of the sub-scales of pre-service class teachers' attitudes towards mathematics, and gender whereas there is a significant difference between "Value of Mathematics" perception score and gender. Thus, it was found that the difference between gender and value of mathematics, a sub-scale of attitude towards mathematics, was in favour of male pre-service class teachers. Akay and Boz (2011) found that there was not a statistically significant difference between the scores of male and female pre-service teachers' attitudes towards mathematics. In their study examining the attitudes of first grade students of classroom teaching department according to various variables, Çelik and Bindak (2005) found that the attitudes of female and male students' towards mathematics were similar. Boran, Aslaner and Çakan (2013) found that the level of attitude of females towards mathematics was higher than males.

As a result of the research, a significant positive correlation was found between scores of pre-service class teachers' self-efficacy perceptions in mathematical literacy and their attitude perceptions towards mathematics between scales and sub-scales. Accordingly, it was concluded that there is a high, positive and significant relationship between self-efficacy in mathematical literacy perceptions and attitude perceptions towards

mathematics. This finding shows similarity with the research by Brown (2003) and Dağlıoğlu (2017). In their research determining the pre-service class teachers' attitudes towards mathematics, self-efficacy perceptions towards mathematics and teacher self-efficacy beliefs and examining the relationships between them, Akay and Boz (2011) found that there was statistically significant relationships in the positive direction between the scores of attitude towards mathematics and self-efficacy perceptions towards mathematics, between the scores of attitude towards mathematics and teachers' self-efficacy beliefs and between the scores of self-efficacy perceptions towards mathematics and teachers' self-efficacy beliefs. Kesicioğlu (2014) determined that there was not a statistically significant relationship between the levels of mathematical literacy of pre-service pre-school teachers and their attitudes towards pre-school mathematics.

It should be aimed that the pre-service teachers' self-efficacy in mathematical literacy be at a high level. To be able to raise class teachers at a high level of mathematical literacy, it is important that pre-service teachers' self-efficacy in mathematical literacy be investigated and measures be taken to contribute to their professional development before they start their professions. One of the general objectives of mathematics is explained in the mathematics program as to develop positive attitudes in students towards mathematics lesson. Teachers' attitudes are influential in the positive development of students' attitudes. Therefore, the attitudes of the pre-service teachers, who receive training in the teacher training programs, towards mathematics are at the forefront.

## 5. References

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