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INVESTIGATION OF THE TEACHER SELF-EFFICACY BELIEFS OF MATH TEACHERS

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ABSTRACT

This study aimed to investigate the teacher self-efficacy beliefs of math teachers in terms of certain variables such as gender, seniority, the program they graduated from, the level of school they are working at. The survey and causal-comparative research methods were used in this study. The sample of the study comprised a total of 158 math teachers. We used Teacher' Sense of Efficacy Scale in the study to collect the data. The data were analyzed using descriptive statistics, independent samples t-test and ANOVA. As a result of data analysis, the teacher self-efficacy belief levels of math teachers, in general, was found to be "quite efficient", but this level was "slightly efficient" in the self-efficacy sub-factor for student engagement. Some statistically significant differences were found between teacher self-efficacy beliefs of math teachers in general and among each sub-factor of the scale in terms of gender. On the other hand, the difference between math teachers' self-efficacy beliefs was also statistically significant in terms of seniority. However, no significant difference was detected between the self-efficacy beliefs of teachers in terms of the level of school they are working at and the program they graduated from.

Keywords: *Mathematics, Teacher, Self-efficacy belief*

INTRODUCTION

Nowadays learning attitudes refer that students must require the "21st century skills" in order to take place in the changing world. Therefore, to develop these skills, the teacher should attentively change his/her teaching role, capacity and quality. In previous studies, teachers play a crucial role in guiding learners in the classroom (Zikre & Leong, 2016). Investigation of educational research on what constitutes as an effective teacher in today's world has become an important condition in the last few decades (Shittu, Gambari, Gimba, & Ahmed, 2016). Realizing an efficient education and educating individuals up to the desired level depend on teachers who have a say in their profession. In this context, it can be said that a good teacher training must be established and is the key to teachers' self- efficacy beliefs. Teachers' perceptions of their own competence are one of the most important factors that affect teaching (Şahin, Gökkurt, & Soylu, 2014). Teacher self-efficacy is defined as teachers' sense and the idea of self-confidence in terms of providing their students an efficient education and teaching (Guskey & Passaro, 1994). Bandura (1994) defined the belief of self-efficacy as the individual's belief in his/her capacity to perform and organize the required activities to obtain success in a certain field. According to Bandura (1986), the individual's belief in his/her capacity and

competence in a certain field is more effective on behaviour than the individual's actual talent in the field. In other words, the individual's behaviour will be shaped according to the individual's belief in his/her own competence. In this regard, Bandura (1986; in Aypay, 2010) emphasizes the importance of the expectations of competence. Strong expectations of competence will increase the individual's activity and effort. Bandura also states that expectations of competence have an effect on the individual's resistance against difficult and unwanted situations (Bandura, 1977). Bandura (1997) claims that self-efficacy is open to development.

Mathematics teaching and learning has evolved on several occasions with the changing world (Krishnan, 2016). For that reason, the belief of self-efficacy is also one of the factors impacting the effectiveness aspect of math teaching (Dede, 2008). Teachers with high self-efficacy beliefs establish a better classroom environment and assist their students to improve their achievement (Henson, 2001; Guo, Connor, Yang, Roehrig, & Morrison, 2012). Pajares and Kranzler (1995) stated that mathematics self-efficacy beliefs had a strong direct effect on mathematics achievement. A strong correlation is known to be between the belief of self-efficacy and success in math (Kiamanesh, Hejazi, & Esfahani, 2004). Again, there have been studies showing the correlation between the student's success and the teacher's self-efficacy (Caprara, Barbaranelli, Steca, & Malone, 2006). These studies show that teachers' beliefs on teaching shapes their behaviour in teaching. Moreover, teachers' beliefs were shown to have an important place in math teaching (Huinker & Madison, 1997; Boz, 2008). Therefore, in order to achieve the desired level of education, the level of self-efficacy belief of the teacher, who is the most important part of education, must be high (Şahin, Gökkurt, and Soylu, 2014).

LITERATURE REVIEW

The literature shows that there are some studies taking math teachers teaching math, math learning, and the nature of math into consideration, whereas there are some studies taking the correlation between the beliefs of math teachers and teaching practices into consideration (Boz, 2008). In addition, teachers' beliefs of self-efficacy play a role in determining the methods and strategies the teachers use in the classroom. Therefore, teachers positively affect their students academically (Azar, 2010). Therefore, the self-efficacy beliefs have an important role on the student engagement and learning in the classroom (Linnenbrink & Pintrich, 2003). Teachers set up their teaching methods through their positive and negative beliefs accordingly, which makes the beliefs of teachers towards any course as very important (Aydoğdu & Peker, 2016). Accordingly, it was observed that while teachers with higher self-efficacy belief are more inquisitive, teachers with lower self-efficacy belief are more teacher-centred (Czerniak, 1990, as cited in Azar, 2010).

The teachers' belief of self-efficacy has been researched from many studies at the last decades. Some of them have investigated teachers' beliefs of self-efficacy according to gender (Azar, 2010; Bakkaloğlu, 2007; Gündüz-Özsoy, 2017; Şensoy & Aydoğdu, 2008; Üstüner, Demirtaş, Cömert, & Özer, 2009; Yenice, 2012; Wilson & Geok-Chin, 2004), according to age or seniority (Egger, 2006; Gündüz-Özsoy, 2017; Kesgin, 2006; Şahin, Gökkurt & Soylu, 2014; Üstüner et al., 2009; Yılmaz & Çokluk-Bökeoğlu, 2008; Wilson & Geok-Chin, 2004; Wu, 2005), according to program they graduated from (Gündüz-Özsoy, 2017; Üstüner et al., 2009), according to the level of education in schools (Üstüner et al., 2009; Yılmaz & Çokluk-Bökeoğlu, 2008; Wilson & Geok-Chin, 2004). Wilson and Geok-Chin (2004) stated that teachers' self-efficacy beliefs differed according to gender, and is in favour of male teachers, but it was not significant. Gündüz-Özsoy (2017) found similar results in Turkey wherein male teachers' self-efficacy belief scores higher than female teachers' scores, but it was not significant. Whereas Üstüner et al. (2009) found female teachers' self-efficacy belief scores to be higher than male teachers' scores, but it was not significant. As seen, there were some studies in the literature studying with teachers' self-efficacy belief according to gender and yet there were no studies in the literature studying with math teachers' self-efficacy beliefs according to gender in Turkey. On the other hand, some studies reported that there were significant difference between teachers' self efficacy beliefs and age or seniority (Gündüz-Özsoy, 2017), some of them reported that there were no significant difference between teachers' self efficacy beliefs and age or seniority (Egger, 2006;

Gündüz-Özsoy, 2017; Kesgin, 2006; Şahin, Gökkurt & Soylu, 2014; Üstüner et al., 2009; Yılmaz & Çokluk-Bökeoğlu, 2008; Wilson & Geok-Chin, 2004; Wu, 2005). However, there were no studies in the literature regarding math teachers' self-efficacy beliefs according to seniority in Turkey. The results of recent study showed that the self-efficacy beliefs of preservice teachers were at a high level (Aydoğdu & Peker, 2016). Similarly, Aydoğdu, Peker and Duban (2017) reported that pre-service science, mathematics and primary school teachers' self-efficacy were quite sufficient. In addition, they showed that the pre-service teachers' self-efficacy scores did not significantly differ on gender and their graduated program.

As seen in the literature, many studies have investigated teachers' beliefs of self-efficacy according to gender, age or seniority, program they graduated from and the level of education in schools. But, there were no studies in the literature regarding math teachers' self-efficacy beliefs in terms of these variables in Turkey. Due to the lack of such studies on math teachers, in particular, this study will further contribute to this field.

The aim of this study is to investigate the teacher self-efficacy beliefs of math teachers working at secondary and high schools in terms of certain variables such as gender, seniority, the program they graduated from, the level of school they are working at.

RESEARCH METHODOLOGY

This study investigates the teacher self-efficacy beliefs of math teachers working at secondary and high schools in terms of certain variables such as: gender, seniority, the program they graduated from and the level of school they are working at. Two different research methods were used for this research. In the first pattern, self-efficacy beliefs of math teachers working at secondary and high schools were identified using "Teacher' Sense of Efficacy Scale", and for data collection, general survey method was used. In the second pattern, in analysing the differences between the self-efficacy beliefs of teachers participating in the study in terms of variables such as gender, seniority, the program of graduation and the level of the school the teacher is working at, the causal-comparative research method was used to compare the scores of different groups (Fraenkel & Wallen, 2009).

Participants

The population of the study comprised of math teachers with the study sample totalling a number of 158 math teachers working in the secondary and high schools in a city at the west of Turkey. The distribution of teachers in the study sample by gender, seniority, program they graduated from and the level of school they are working at are shown in Table 1.

Table 1
Distribution of teachers in the study sample by gender, seniority, program they graduated from and the level of school they are working at

Variables	Category	f	%
Gender	Female	89	56.3
	Male	69	43.7
	Total	158	100
Seniority	1-9 years	48	30.4
	10-19 years	93	58.9
	20 year or more	17	10.8
	Total	158	100
Graduated program	Mathematics	57	36.1
	Math Teacher Training	29	18.4
	Elementary School Math Teacher Training	67	42.4
	Other	5	3.2
	Total	158	100

Type of school working at	Secondary School	94	59.5
	High School	64	40.5
	Total	158	100

Table 1 shows that 56.3% of math teachers in the study sample were female and 43.7% were male. In addition, based on the distribution of teachers by their years in service; it can be seen that 30.4% of the teachers had experiences of 1-9-years in service, 58.9% had 10-19 years in service, 10.8% had 20 or more years in service. The distribution of teachers by the programs they graduated from shows that 36.1% graduated from Faculty of Science and Literature. Whereas, for the Department of Mathematics, 18.4% graduated from high school mathematics teacher training program, 42.4% graduated from elementary school mathematics teacher training program, and 3.2% graduated from different programs. In addition, it can be seen that 59.5% of these teachers work in secondary schools while 40.5% work in high schools.

Instruments

The participants were given a personal information form and the "Teacher' Sense of Efficacy Scale" developed by Tschannen-Moran and Woolfolk Hoy (2001), whose Turkish adaptation, and validity and reliability studies were done by Çapa, Çakıroğlu, and Sarıkaya (2005). Teacher' Sense of Efficacy Scale comprises 24 items and three sub-factors. The sub-factors of the scale are "self-efficacy for Student Engagement (SE)" (8 items), "self-efficacy for Instructional Strategies (IS)" (8 items), and "self-efficacy for Classroom Management (CM)" (8 items). In the adaptation of the scale to Turkish, was done by Rasch analysis. It is based on the rating scale model was used in support of the construct validity of the scale (Çapa et al., 2005).

In the adaptation of the scale to Turkish, the Cronbach-Alpha coefficient for the general reliability of the scale was 0.93, 0.82 for the self-efficacy sub-factor of self-efficacy for student engagement, 0.86 for the self-efficacy sub-factor of instructional strategies, and 0.84 for the self-efficacy sub-factor of classroom management (Çapa et al., 2005). In this study with math teachers working at secondary and high schools, the Cronbach-Alpha coefficient for the general reliability of the scale was 0.95, 0.87 for the self-efficacy sub-factor of student engagement, 0.88 for the self-efficacy sub-factor of instructional strategies, and 0.89 for the self-efficacy sub-factor of classroom management.

There are no negative items in the scale, and the scores obtained based on the answers given by teachers constituted the self-efficacy belief score of each teacher. By dividing the total score by the number of items, 9-point Likert type equivalent of the scores each teacher got from the scale in general and its sub-factors were obtained.

Data Analysis

In the analysis of data, first of all, descriptive statistics was used to determine the self-efficacy belief levels and the distribution of self-efficacy belief levels by the gender, seniority, program of graduation and the level of school. To determine the difference between self-efficacy beliefs of teachers in terms of gender and the level of school they are working at, for independent samples, a t-test was used. To determine the difference between self-efficacy beliefs of teachers in terms of seniority and the program they graduated from, one-way analysis of variance (ANOVA) was used. The tests used were decided after the data was seen to be parametric and the distribution to be normal.

RESULTS

The results of the statistical analyses performed on the data collected via data collection tools used in the study are given in the tables below. To determine the self-efficacy belief levels of the math teachers participating in the study, the descriptive statistical analysis was performed, and the data obtained from this analysis is given in Table 2.

Table 2
Descriptive statistics on the self-efficacy belief levels of teachers

Sub- Factors	N	M	sd
Self-efficacy for student engagement	158	6.32	0.89
Self-efficacy for instructional strategies	158	7.17	1.02
Self-efficacy for classroom management	158	7.07	0.90
Whole scale	158	6.86	0.98

According to Table 2, self-efficacy belief levels of math teachers working at secondary and high schools are "quite enough" in general, whereas this level is reduced to "slightly enough" when it comes to the self-efficacy sub-factor of student engagement. Arithmetic means were analyzed; and the arithmetic mean of the scale, in general, is 6.86, 7.17 for the sub-factor "self-efficacy for instructional strategies", 7.07 for the sub-factor "self-efficacy for classroom management", and 6.32 for the sub-factor "self-efficacy for student engagement". For independent samples to identify the difference between the self-efficacy beliefs of the math teachers participating in the study in terms of gender, t-test analysis was performed, and the results are given in Table 3.

Table 3
Difference between self-efficacy belief levels of math teachers in the study sample in terms of gender

Sub-Factors	Gender	N	M	sd	df	t	p
Self-efficacy for student engagement	Female	89	6.12	0.93	156	-2.848	.005
	Male	69	6.58	1.08			
Self-efficacy for instructional strategies	Female	89	6.93	0.88	156	-4.013	.001
	Male	69	7.49	0.84			
Self-efficacy for classroom management	Female	89	6.90	0.95	156	-2.486	.014
	Male	69	7.29	0.99			
Whole scale	Female	89	6.65	0.84	156	-3.375	.001
	Male	69	7.12	0.88			

In Table 3, a significant difference can be seen between the self-efficacy belief scores of the teachers in the teacher' sense of efficacy scale in general [$t_{(156)}$= -3.375; $p<0.05$], in self-efficacy in student engagement sub-factor [$t_{(156)}$= -2.848; $p<0.05$], in self-efficacy in instructional strategies sub-factor [$t_{(156)}$= -4.013; $p<0.05$] and in self-efficacy in classroom management sub-factor [$t_{(156)}$= -2.486; $p<0.05$] in terms of gender. In the scale in general, self-efficacy belief levels of male teachers, for each sub-factor, are higher than the self-efficacy belief levels of female teachers. According to Cohen (1988, pp. 284-287), the magnitude of the differences in the means of whole scale was small (eta squared = .053), means of student engagement sub-factor was small (eta squared = .045), and means of self-efficacy in classroom management sub-factor was small (eta squared = .039). But, the magnitude of the differences in the means of self-efficacy in instructional strategies sub-factor was moderate (eta squared = .064).

The results of the t-test performed to identify the difference between the self-efficacy beliefs levels of math teachers participating in the study in terms of the level of school they are working at are given in Table 4.

Table 4
Difference between the self-efficacy belief levels of math teachers participating in the study in terms of the level of school they are working at

Sub-Factors	Type of School	N	M	sd	df	t	p
Self-efficacy for student engagement	Secondary School	94	6.39	0.93	156	1.068	.287
	High School	64	6.22	1.14			
Self-efficacy for instructional strategies	Secondary School	94	7.25	0.77	156	1.346	.180
	High School	64	7.06	1.06			
Self-efficacy for classroom management	Secondary School	94	7.12	0.90	156	0.701	.484
	High School	64	7.00	1.10			
Whole scale	Secondary School	94	6.92	0.78	156	1.124	.263
	High School	64	6.76	1.02			

Table 4 shows that there is no significant difference between the self-efficacy belief scores of the teachers in the teacher' sense of efficacy scale in general [$t_{(156)}$= 1.124; p>0.05], in self-efficacy in student engagement sub-factor [$t_{(156)}$= 1.068; p>0.05], in self-efficacy in instructional strategies sub-factor [$t_{(156)}$= 1.346; p>0.05] and in self-efficacy in classroom management sub-factor [$t_{(156)}$= 0.701; p>0.05] in terms of gender. However, it was found that, in general, for each sub-factor, the self-efficacy belief scores of the teachers working at secondary schools are higher than the self-efficacy belief scores of the teachers working at high schools, albeit slightly. The magnitude of the differences in the means of whole scale and the sub-factors were very small.

The results of the one-way analysis of variance (ANOVA) performed to identify the difference between the self-efficacy beliefs of math teachers in terms of seniority are given in Table 5.

Table 5
Difference between self-efficacy belief levels of math teachers in the study sample in terms of seniority

Sub-Factors	Variables	N	M	sd	df	F	p	Differences
Self-efficacy for student engagement	1) 1-9 years	48	5.95	0.92	2-	4.907	.00	1-2
	2) 10-19 years	93	6.51	0.95				
	3) ≥ 20 years or	17	6.36	1.34				
Self-efficacy for instructional strategies	1) 1-9 years	48	6.90	0.95	2-	3.606	.02	1-2
	2) 10-19 years	93	7.32	0.87				
	3) ≥ 20 years or	17	7.13	0.77				
Self-efficacy for classroom management	1) 1-9 years	48	6.81	0.97	2-	2.626	.07	---
	2) 10-19 years	93	7.21	0.91				
	3) ≥ 20 years or	17	7.06	1.29				
Whole scale	1) 1-9 years	48	6.55	0.85	2-	4.383	.01	1-2
	2) 10-19 years	93	7.01	0.84				
	3) ≥ 20 years or	17	6.85	1.05				

Table 5 shows that, based on the ANOVA performed, in the overall teacher' sense of efficacy scale [$F_{(2-155)}$= 4.383; p <.05], there are statistically significant differences between the self-efficacy scores of math teachers in self-efficacy for student engagement sub-factor [$F_{(2-155)}$= 4.907; p <.05] and in self-efficacy for instructional strategies sub-factor [$F_{(2-155)}$= 3.606; p<.05], in terms of seniority. Tukey's HSD (Honestly Significant Difference) multiple comparison analysis showed that this

difference is in self-efficacy for student engagement and self-efficacy for instructional strategies sub-factors and between teachers in service for 1-9 years and teachers in service for 10-19 years, and is in favor of teachers in service for 10-19 years. It can also be seen in the table that the self-efficacy belief scores of teachers in service for 10-19 years is higher than the others. According to Cohen (1988, pp. 284-287), the difference in mean scores of the whole scale between the groups was small. The effect size, calculated using eta squared, was .053. The difference in mean scores of self-efficacy for student engagement sub-factor between the groups was moderate. The effect size, calculated using eta squared, was .059. The difference in mean scores of self-efficacy for instructional strategies sub-factor between the groups was small. The effect size, calculated using eta squared, was .044. However, in self-efficacy for classroom management sub-factor [$F_{(2-155)}$= 2.626; p>.05], there is no statistically significant difference between the self-efficacy belief scores of teachers in terms of seniority. The difference in mean scores of self-efficacy for classroom management sub-factor between the groups was quite small. However, it can be seen in the table that despite the lack of significant difference, the self-efficacy belief scores of teachers in service for 10-19 years is higher than the others.

The results of the one-way analysis of variance (ANOVA) performed to identify the difference between the self-efficacy beliefs of math teachers in terms of the program they graduated from are given in Table 6. Since the grouping of the five teachers who graduated from different programs such as Science, Astronomy, Primary School Teacher Training Program but working as math teacher after changing fields would not constitute a majority, it was not taken into consideration in this analysis.

Table 6
Difference in self-efficacy belief levels of math teachers in terms of the program they graduated from

Sub-Factors	Variables	N	M	sd	df	F	p
Self-efficacy for student engagement	Mathematics	57	6.29	1.16	2-150	0.370	.691
	Math Teacher Training	29	6.46	1.02			
	Elementary School Math Teacher Training	67	6.28	0.92			
Self-efficacy for instructional strategies	Mathematics	57	7.13	0.99	2-150	0.385	.681
	Math Teacher Training	29	7.11	0.96			
	Elementary School Math Teacher Training	67	7.25	0.82			
Self-efficacy for classroom management	Mathematics	57	7.06	1.13	2-150	0.051	.950
	Math Teacher Training	29	7.09	0.85			
	Elementary School Math Teacher Training	67	7.11	0.94			
Whole scale	Mathematics	57	6.82	1.01	2-150	0.080	.924
	Math Teacher Training	29	6.89	0.87			
	Elementary School Math Teacher Training	67	6.88	0.81			

According to Table 6, based on the ANOVA performed, there are no statistically significant differences in teacher' sense of efficacy scale [$F_{(2-150)}$= 0.080; p>.05] between the self-efficacy scores of math teachers for student engagement sub-factor [$F_{(2-150)}$= 0.370; p >.05], self-efficacy for instructional strategies sub-factor [$F_{(2-150)}$= 0.385; p >.05] and self-efficacy for classroom management sub-factor

[$F_{(2-150)}$= 0.051; p >.05], in terms of the program they graduated from. The difference in mean scores of the whole scale and all sub-factors between the groups was very small.

DISCUSSION AND CONCLUSION

One of the conclusions of this study is that self-efficacy belief levels of math teachers are "quite enough" in general, but regarding the self-efficacy for student engagement sub-factor of the scale, the level is "slightly enough". The teachers having a high level of self-efficacy beliefs in math is a desirable condition that positively affects math teaching (Riggs & Enochs, 1990). There is a strong correlation between their beliefs in their ability to teach math effectively and an effective math teaching (Swars, Hart, Smith, Smith, & Tolar, 2007). The results of the current study show that the level of self-efficacy beliefs of math teachers is high, and our results corroborated with the results of the study by Şahin, Gökkurt, and Soylu (2014) on the comparison of self-efficacy beliefs of pre-service teachers and the results of the study by Dede (2008) on math teachers. Similarly, in the study by Pekşen-Varlıoğlu (2013) that investigated the pre-service math teachers' self-efficacy in math teaching, self-efficacy perceptions of pre-service math teachers were high.

The second conclusion of this study is that self-efficacy beliefs of math teachers are statistically significantly different in general and in each sub-factor of the scale according to gender, and this difference is in favour of the male teachers. This means that the self-efficacy belief levels of male teachers are higher than the self-efficacy belief levels of female teachers. In the literature, there are findings that do and do not corroborate with this conclusion. In the study by Bakkaloğlu (2007), where in she investigates the pre-service primary school math teachers' self-efficacy beliefs for using physical materials in teaching, she did not find any differences in terms of gender. In the study by Gündüz-Özsoy (2017), there were no gender differences in terms of student engagement, instructional strategies and classroom management sub-factor in the research conducted with 270 females and 181 male teachers working in state high schools. In the studies by Azar (2010), Yenice (2012) and Şensoy and Aydoğdu (2008), there were no differences in pre-service teachers' self-efficacies in terms of gender. Researches from Shahid and Thompson (2001) alongside Cheung (2008) compared teachers' self-efficiency in terms of gender and found a significant difference in favour of female teachers. In a study by Cantrell, Young and Moore (2003), a significant difference in self-efficacies of pre-service teachers in terms of gender was found and it was in favour of male teachers. The conflicting results from these different studies can be explained by sample differences and cultural differences (Bandura, 2002). Tschannen-Moran and Woolfolk Hoy (2007) indicate that demographic variables do not have a strong influence on self-efficacy beliefs.

The third conclusion of the study is that no statistically significant difference was found between the self-efficacy beliefs of teachers in terms of the level of school they are working at and the program they graduated from. This result is consistent with the results of the study of Yılmaz and Çokluk-Bökeoğlu (2008) on the self-efficacy beliefs of primary school teachers. In their study, Yılmaz and Çokluk-Bökeoğlu did not find any significant difference in terms of the subject matters. No significant differences were detected in terms of the subject matters in the study performed by Üstüner et al. (2009) on secondary school teachers. However, in the study by Üstün and Tekin (2009), a significant difference was found in terms of the subject matters. Similarly, Çapri and Çelikkaleli (2008) found a significant difference between the self-efficacy beliefs of pre-service teachers who graduated from different programs. The different results obtained from different studies can be explained by the differences in sample groups.

The fourth conclusion of this study is that there are statistically significant differences between the self-efficacy belief levels of math teachers in terms of seniority. This difference was between teachers who had 1-9 years in service and those who had 10-19 years in service, and the teachers who had 10-19 years in service had a higher level of self-efficacy belief than those who had 1-9 years in service. Gündüz-Özsoy (2017) also analyzed the correlation between the age ranges and self-efficacy and found a significant difference. According to the results of the research, teachers in the age group 41-50 had higher self-efficacy beliefs than teachers in age groups 21-30 and 31-40. However, there

are also studies in the literature that show age or seniority are not correlated with self-efficacy beliefs (Wu, 2005; Egger, 2006; Kesgin, 2006; Yilmaz & Çokluk-Bökeoğlu, 2008; Üstüner et al., 2009; Şahin, Gökkurt, & Soylu, 2014). The contradictory results presented in these different studies may be due to sample differences, or as indicated by Tschannen-Moran and Woolfolk Hoy (2007), it can be explained by the fact that the effort and the quality of education are more effective on self-efficacy and the demographic variables do not have much effect on self-efficacy. Nevertheless, Gordon et al. and Pajares (in Kurbanoğlu, 2004) stated that people with low level of self-efficacy belief avoid action and give up more quickly when faced with difficulties.

LIMITATIONS AND RECOMMENDATIONS

There are some limitations of this study. Firstly, it was conducted in only one province in Turkey. Secondly, in this study, the researchers only investigated certain variables such as gender, seniority, the program they graduated from, and the level of school they are working at.

In light of the results of this study and other studies in the literature, the following recommendations are provided for future researches.

1) Studies may be performed to improve the self-efficacy beliefs of teachers regarding ensuring student participation.
2) Self-efficacy beliefs of teachers are one of the most important variables that increase their professional success. In teacher training programs, practice-based studies which will increase the self-efficacy belief of teachers may be performed. Efforts and successes of pre-service teachers should not be missed out, and reinforcement strategies should be employed to encourage them.
3) With additional studies on math teachers, self-efficacy belief may be studied in terms of different variables.
4) In-service training courses and skill-based workshops may be arranged for teachers at schools in order to inform them about the new studies and methods regarding math teaching.
5) With practices that support the efforts and successes of the teachers, school administrators may contribute to increase the self-efficacy beliefs of teachers.

REFERENCES

Aydoğdu, B., & Peker, M. (2016). Science and Mathematics Teaching Efficacy Beliefs of Pre-School Teachers. *Universal Journal of Educational Research*, *4*(11), 2541-2550.

Aydoğdu, B., Peker, M., & Duban, N. (2017, October). *An Investigation on pre-service teachers' levels of self-efficacy*. Paper presented at the 2nd International Conference on Best Practices and Innovations in Education, Izmir, Turkey.

Aypay, A. (2010). The adaptation study of general self-efficacy scale to Turkish. *Inonu University Journal of the Faculty of Education*, *11*(2), 113-131.

Azar, A. (2010). In-service and pre-service secondary science teachers' self-efficacy beliefs about science teaching. *ZKU Journal of Social Sciences, 6*(12), 235-252.

Bakkaloğlu, E. (2007). *Preservice elementary mathematics teachers' efficacy beliefs about using manipulatives in teaching mathematics*. Unpublished Master Dissertation. Middle East Technical University, Turkey.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.). *Encyclopedia of human behavior* (Vol. 4, pp. 71-81). New York: Academic Press.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bandura, A. (2002). Social cognitive theory in cultural context. *Applied Psychology: An International Review, 51*(2), 269–290.

Boz, N. (2008). Turkish pre-service mathematics teachers' beliefs about mathematics teaching. *Australian Journal of Teacher Education, 33*(5), 66-80.

Cantrell, P., Young, S., & Moore, A. (2003). Factors affecting science teaching efficacy of preservice elementary teachers. *Journal of Science Teacher Education, 14*(3), 177-192.

Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of School Psychology, 44*, 473-490.

Çapa, Y., Çakıroğlu, J., & Sarıkaya, H. (2005). The development and validation of a Turkish version of the teachers' sense of efficacy scale. *Education and Science, 117,* 74-81.

Çapri, B., & Çelikkaleli, Ö. (2008). Investigation of preservice teachers' attitudes towards teaching and professional self-efficacy beliefs according to their gender, programs, and faculties. *Inonu University Journal of the Faculty of Education, 9(1*5), 33-53.

Cheung, Y. H. (2008). Teacher efficacy: A comparative study of Hong Kong and Shanghai primary in-service teachers. *Australian Educational Researcher, 35*(4), 103-123.

Cohen, J. W. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Dede, Y. (2008). Self-efficacy beliefs of mathematics teachers toward their teaching. *Journal of Turkish Education Science, 6*(4), 741-757.

Egger, K. J. (2006). *An exploration of the relationships among teacher efficacy, collective teacher efficacy, and teacher demographic characteristics in conservative Christian schools.* Unpublished Doctoral Dissertation. University of North Texas, USA.

Fraenkel, J. R., & Wallen, N. E. (2009). *How to design and evaluate research in education* (7th ed.). Boston: McGraw Hill.

Guskey, T. R., & Passaro, P. D. (1994). Teacher efficacy: A study of construct dimensions. *American Educational Research Journal, 31*(3), 627-643.

Guo, Y., Connor, C. M., Yang, Y., Roehrig, A. D., & Morrison, F. J. (2012). The effects of teacher qualification, teacher self-efficacy, and classroom practices on fifth graders' literacy outcomes. *The Elementary School Journal*, *113*(1), 3-24.

Gündüz-Özsoy, A. (2017). *Investigation of the relationship between teachers' self-efficacy beliefs and change resistance behaviors in state high schools.* Unpublished Master Thesis. Marmara University, Turkey.

Henson, R. K. (2001, January). Teacher self-efficacy: Substantive implications and measurement dilemmas. Paper presented at the Annual Meeting of the Educational Research Exchange, College Station, Texas.

Huinker, D., & Madison, S. K. (1997). Preparing efficacious elementary teachers in science and mathematics: The influence of methods courses. *Journal of Science Teacher Education, 8*(2), 107-126.

Kesgin, E. (2006). *The investigation of the relation between the nursery school teachers' self-efficiency and the usage of the problem solving techniques (Denizli Province Sample).* Unpublished Master Thesis. Pamukkale University, Turkey.

Kiamanesh, A. R., Hejazi, E., & Esfahani, Z. N. (2004, July). *The role of math self efficacy, math self-concept, perceived usefulness of mathematics and math anxiety in math achievement.* Paper presented at the Proceedings of the 3rd International Biennial SELF Research Conference, Self-Concept, Motivation and Identity: Where to from here? Berlin, Germany. Retrieved from https://www.researchgate.net/publication/239579908

Krishnan, S. (2016). Students' perceptions of learning mode in mathematics. *Malaysian Online Journal of Educational Sciences*, *4*(2), 32-41.

Kurbanoğlu, S. S. (2004). Self-efficacy belief and its importance for information professionals. *Information World, 5*(2), 137-152.

Linnenbrink, E. A., & Pintrich, P. R. (2003). The role of self-efficacy beliefs in student engagement and learning in the classroom. *Reading &Writing Quarterly*, *19*(2), 119-137.

Pajares, F., & Kranzler, J. (1995). Self-efficacy beliefs and general mental ability in mathematical problem-solving. *Contemporary Educational Psychology*, *20*(4), 426-443.

Pekşen-Varlıoğlu, R. (2013). *Preservice mathematics teachers' self-efficacy perceptions regarding mathematics and teaching.* Unpublished Master Thesis. Marmara University, Turkey.

Riggs, I. M., & Enochs, L. G. (1990). Toward the development of an elementary teacher's science teaching efficacy belief instrument. *Science Education, 74*(6), 625-637.

Şahin, Ö., Gökkurt, B., & Soylu, Y. (2014). A comparison of teachers' and preservice teachers' self-efficacy beliefs regarding mathematics instruction. *Dicle University Journal of Ziya Gokalp Faculty of Education, 22*, 120-133.

Şensoy, Ö. & Aydoğdu, M. (2008). The effect of inquiry-based science instruction approach on the development of self-efficacy belief levels intended for science teaching of secondary science education teacher candidates. *Gazi University Journal of Gazi Educational Faculty, 28*(2), 69–93.

Shahid, J., & Thompson, D. (2001, April). *Teacher efficacy: A research synthesis*. Paper presented at the Annual Meeting of the American Educational Research Association. Seattle, Washington.

Shittu, A. T., Gambari, A. I., Gimba, W. R., & Ahmed, H. (2016). Modeling technology preparedness as an antecedent of mathematic pre-service teachers' self-efficacy, perceived usefulness and intention toward use of information technology in Nigeria. *Malaysian Online Journal of Educational Sciences*, *4*(3), 39-48.

Swars, S., Hart, L. C., Smith, S. Z., Smith, M. E., & Tolar, T. A. (2007). Longitudinal study of elementary pre-service teachers' mathematics beliefs and content knowledge. *Elementary Pre-Service Teachers' Mathematics, 107*(9), 325-335.

Tschannen-Moran, M., & Woolfolk Hoy, A. (2007). The differential antecedents of self-efficacy beliefs of novice and experienced teachers. *Teaching and Teacher Education, 23*, 944–956.

Üstün, A., & Tekin, S. (2009). A comparison of the self- efficacy beliefs of teacher candidates in terms of different variables at Amasya University faculty of education. *Journal of Abant İzzet Baysal University Faculty of Education, 9*(1), 35-47.

Üstüner, M., Demirtaş, H., Cömert, M., & Özer, N. (2009). Secondary school teachers' self-efficacy beliefs. *Journal of Mehmet Akif Ersoy University Faculty of Education, 9*(17), 1-16.

Wilson, P., & Geok-Chin, I. T. (2004), Singapore teachers' personal and general efficacy for teaching primary social studies. *International Research in Geographical and Environmental Education, 13*(3), 209-222.

Wu, R. T. Y. (2005). *Relationship between teachers' teaching effectiveness and school effectiveness in comprehensive high schools in Taiwan, Republic of China*. Paper presented at the International Congress for School Effectiveness and Improvement Conference, Barcelona, Spain.

Yenice, N. (2012). Investigating the self-efficacy and problem solving skills of preservice teachers. *Electronic Journal of Social Science, 11*(39), 36-58.

Yılmaz, K., & Çokluk-Bökeoğlu, Ö. (2008). Primary school teachers' belief of efficacy. *Ankara University Journal of Faculty of Educational Sciences, 41*(2), 143-167.

Zikre, N. M., & Leong, K. E. (2016). Malaysian mathematics teachers' beliefs about the nature of teaching and learning. *Malaysian Online Journal of Educational Sciences*, *4*(1), 21-29.