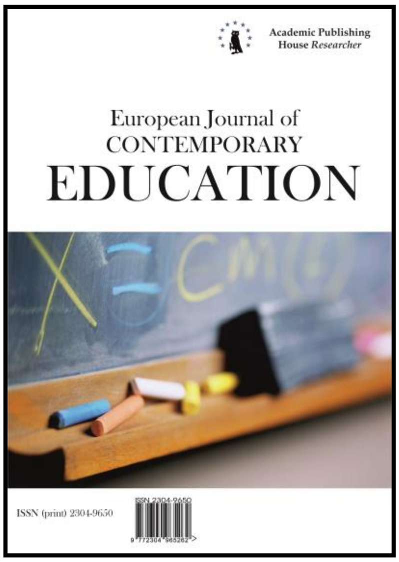
Published in the Russian Federation
European Journal of Contemporary Education
ISSN 2304-9650
E-ISSN 2305-6746
Vol. 18, Is. 4, pp. 438-451, 2016
DOI: 10.13187/ejced.2016.18.438
www.ejournal1.com



Resources of Mathematics Self-Efficacy and Perception of Science Self-Efficacy as Predictors of Academic Achievement

Deniz Kaya [a, *], Hüseyin Cihan Bozdağ [a]

[a] Ministry of National Education, Turkey

Abstract

The main objective of this study is to determine the predictive power of mathematics self-efficacy resources and perception of science self-efficacy on academic achievement. The study, adopting a relational screening model, was conducted with a total of 698 students in sixth, seventh and eighth grade level of a state secondary school. Mathematics self-efficacy resources and science self-efficacy scales were used as data collection tools. Additionally, the half-terms report card grade point averages prior to the term when the study was conducted were also taken into account to determine students' academic achievements. Data analysis was performed by Pearson product-moment correlation technique and multiple linear regression analysis. According to the obtained results, resources of mathematics self-efficacy and perception of science self-efficacy were found to be significantly correlated with academic achievement in high, medium and low levels of influence. Belief in learning ability, belief in skills, mastery experiences, social persuasions and physiological states, which have significant impacts on the academic achievement, account for 48 % of the variance in the academic achievement. Indirect experiences, however, do not have a significant effect on academic achievement. Besides this, when examined the relationship between dimensions of science self-efficacy perception and mathematics self-efficacy resources; a significant relationship was observed between the belief in learning ability and mastery experiences, indirect experiences and physiological states, belief in skills and mastery experiences, indirect experiences and social persuasions.

Keywords: Academic achievement, Mathematics, Science, Sources of self efficacy, Perception of self efficacy.

* Corresponding author
E-mail addresses: denizkaya50@yahoo.com (Deniz Kaya), chnbzd@gmail.com (Hüseyin Cihan Bozdağ)

1. Introduction

In today's information and technology community; training/upbringing of individuals with high-level mental skills is of great importance. This has made the educational policies of many nations, on a global scale, the focus of an innovative concept in line with a competitive environment, a scientific continuity, and economic and technological developments. In particular, due to the change in social needs, the emergence of new competition areas and the need for individuals that can constantly renew themselves, basically people-oriented education systems have gained momentum. In this context, the creation of high-quality learning environments, the provision of quality learning materials accessible to all students and the placement of a coherent educational approach has now become a necessity for many nations. The indicator of all these developments is the fact that training generations who can understand the nature of mathematics and science is once again understood. Today, it is vital for many research organizations, including the discourses raised in many international reports, to understand the nature of mathematical and digital competences and science for full participation in the information society and competition with the modern economy (Eurydice, 2011; NAEP, 2002; NCTM, 2000; OECD, 2012; TIMSS, 2011). Because; science and mathematics fields consisting of many products of thought systematics, in addition to having universal values for centuries, are considered the most reliable tools that are not linked to the concept of time and space. In this context, that the basic objective of science and mathematics courses is to train high-level and productive individuals in terms of mental skills for many developed/developing countries today has made the importance of these two fields more understandable.

The data from Trends in International Mathematics and Science Study [TIMSS], to which 42 countries participate in order to assess the knowledge, skills and literacy of students in mathematics and science, and Programme for International Student Assessment [PISA], to which 65 countries participate, have revealed that Turkish students' achievements in science and mathematics are not at the desired level (MNE, 2015). According to the 2011 TIMSS report, while there were 28 countries whose average score in mathematics achievement test was below the midpoint of the TIMSS scale (500 points), Turkey was ranked 24th. In the same report, while there were 24 countries under the midpoint of the TIMSS scale in science and technology achievement tests, Turkey was ranked 21st (MNE, 2015). Also, in the national final report of the PISA 2012 survey; while the overall average score of 65 countries in terms of students' math performance was 487, Turkey's score was 448 points. When the proficiency levels cut-off point ranges defined in PISA 2012 are considered, Turkey took place on Level 2, and was ranked 52nd in terms of the student percentages on this level (MNE, 2015; OECD, 2012). The obtained results led many researchers to better know, recognize and understand the affective and cognitive features whose impact on students' science and mathematics achievements is well known (Akyüz 2014; Anıl, 2011; Delil and Yolcu-Tetik, 2015; Ergin-Aydemir and Sünbül, 2016; Pahlke, Hyde and Mertz, 2013; Yurt, 2016). In this context, there have been many studies on the positive impact of affective properties on achievement, which have attempted to explain this concept based on theoretical grounds (Bandura, 1997; Bloom, 1998; Pajares, 1996; Schunk, 2011; Zimmerman, 1999). Indeed, considering the impact of affective characteristics on science and mathematics achievement, many study findings support the theoretical explanations proposed in this direction (Abalı-Öztürk and Şahin, 2015; Ayan, 2014; Chen and Usher, 2013; Çalık, 2014; Çaycı, 2013; Dadlı, 2015; Donahue, 2016; Ilgaz, 2011; Larson, Stephen, Bonitz and Wu, 2014; Peters, 2013; Usher and Pajares, 2009; Yurt, 2014; Yurt and Sünbül, 2014).

One of the most important affective characteristics of students that have an influence on science and maths achievement is undoubtedly their belief of self-efficacy. The self-efficacy belief represent the individual's the competence to deal with possible situations, his judgment for his learning and achievement skills, the capacity to manage and the resistance he shows against the difficulties encountered in the mission given (Bandura, 1997; Pajares, 1996; Zimmerman, 1999). Bandura (1997) explains the self-efficacy belief with four basic sources connected to each other including; Mastery Experiences, Indirect Experiences, Social Persuasions and Psychological and Affective States. Mastery experiences refer to the experience gained resulting from the successes and failures of the individual. Since mastery experiences are permanent and show continuity, it is the most effective and powerful one of all the self-efficacy resources (Bandura, 1997). When individuals have the belief to be successful that is foreseen by their mastery experiences, they begin to find immediate solutions to the challenges and adversities, and can get out of difficulties in a more resistant way (Bandura, 1993). In this way, individuals develop believes for their next duties by interpreting the performance they show, and get the opportunity to guide their behavior in line with the beliefs they develop (Pajares, 1996). Indirect experiences are resources of information where individuals do not limit their self-efficacy beliefs and perceptions only to their own mastery experiences. If individuals are not sure of their own skills, or their experiences are limited, they can also shape their self-efficacy beliefs by observing others' experiences (Pajares, 1996). In this way, individuals will get indirect experience by following those around them (friends, teachers, siblings, parents, etc.). The results of the competency levels of the people observed by the individuals may have a strong and weak impact on their self-efficacy beliefs (Schunk, 2011). In particular, in cases where individuals need to recognize their own capacities and to have feedback for their own competence levels, indirect experiences have been shown to have an effect on the performance (Bandura, 1997). And, social persuasions are the tendency of individuals to maintain their successful performances in the past with the persuading words coming from their environment (family, friends, teachers). Social persuasions support the development of self-efficacy of the individuals with enough effort to achieve success (Pajares and Urdan, 2006). Additionally, although not providing the potential required for the development of self-efficacy on its own, social persuasions are reported to contribute positively to demonstrating an effective performance (Bandura, 1997). Another source of self-efficacy is the psychological and affective states, which refer to the perceptions -moods- of individuals that they develop for their own competency systems. According to this source of information, if individuals exhibit a low performance, their level of anxiety and stress rises; and for this reason, they experience hesitations about fulfilling a task (Bandura, 1997). In this context, the individuals with a high level of self-efficacy see the performance they have as a driving force in achieving a job; while those who doubt their own potential have lower self-efficacy perceptions believe that their performance has a weakening effect on them (Pajares, 1996). The most powerful aspect of the self-efficacy belief is to help the individual think about what he can do well in which situations; see himself self-sufficient; transform his skills and capacity into behavior by recognizing them; and gain a personality (Schunk, 2011). Self-efficacy also helps to improve the level of learning and behavior of the individual by increasing the self-belief (Bandura, 1997). The results of several studies carried out in this direction show that self-efficacy beliefs are the source of the positive attitudes, and are a significant predictor of many academic performances (Schunk, 2011; Usher and Pajares, 2009). While there are many fields of study where self-efficacy is effective, the fields of science and mathematics are the leading ones (Chen and Usher, 2013; Dadlı, 2015; İnce, Gülten and Kırbaşlar, 2012; Larson et al, 2014; Yıldırım, 2011; Yurt, 2014). When examining related literature, various study results for both science and mathematics self-efficacy sources and perceptions are encountered (Abalı-Öztürk and Şahin, 2015; Bassi, Steca, Fave and Caprara, 2007; Blake and Lesser, 2006; Çaycı, 2013; Güneri, 2013; Ilgaz, 2011; İsrel, 2007; Pajares and Graham, 1999; Sottile, Carter and Carter, 2001; Usher and Pajares, 2006; Pietsch, Walker and Chapman, 2003; Uzar, 2010; Yurt, 2014; Yurt and Sünbül, 2014).

When the related studied are taken in terms of the context of science; it is reported that the self-efficacy perceptions of the students are high (Ilgaz, 2011, Israel, 2007; Kim and Park, 2000), a positive (Aydin, 2010; Bassi et al., 2007; Çaycı 2013; Dadlı, 2015; Güneri, 2013; Lane, Lane and Kyprianou, 2004) and low level (Lodewyk and Winne, 2005) relationships between the academic, course and conceptual achievements of the students. The results obtained by Dadlı (2015) from 881 eighth grade students show that a medium-level, positive and significant relationship exists between the self-efficacy beliefs of 8th grade students for science courses and their academic achievements. In a study conducted by Ilgaz (2011) on a total of 1286 students on 6th, 7th and 8th grade levels, it was concluded that the science self-efficacy of the students both in general and in the scale subscales was high. Similarly, Israel (2007) identified that there was a significant relationship between measurement averages of science self-efficacy and science achievement test averages of a total of 488 students, whom he classified according to their science self-efficacy scores [high, medium and low]. Of the groups classified according to the science self-efficacy score; he also found that science achievement test averages of the group with "high" scores were significantly higher than those of the group with "low" and "medium" scores. In the study conducted by Sottile et al (2001), the relationship between the science course achievements and self-efficacy perceptions of secondary school students was investigated. In addition to a positive relationship between the academic self-efficacy perception and achievement, a significant linear relationship was encountered between science course achievement and self-efficacy. On the other hand, Güneri (2013) determined, as a result of his study conducted on 450 secondary school students that the self-efficacy scores of the students were high both in general and in the subscales of beliefs to succeed and learn. Another research was conducted by Bassi et al, (2007) on 130 Italian adolescents whose ages ranged from 15 to 19. As a result, the individuals with high academic self-efficacy perception do a job more wishfully and spent more time on a job than those with a lower perception of self-efficacy. In addition, the individuals with high self-efficacy beliefs allocate more time for homework while those with lower self-efficacy beliefs devote more time to resting and relaxation.

When examining the studies conducted in terms of mathematics self-efficacy resources; it is observed in the majority of the studies that the mastery experience, which is the most effective among self-efficacy sources, are in high – and medium – level relationships with other sources (Arslan, 2012; Chen, 2010; Hampton and Mason, 2003; Klassen, 2004; Lopez and Lent, 1992; Usher and Pajeres, 2009, Uzar, 2010; Yurt, 2014). Examining the literature in terms of indirect experiences and social persuasions, low level (Gainer and Lent, 1998; Özyürek, 2005; Uzar, 2010), medium level (Arslan, 2012; Usher and Pajares, 2006; Matsui, Matsui and Ohnishi, 1990) and high level (Chen, 2010; Klassen, 2004) relationships are seen. It is also possible to meet various study results suggesting that indirect experiences do not have a significant impact on mathematics achievement (Arslan, 2012; Yurt, 2014), that the physiological states show a low relationship (Arslan, 2012; Joët, Usher, and Bressoux, 2011, Usher and Pajares, 2006), and that physiological and emotional responses are in a negative relationship (Uzar, 2010). On the other hand, the existence of a low-level (Özyürek, 2005), mid-level (Arslan, 2012; Klassen, 2004; Yurt, 2014) and high-level (Gainer and Lent, 1998) relationships was also identified between social persuasions and physiological states. In addition to them, there are also studies that did not find a significant relationship between the indirect experiences and physiological states (Usher and Pajares, 2006), and self-efficacy sources (Matsui et al., 1990). When the related literature is examined, it is seen that self-efficacy sources are in different relationships with each other. For example, in the study conducted by Uzar (2010) on a total of 491 students at 6th, 7th and 8th grade levels, which investigated the impact of the mathematics self-efficacy sources on the mathematics achievement, it was determined that average scores taken from the sources increased as the mathematics scores increased, for the subscales of mastery experiences and social persuasion sources. It was determined that average scores taken from the scale got higher as the grades got higher in students except for those whose mathematics grades were five in terms of the indirect experience source, and that the average scores of the scale did not show a regular order according to the mathematics grades in terms of the source of physiological and emotional state. In addition, it was concluded that the effect size index was 0.44 for the source of mastery experiences; 0.45 for the result driven from other people's experiences with an extensive impact; 0.25 for the social approval source; 0.29 for the physiological and emotional source with a small impact. According to the study conducted by Pietsch et al (2003); the students who had a high level of mathematics self-efficacy had a high-level of mathematics performance, the students who had a low self-efficacy had a low math performance. A similar study was carried out by Blake and Lesser (2006) on 2508 secondary school students. As a result of the study which investigated the relationship between the students' academic self-efficacy and performance of math exam, the students who had high self-efficacy were observed to have high test scores, too. Usher and Pajares (2006) investigated the relationship between the academic self-efficacy belief and the academic achievement of 468 6th-grade students (238 female, 230 male), and the impact of the sources of self-efficacy belief on individuals. According to the results of the study, it was determined that the academic self-efficacy was associated with academic achievement; and that - considering the sources of self-efficacy – the impact of social persuasion, mastery experiences and psychological states in forming the self-efficacy beliefs of girls was higher than in forming the self-efficacy beliefs of boys. On the other hand, as the results of the study carried out by Yurt (2014) with 350 seventh grade students; a significant high and mid-level correlation was found between the resources of mathematics self-efficacy and mathematics achievement. It has been determined that mastery experiences, social persuasion and physiological state, which are sources of self-efficacy, are significant predictors of math success, while indirect experiences do not have significant effect on math achievement. The impact of the predictors of mathematics achievement on the success has been expressed as 59 %.

As a result, the self-efficacy belief triggers final achievement and the perception that a task can be managed when believed (Bandura, 1997; Schunk, 2011). Thus, it is known that a strong self-efficacy belief has positive effects on the academic performance of the individual (Schunk and Pajares, 2009). Additionally, self-efficacy was reported to an important predictor of academic achievement by many studies (Abalı-Öztürk and Şahin, 2015; Andrew, 1998; Carroll et al, 2009; Güneri, 2013; Schunk, 2011; Yurt and Sünbül, 2014). The above mentioned discourses are supported by the fact that the variable of math self-efficacy was a significant predictor of the academic achievement according to the study of Abalı-Öztürk and Şahin (2015) with 1363 fifth grade students; and that science self-efficacy beliefs were significant predictors of concept achievements according to the study of Çaycı with 363 fifth grade students. In addition, according to the model developed between Turkey and Finland based on the 2003 PISA report, Akarsu (2009) concluded that the self-efficacy was a strong predictor of mathematics achievement in both countries. Secondary education is the most important step in which many students shape their future. The self-efficacy beliefs of the students in this period are known to have positive effects on their academic performance (Bandura, 1993; 1997). In this context, there are many studies in the literature not only on resources of mathematics self-efficacy but also the perception of science self-efficacy. However, no study is available which considers a combination of mathematics and science self-efficacy beliefs and that investigates their relationship with the academic achievement. In the light of all the statements above, the main objective of this study is to determine the predictive power of mathematics self-efficacy resources and perception of science self-efficacy on academic achievement. In this regard, the following questions were sought to be answered by the study carried out:

1. What kind of relationship exists between the resources of mathematics self-efficacy and perception of science self-efficacy?
2. What kind of relationship exists between the resources of mathematics self-efficacy and perception of science self-efficacy, and the academic achievement?
3. What is the predictive power of mathematics self-efficacy resources and perception of science self-efficacy on academic achievement?
4. What is the relative order of importance of the mathematics self-efficacy resources and perception of science self-efficacy on the academic achievement?

2. Method

Research Model

In the study conducted, since the relationships between the resources of mathematics self-efficacy and perception of science self-efficacy, and the academic achievement; a descriptive approach was adopted in the relational model. Relational screening models are models aiming to determine the existence or degree of change between two or more variables (Karasar, 2013).

Study Group

The research was conducted with a total of 698 students from sixth (267, 38.2 %), seventh (231, 33.1 %) and eighth (200, 28.7 %) grades in a public secondary school in İzmir. The mean age of the students was 12.93, and 52.6 % (n=367) of the students consisted of males, and 47.4 % (n=331) of females.

Variables

The Perception of Science and Technology Self-Efficacy: In line with the recommendations of Bandura (2006) to determine the science self-efficacy perceptions of students, the Science and Technology Self-Efficacy Scale, developed by Ilgaz (2011) and consisting of the dimensions of *Belief in Learning Ability* and *Belief in Skills* was used. In the scale, including no negative items; scoring of the items was made according to the direct score data in units of 10 between 0 and 100. To determine the construct validity of the scale, the Exploratory and Confirmatory Factor Analysis methods were used. In order to determine the distinguishing characteristics of each individual, the significance and item-total correlations between the top-bottom groups of %27 which were defined by the total score were considered. The item-corrected item-total correlations of the items in the scale vary 0.48 and 0.73. In addition, the reliability of the scale was determined by the Cronbach alpha coefficient of internal consistency, and the reliability values of the factors were expressed as 0.82 and 0.83. The scale was applied to students by the researchers in a single session, and the application lasted about twenty minutes.

The Resources of Mathematics Self-Efficacy: In order to determine the resources of mathematics self-efficacy of students, the Mathematics Self-Efficacy Resources Scale, which was developed by Usher and Pajares (2009) based on the Social Cognitive Theory of Bandura (1997), and adapted to Turkish by Yurt and Sünbül (2014), was used. The scale, which consists of Mastery Experiences, Indirect Experiences, Verbal Persuasions and Physiological States, comprises a total of 24 items, including 6 items in each dimension. The scoring of the scale items varies according to the degree of agreement on the item from 1 to 100. 1 and the low scores close to 1 indicate a low agreement level, 100 and the scores close to 100 indicate a high agreement level. The only negative item in the scale is item 3. The lowest score for each subscale of the scale is defined as 6, and the maximum score as 600. To determine the construct validity of the scale, the Exploratory and Confirmatory Factor Analysis methods were used. To determine the reliability of the scale, the Cronbach alpha coefficient of internal consistency [0.80-0.94], test-retest reliability [0.62-0.87] studies were conducted. In addition to them, according to the results of the criteria validity study, it was indicated that the scale served its purpose. The scale was applied to students by the researchers in a single session, and the application lasted about thirty minutes.

Academic Achievement: The half-terms report card grade point averages (all classes) prior to the term when the study was conducted were used to determine students' academic achievements. According to this; three terms for sixth grade, five terms for seventh grade and seven terms for eighth grade were taken into consideration. The student academic grade point average was 67.89 and the standard deviation was 15.17, mode and median were 76 and 68, respectively.

Data Analysis

In the study conducted, the relationships between the resources of mathematics self-efficacy and perception of science self-efficacy, and the academic achievement were calculated with the Pearson Product Moment Correlation technique. In this context, in order to investigate the influence of both mathematics self-efficacy resources and science self-efficacy perception on the academic achievement; a multiple linear regression analysis was performed. However, before the multivariate analysis, some assumptions have to be met. These assumptions are: to examine (i) the impact of the end values, (ii) the compliance between the premises of the analysis technique to be applied (normality, linearity), (iii) a highly significant relationship between independent variables (multicollinearity problem) (Çokluk et al., 2014). The identification of omnidirectional outliers, in other words, whether the normal distribution assumption is met or not can be examined by calculating the Mahalanobis distance values (Büyüköztürk, 2011). The Mahalanobis distance values belonging to the data sets were examined in comparison with chi-square values, and it was understood that the two values complicated the normality and linearity assumptions. At the same time, this situation was analyzed by examining the collective splash matrix graph of the dependent and independent variables. The extreme values resulting from incorrect data input can be corrected easily, but if they are caused by other reasons, it is not easy to determine this; furthermore, this case impairs the compliance of the current regression model with the theoretical model (Can, 2016; Çokluk et al., 2014). Therefore, the values belonging to these two values were extracted from the data set, and the regression analyses were performed again. According to the findings, both the standardized residual values and the splash diagrams created for the predicted values were seen to be in a linear relationship.

Another assumption of the regression analysis is the absence of multiple connection problems between the predicting variables (independent) located in the data set. The multiple connection problem is the existence of strong relationships between the independent variables ($r > 0.90$ and above) (Çokluk et al., 2014). To test the multicollinearity problem; it is usually recommended in the literature that variance increase factors (VIF) be examined; tolerance values (TV), the condition index (CI) and the correlations between the independent variables be calculated (Büyüköztürk, 2011; Can, 2016; Çokluk et al., 2014; Field, 2005). Accordingly, if VIF values equal to 10 and greater ($VIF \geq 10$), TV values equal to 0.10 or smaller ($TV \leq 0.10$) and CI values equal to 30 and greater (CI≥30), then a multiple correlation problem exists (Çokluk et al., 2014). The high correlation between the independent variables in this study is 0.75. The VIF values of the variables range from 1.02 to 2.65; CI values from 1.00 to 19.45, and TV values from 0.37 to 0.97. As a result, considering the VIF, CI and CV values obtained; it can be said that no multiple connection problem exists between the independent variables. In this respect; the regression analysis was performed with 698 data, with the exclusion of the two values in the data set.

3. Results

In Table 1, the correlation values belonging to the relationships between the resources of mathematics self-efficacy and perception of science self-efficacy, and the academic achievement are given. According to the findings obtained from the study, it was concluded that significant relationships existed between the resources of mathematics self-efficacy and perception of science self-efficacy, and the academic achievement. The relationship between the academic achievement and belief in skills has the highest correlation ($r=0.563$, $p<0.01$). This is followed by the relationships between mastery experiences and academic achievement ($r=0.547$, $p<0.01$), academic achievement and belief in learning ability ($r=0.515$, $p<0.01$), academic achievement and social persuasions ($r=0.493$, $p<0.01$); academic achievement and indirect experiences ($r=0.455$, $p<0.01$) and academic achievement and physiological states ($r=-0.30$, $p<0.01$). In addition, the relationships between the mathematics self-efficacy resources and science self-efficacy perception were found to be significant ($p<0.01$; $p<0.05$) and they were determined to take values -0.09 to 0.75.

Table 1. The correlation values between the resources of mathematics self-efficacy and perception of science self-efficacy, and the academic achievement

	Variables	$\bar{x}$	Ss	D1	D2	D3	D4	D5	D6	D7
	D1 Academic achievement	67.89	15.17	1						
Science	D2 Belief in learning ability	75.09	20.36	0.52**	1					
	D3 Belief in skills	73.41	20.16	0.56**	0.75**	1				
Mathematics	D4 Mastery experiences	55.53	20.97	0.55**	0.43**	0.52**	1			
	D5 Indirect experiences	64.32	24.34	0.46**	0.37**	0.49**	0.67**	1		
	D6 Social persuasions	52.32	26.61	0.49**	0.36**	0.46**	0.73**	0.65**	1	
	D7 Physiological states	33.55	26.24	-0.30**	-0.13**	-0.12*	-0.09*	-0.12*	-0.12*	1

**p<0.01, *p<0.05, N=698

According to the results of the multiple regression analysis which predicted the beliefs in learning ability and skills, mastery experiences, indirect experiences, which are thought to have an impact on students' academic achievement, social persuasions and physiological states, these variables exhibited a significant relationship with academic achievement ($R=0.689$, $R^2=0.475$) ($F_{6\text{-}691}=104.23$, $p<0.01$). The six variables specified explain 48% of the change in academic score, together. According to the standardized regression coefficients, the relative order of importance of the predictor variables on academic achievement is; mastery experience ($\beta=0.245$), belief in skills ($\beta=0.220$), belief in learning ability ($\beta=0.169$), social persuasion ($\beta=0.114$), indirect experiences ($\beta=0.019$) and physiological states ($\beta=-0.217$), respectively. According to the correlation values mentioned above; it is observed that the relationship between the academic achievement and belief in skills is the highest, and that there is a significant negative relationship between the predictors of the academic achievement and physiological states. In this context, it can be said that the students' physiological states will get lower as their academic scores get higher. *B* coefficients located in the regression equation also gives us the change that each predictor creates with the academic achievement, when other predictors are held constant. For example, a standard deviation increase in the belief in learning ability, when other predictors are held constant, causes an increase of 0.126 units in the academic achievement. Similarly, when other predictors are held constant; a standard deviation increase in belief in skills will cause an increase of 0.166; a standard deviation increase in mastery experiences, 0.177; a standard deviation increase in social persuasions, 0.065; and a standard deviation decreases in physiological states, 0.125 units in academic achievement. Additionally, when the significance values of regression coefficients is taken into account; the predicting variables of beliefs in learning ability and skills ($p<0.01$), mastery experiences ($p<0.01$), social persuasions ($p<0.05$) and physiological states ($p<0.01$) are seen to be significant predictors of academic success.

Table 2. Multiple regression analysis results on the predicting power of mathematics self-efficacy resources and science self-efficacy perception on academic achievement

Predictor Variable(s)	*B*	Standard Error	β	t	Double r	Partial r
Constant	36.460	1.920	-	18.994**	-	-
Belief in learning ability	0.126	0.031	0.169	4.057**	0.515	0.153
Belief in skills	0.166	0.034	0.220	4.908**	0.563	0.184
Mastery experiences	0.177	0.032	0.245	5.470**	0.547	0.204
Indirect experiences	0.012	0.025	0.019	0.470	0.455	0.018
Social persuasions	0.065	0.024	0.114	2.690*	0.493	0.102
Physiological states	-0.125	0.016	-0.217	-7.756**	-0.302	-0.283
$R=0.689$ $R^2=0.475$ $F_{6\text{-}691}=104.23$						

**p<0.001, *p<0.05, N=698

According to the results of the multiple regression analysis performed between the belief in learning ability, with the dimension of science self-efficacy perception, and mathematics self-efficacy resources, it is observed that the variable in question had a significant relationship with the mathematics self-efficacy resources ($R=0.455$, $R^2=0.207$; $F_{4\text{-}693}=45.225$; $p<0.01$). Mathematics self-efficacy resources explain about 21% of the change in the beliefs in science learning ability. According to the standardized regression coefficients, the relative order of importance of the predictor variables on belief in learning ability is; mastery experiences (β=0.302), indirect experiences (β=0.128), social persuasions (β=0.051), and physiological states (β=-0.077). Similarly, when the results of the multiple regression analysis performed between the belief in learning ability, with the dimension of science self-efficacy perception, and mathematics self-efficacy resources are examined, it is observed that the variable in question had a significant relationship with the mathematics self-efficacy resources ($R=0.562$; $R^2=0.316$; $F_{4\text{-}693}=79.946$; $p<0.01$). Mathematics self-efficacy resources explain about 32% of the change in the beliefs in science skills. According to the standardized regression coefficients, the relative order of importance of the predictor variables on belief in skills is; mastery experiences (β=0.294), indirect experiences (β=0.224), social persuasions (β=0.098), and physiological states (β=-0.059).

Table 3. Multiple regression analysis results on beliefs in learning ability and skills, and resources of mathematics self-efficacy

Predictor Variable(s)	*B*	Standard Error	β	t	Double r	Partial r
Belief in learning ability	51.836	2.390	-	21.693**	-	-
Mastery experiences	0.294	0.052	0.302	5.668**	0.433	0.210
Indirect experiences	0.107	0.040	0.128	2.654*	0.374	0.100
Social persuasions	0.039	0.040	0.051	0.991	0.363	0.038
Physiological states	-0.060	0.026	-0.077	-2.258*	-0.125	-0.085

R=0.455 R^2=0.207 $F_{4\text{-}693}$=45.225						
	B	Standard Error	β	t	Double r	Partial r
Belief in skills	43.426	2.198	-	19.761**	-	-
Mastery experiences	0.283	0.048	0.294	5.932**	0.521	0.220
Indirect experiences	0.185	0.037	0.224	4.988**	0.492	0.186
Social persuasions	0.074	0.036	0.098	2.037*	0.463	0.077
Physiological states	-0.045	0.024	-0.059	-1.850	-0.123	-0.070
R=0.562 R^2=0.316 $F_{4\text{-}693}$=79.946						

**$p<0.001$, *$p<0.05$, N=698

4. Discussion, Conclusıons and Recommendatıons

This study was conducted primarily to investigate the relationships of mathematics self-efficacy resources and science self-efficacy perceptions with each other and with academic achievement. Considering the results obtained from this study; significant relationships at a high influence level in dimensions of mastery experience, beliefs in learning ability and skills; significant relationships at a medium influence level in the dimension of social persuasion; and significant relationships at a low influence level in the dimension of physiological states can be seen. Especially, the belief in skills in the perception of science self-efficacy dimension and mastery experiences in the resources of mathematics self-efficacy dimension were seen to have significant relationships at an extensive impact level. The results similar to these dimensions are consistent with the results in the literature. In this regard, when examined the related studies in terms of mathematics self-efficacy resources; it was stated that the mastery experiences, which were defined as the most important and powerful resource by Bandura (1997), were reported to be in highly significant relationships with indirect experiences (Chen, 2010; Uzar, 2010; Yurt, 2014), social persuasions (Chen, 2010; Usher and Pajares, 2009; Yurt, 2014) and physiological states (Gainer and Lent, 1998; Usher and Pajares, 2009; Yurt, 2014). On the other hand, it was concluded that the relationships between the mastery experiences and physiological states; social persuasions and physiological states; and indirect experiences and physiological states were at a rather low level. The studies with similar inconsistent results can be found in the literature (Usher and Pajares, 2006; Gainor and Lent, 1998; Uzar, 2010; Yurt, 2014). While there are many reasons these inconsistent results obtained from the research, the socio-cultural environment where the school on which the measurement tool was applied was located can be considered as the most important one. The most important indicator of this situation is that the school where the study was conducted had student profiles from multiple geographic locations. Thus, the results of the study investigating the students 'mathematics self-efficacy resources may vary according to students' age group and cultural characteristics. When the study results are discussed in terms of science, it has been shown that there is a high correlation between beliefs in skills and learning ability. These results are similar to the results of the studies carried out by Kim and Park (2000), Güneri (2013) and Ilgaz (2011).

Another result obtained from the research is that mastery experiences dimension, belonging to the mathematics self-efficacy resources, and belief in skills dimension, belonging to the science self-efficacy perceptions, are the most powerful variables predicting the academic achievement. According to the results obtained, it can be said that the students with a successful mathematics experience and science skills have higher academic self-efficacy beliefs. These findings support the discourses of Bandura (1997) and Pajares (1996) on self-efficacy resources. In addition, the belief in skills, one of the dimensions of science self-efficacy beliefs, can basically be included in the mastery experiences resources voiced by Bandura (1997). In this respect, considering the self-efficacy belief both in mathematics and in science, it is seen that mastery experiences have a significant impact on students' success. Secondary school students' all course grades, including mathematics and science, academic achievement, experiences in mathematics and science applications, performances in courses, project works, class activities, ability to process and comment, and judgments for success and belief in learning ability constitute the mastery experiences of students in mathematics and science. When the study results are examined, it is understood that a positive mastery experience, high beliefs in learning ability and skills are closely related to the self-efficacy and academic achievements of the students. On the other hand, a negative mastery experience, low perceptions of their beliefs in learning ability and skills cause a decrease in the self-efficacy and academic achievements of the students. In addition to these, students' perceptions of success that have a belief in their learning ability are affected positively. Furthermore, the academic achievement of the students with successful and unsuccessful mastery experiences in mathematics is affected more when compared with their social persuasions, indirect experiences and physiological states. In this regard, the fact that mastery experiences are the most important source of academic achievement is consistent with the results of many studies (Lopez and Lent, 1992; Usher and Pajares, 2009; Yurt, 2014).

Another result obtained from research is that the belief in learning ability, one of the science self-efficacy perceptions, has an extensive effect just as like the belief in skills. When examining the literature, according to the results of the studies conducted by Güneri (2013) on 450 students and by Ilgaz (2011) on 1286, beliefs in learning ability and skills were found to be high. Given the self-efficacy beliefs in terms of mathematics; after mastery experiences, social persuasions were shown to be in a mid-level significant relationship with academic achievement. Examining the studies in the literature, it is possible to come across studies reaching similar findings (Arslan, 2012; Klassen, 2004; Yurt, 2014). However, there are also studies in the literature that obtained different results (Özyürek, 2005; Chen, 2010; Klassen, 2004). It is known that social persuasion help the development of self-efficacy perception of individuals who make an effort to succeed (Pajares and Urdan, 2006). Secondary students' receiving positive feedback from friends (we believe you can do it), encouraging discourses of their teachers (I trust you), and being appreciated by their family and immediate surroundings can create a positive impact on their academic performance. It was also understood in the study that physiological states had negative low impact on academic achievement. This shows that a negative resource of physiological state negatively affects academic achievement by decreasing the students' beliefs. Another striking result of the study is that indirect experiences do not have a significant effect on the academic achievement. Similar results of studies conducted in the literature support this conclusion (Arslan, 2012; Usher and Pajares, 2009 Usher and Pajares, 2006; Yurt, 2014). However; although indirect experiences do not have a significant effect on the academic achievement, the corporate disclosures referred for them (Bandura, 1997; Pajares, 1996; Schunk, 2011) are inconsistent with the findings. While there are many reasons for this situation, one of the possible causes is the assumption that the level of impact of the individuals whom students take as a model on students is limited. Another possible assumption may be that the individual taken as model use a combination of many features of his in achieving a job. In this regard, cannot efficiently take advantage of people who are taken of the students of the study model or models they observe no difficulty in converting performance to achieve a rich life can be restricted to a certain extent indirectly.

Beliefs in learning ability and skills, mastery experiences, social persuasions and physiological states, which have significant impacts on the academic achievement, account for 48 % of the variance in the academic achievement. In particular, the effect of belief in skills and mastery experiences on the variance in the academic achievement is more than the other variables. In order to develop the self-efficacy perceptions of the students for science and to make them gain a successful belief in skills, curiosity and interest in science courses must be awakened, first. Then, a sense of accomplishment must be tasted by the students by creating a learning environment where they can feel comfortable. In this regard, there are a number of responsibilities of science teachers. First, learning environment that is suitable for the learning speed of each student should be created, science applications that require skills should be given more weight. In this direction, especially student-oriented preparation of experiment-oriented class-activities can be helpful. On the other hand, mathematics teachers should also take into account the individual differences of students and must take care to create a learning environment that is suitable for the learning speed of each student. He must first make math attractive to students to make them gain a successful mastery experience. Selection of samples must be made at a level that students can accomplish in order to be able to ensure an active student participation in the class, and students' mathematics self-efficacy beliefs should be prepared for other learning situations in a healthy manner. The most important of all is that students should be helped to discover the new knowledge by creating an environment that provides opportunities for students' self-evaluation in situations where students make errors to prevent the decrease in their self-efficacy perceptions.

Finally, given the relationship between science self-efficacy perception and mathematics self-efficacy resources; a significant relationship has been detected between the belief in learning ability and mastery experiences; and indirect experiences and physiological state. On the other hand, it is observed that the relationship between belief in learning ability and mastery experiences had a wide effect at a medium level. In this regard, it can be said that science learning ability self-efficacy perceptions of the students develop in a positive way depending on the increase in their mastery experience self-efficacy resources in mathematics. Examining the relationship between the belief in skills, one of the science self-efficacy dimensions, and mathematics self-efficacy resources, it is seen that a significant relationship exist between mastery experiences, indirect experiences and social persuasions. On the other hand, it has been detected that the relationship between belief in skills and mastery experiences, and indirect experiences and social persuasions is above the medium level and has a extensive impact close to medium level. In this respect, it can be said, depending on the increase in students' mastery experience in mathematics, indirect experiences and social persuasions self-efficacy resources that their science skills self-efficacy perceptions develop in a positive way. In light of these findings obtained from the study, it can be said that improving students' beliefs in learning ability and skills in their science self-efficacy perceptions, and mastery experiences, social persuasions and physiological states creates a positive impact on the academic achievement. In this context, mathematics and science teachers should support students' self-efficacy beliefs and efforts to get help, and make them gain the self-efficacy belief necessary for the next performance task. In addition, course teachers should support the students' belief in learning ability, desires to succeed, sense of pleasure from mastery experiences, and consider the importance of creating an effective learning environment by being a model, providing an emotional and psychological support suitable for their development.

References

Abalı Öztürk, Şahin, 2015 – *Abalı Öztürk, Y., & Şahin, Ç.* (2015). Determining the relationships between academic achievement, self-efficacy and attitudes towards maths. *The Journal of Academic Social Science Studies,* 31, 343-366.

Akarsu, 2009 – *Akarsu, S.* (2009). *A cross-national study on self-efficacy, motivation and Pisa 2003 mathematics literacy: Turkey and Finland* (Master's Thesis, Abant İzzet Baysal University, Institute of Social Sciences, Bolu). Retrieved from http://tez2.yok.gov.tr/.

Akyüz, 2014 – *Akyüz, G.* (2014). The effects of student and school factors on mathematics achievement in TIMSS 2011. *Education and Science,* 39(172), 150-162.

Andrew, 1998 – *Andrew, S.* (1998). Self efficacy as a predictor of academic performance in science. *Journal of Advanced Nursing,* 27(3), 596-603.

Anıl, 2011 – *Anıl, D.* (2011). Investigation of factors influencing Turkey's PISA 2006 science achievement with structural equation modelling. *Educational Sciences: Theory & Practice,* 11(3), 1253-1266.

Arslan, 2012 – *Arslan, A.* (2012). Predictive power of the sources of primary school students' self-efficacy beliefs on their self-efficacy beliefs for learning and performance. *Educational Science: Theory & Practice,* 12(3), 1907-1920.

Ayan, 2014 – *Ayan, A.* (2014). *The relationship between mathematics self-efficacy, motivations, anxieties and the attitudes for secondary school students (*Master's Thesis, Balıkesir University, Institute of Science, Balıkesir). Retrieved from http://tez2.yok.gov.tr/.

Aydın, 2010 – *Aydın, F.* (2010). Academic motivation, self efficacy and test anxiety as the predictors of academic success (Master's Thesis, Hacettepe University, Institute of Social Sciences, Ankara). Retrieved from http://tez2.yok.gov.tr/.

Bandura, 1993 – *Bandura, A.* (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist,* 28,117-148.

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

Bandura, 2006 – *Bandura, A.* (2006). Guide for constructing self-efficacy scales. In F. Pajares & T. Urdan (Eds.), Self-efficacy beliefs of adolescents (pp. 307–337). Greenwich, CT: New Age.

Bassi et al., 2007 – Bassi, M., Steca, P., Fave D. A., & Caprara, G. V. (2007). Academic self-efficacy beliefs and quality of experience in learning. *Journal of Youth and Adolescence,* 36, 301–312.

Blake, Lesser, 2006 – *Blake, S. ve Lesser, L.* (2006). Exploring the relationship between academic self efficacy and middle school students' performance on a high-stakes mathematics test. In Alatorre, S., Cortina, J.L., Sáiz, M., and Méndez, A. (Eds). Proceedings of the 28th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (v.2, pp. 656). Mérida, México: Universidad Pedagógica Nacional.

Bloom, 1998 – *Bloom, B. S.* (1998). *Human characteristics and school learning* (Trans. D. A. Özçelik). İstanbul: MNE Publications.

Büyüköztürk, 2011 – *Büyüköztürk, Ş.* (2011). *Data analysis handbook for social sciences (15.Edition).* Ankara: Pegem Akademi.

Can, 2016 – *Can, A.* (2016). *Quantitative data analysis in the scientific research process with SPSS (4. Edition).* Ankara: Pegem Akademi.

Carroll, 2009 – *Carroll, A., Houghton, S., Wood, R., Unsworth, K., Hattie, J., Gordon, L., & Bower, J.* (2009). Self-efficacy and academic achievement in Australian high school students: The mediating effects of academic aspirations and delinquency. *Journal of Adolescence, 32,* 797–817.

Chen, Usher, 2013 – *Chen, J. A., & Usher, E. L.* (2013). Profiles of the sources of science self-efficacy. *Learning and Individual Differences*, 24, 11-21.

Chen, 2010 – *Chen, Y. C.* (2010). *Sources of mathematics self-efficacy and predictors of mathematics achievement among seventh-and eighth-grade Taiwanese students.* (Doctoral dissertation). Available from ProOuest Dissertations and Theses database (UMI No. 3492807).

Çalık, 2014 – *Çalık, B.* (2014). *The relationship between mathematics achievement emotions, mathematics self-efficacy, and self-regulated learning strategies among middle school students (*Master's Thesis, Middle East Technical University, Institute of Social Sciences, Ankara). Retrieved from http://tez2.yok.gov.tr/.

Çaycı, 2013 – *Çaycı, B.* (2013). The relationship between elementary school students' self-efficacy beliefs towards science and technology and their concept achievements. *Ahi Evran University, Journal of Kırşehir Education Faculty, 14(2), 305-324.*

Çokluk, 2014 – *Çokluk, Ö., Şekercioğlu, G. & Büyüköztürk, Ş.* (2014). *Multivariate statistics for the social sciences: SPSS and LISREL applications (3. Edition).* Ankara: Pegem Akademi.

Dadlı, 2015 – Dadlı, G. (2015). *The researching the relation between the 8th grade secondary school students' self regulation skills and self efficiency in science - technology course and their academic success (*Master's Thesis, Kahramanmaraş Sütçü İmam University, Institute of Social Sciences, Kahramanmaraş). Retrieved from http://tez2.yok.gov.tr/.

Donahue, 2016 – *Donahue, E.* (2016). Expecting success: Factors influencing ninth graders' science self-efficacy. *CUNY Academic Works. Retrieved from* http://academicworks.cuny.edu/gc_etds/709 on 23 April 2016.

Delil, Yolcu Tetik, 2015 – *Delil, A. & Yolcu Tetik, B.* (2015). An analysis of Turkish eighth grade high stakes mathematics examination questions based on TIMSS-2015 framework. *Celal Bayar University, Journal of Social Sciences,* 13(4), 165-184.

Ergin Aydemir, Sünbül, 2016 – *Ergin Aydemir, S., Sünbül, Ö.* (2016). Monitoring the mathematics cognitive development with the latent growth modeling. *Abant İzzet Baysal University, Journal of Education Faculty,* 16(1), 20-40.

Eurydice, 2011 – *Eurydice* (2011). Mathematics education in Europe: Common challenges and national policies. *Retrieved from* http://eacea.ec.europa.eu/ on 13 March 2016.

Field, 2005 – *Field, A.* (2005). Discovering statistics using SPSS. London: Sage Publication.

Gainor, Lent, 1998 – *Gainor, K. A. & Lent, R. W.* (1998). Social cognitive expectations and racial identity attitudes in predicting the math choice intentions of Black college students. *Journal of Counseling Psychology,* 45(4), 403.

Güneri, 2013 – *Güneri, E.* (2013). The secondary school students' self efficacy perceptions and engagement & disaffection in Science and Technology course *(*Master's Thesis, Çanakkale Onsekiz Mart University, Institute of Educational Sciences, Çanakkale). Retrieved from http://tez2.yok. gov.tr/.

Hampton, Mason, 2003 – *Hampton, N. Z. & Mason, E.* (2003). Learning disabilities, gender, sources of efficacy, self-efficacy beliefs, and academic achievement in high school students. *Journal of School Psychology,* 41(2), 101-112.

Ilgaz, 2011 – *Ilgaz, G.* (2011). *Investigation of elementary learners? Perceptions on self-regulated learning strategies, self-efficacy and learner autonomy in science and technology course (*Doctoral dissertation, Gazi University, Institute of Educational Sciences, Ankara). Retrieved from http://tez2.yok. gov.tr/.

İnce, 2012 – *İnce, E., Gülten, D. Ç. & Kırbaşlar, F. G.* (2012). Fen bilgisi öğretmen adaylarının matematik öz-yeterlikleri ve fizik problemlerine yönelik görüşleri. *Hasan Ali Yücel Eğitim Fakültesi Dergisi,* 17(1), 58-71.

İsrael, 2007 – *İsrael, E.* (2007). *Self regulation instruction, science achievement and self efficacy* (Doctoral dissertation, Dokuz Eylül University, Institute of Educational Sciences, İzmir). Retrieved from http://tez2.yok. gov.tr/.

Joët et al., 2011 – *Joët, G., Usher, E. L. & Bressoux, P.* (2011). Sources of self-efficacy: An investigation of elementary school students in France. *Journal of educational psychology,* 103(3), 649.

Klassen, 2004 – *Klassen, R. M.* (2004). A cross-cultural investigation of the efficacy beliefs of South Asian immigrant and Anglo Canadian nonimmigrant early adolescents. *Journal of Educational Psychology,* 96(4), 731.

Lane et al., 2004 – Lane, J., Lane, A. M., & Kyprianou, A. (2004). Self-efficacy, self-esteem and their impact on academic performance. *Social Behavior and Personality: An international Journal,* 32(3), 247-256.

Larson et al., 2014 – *Larson, L. M., Stephen, A., Bonitz, V. S., & Wu, T. F.* (2014). Predicting science achievement in India role of gender, self- efficacy, interests, and effort. *Journal of Career Assessment*, 22(1), 89-101.

Lodewyk, Winne, 2005 – *Lodewyk, K. & Winne, H. P.* (2005). Relations among structure of learning tasks, achievement and changes in self-efficacy in secondary students. *Journal of Educational Psychology,* 97, 3-12.

Lopez, Lent, 1992 – *Lopez, F.G. & Lent, R.W.* (1992). Sources of mathematics self-efficacy in high school students. *The Career Development Quarterly, 41,* 3-12.

Karasar, 2013 – *Karasar, N.* (2013). *Scientific research method (25. Edition)*. Ankara: Nobel Publication Distribution.

Kim, Park, 2000 – *Kim, A., & Park, I. Y.* (2000). Hierarchical structure of self efficacy in terms of generality levels and its relations to academic performance: General, academic, domain-specific, and subject- specific self-efficacy. Paper presented at the Annual Meeting of the American Educational Research Association, 24-28 April 2000, New Orleans. Retrieved from http://eric.ed.gov/?id=ED446119 on 09 May 2016.

Matsui et al., 1990 – *Matsui, T., Matsui, K. & Ohnishi, R.* (1990). Mechanisms underlying math self-efficacy learning of college students. *Journal of Vocational Behavior, 37*(2), 225-238.

MNE, 2015 – Ministry of National Education (MNE) (2015). The national final report of the PISA 2012. Retrieved from http://pisa.meb.gov.tr/?page_id=22 on 25 January 2016.

NAEP, 2002 – National Assessment of Educational Practices (NAEP) (2002). *Mathematics framework for the 2003 national assessment of educational progress*. Washington, DC: National Assessment Governing Board.

NCTM, 2000 – National Council of Teachers of Mathematics (NCTM) (2000). *Principles and standards for school mathematics*. Reston, VA: National Council of Teacher of Mathematics.

OECD, 2012 – Organisation for Economic Co-operation and Development (OECD) (2012). *Mathematics teaching and learning strategies in PISA*. Paris: OECD Publishing. Retrieved from http://www.oecd.org on 15 March 2016.

Özyürek, 2005 – *Özyürek, R.* (2005). Informative sources of math-related self-efficacy expectations and their relationship with math-related self-efficacy, interest, and preference. *International Journal of Psychology,* 40, 145-156.

Pahlke et al., 2013 – *Pahlke, E., Hyde, J. S. & Mertz, J. E.* (2013). The effects of single-sex compared with coeducational schooling on mathematics and science achievement: Data from Korea. *Journal of Educational Psychology,* 105(2), 444-452.

Pajares, Urdan, 2006 – *Pajares, F., & Urdan, T. C.* (2006). Self-efficacy beliefs of adolescents. Greenwich, CT: Information Age Publishing.

Pajares, Graham, 1999 – *Pajares, F. ve Graham, L.* (1999). Self-efficacy, motivation constructs, and mathematics performance of entering middle school students. *Contemporary Educational Psychology,* 24(2), 124-139.

Pajares, 1996 – *Pajares, F.* (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research,* 66*,* 543-578.

Peters, 2013 – *Peters, M. L.* (2013). Examining the relationships among classroom climate, self-efficacy, and achievement in undergraduate mathematics: A multi-level analysis. *International Journal of Science and Mathematics Education,* 11(2), 459-480.

Pietsch et al., 2003 – *Pietsch, J., Walker, R. & Chapman, E.* (2003). The relationship among self concept, self-efficacy and performance in mathematics during secondary school. *Journal of Educational Psychology,* 95*,* 589-603.

Schunk, 2011 – *Schunk, D. H.* (2011). *Learning theories: An educational perspective*. Pearson Education, Inc.

Schunk, Pajares, 2009 – *Schunk, D. H. ve Pajares, F.* (2009). Self-efficacy theory. In K. R. Wentzel ve A. Wigfi eld (Eds.), *Handbook of motivation at school* (pp. 35-53). New York: Routledge.

Sottile et al., 2001 – *Sottile, M. J., Carter, W. & Carter, J.* (2001). Science achievement and self-efficacy among middle age children as related to student development. Paper Presented at the Annual Meeting of the Eastern Educational Research Association. Retrieved from http://files.eric.ed.gov/fulltext/ ED458118.pdf on 6 May 2016.

TIMSS, 2011 – Trends in International Mathematics and Science Study (TIMSS) (2011). TIMSS and PIRLS 2011: Relationships among reading, mathematics, and science achievement at the fourth grade-implications for early learning. TIMSS & PIRLS International Study Lynch School of Education, Boston College.

Usher, Pajares, 2009 – *Usher, E. L. & Pajares, F.* (2009). Sources of self-efficacy in mathematics: A validation study. *Contemporary Educational Psychology,* 34(1), 89-101.

Usher, Pajares, 2006 – *Usher, E. L. & Pajares, F.* (2006). Sources of academic and self regulatory efficacy beliefs of entering middle school students. *Contemporary Educational Psychology,* 31, 125-141.

Uzar, 2010 – *Uzar, F. N.* (2010). Exploring sources of middle school students' mathematics self-efficacy with respect to different variables (Master's Thesis, Hacettepe University, Institute of Social Sciences, Ankara). Retrieved from http://tez2.yok. gov.tr/.

Zimmerman, 1999 – *Zimmerman, B. J.* (1999). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology,* 25*,* 82-91.

Yıldırım, 2011 – *Yıldırım, S.* (2011). Self-efficacy, intrinsic motivation, anxiety and mathematics achievement: Findings from Turkey, Japan and Finland. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education,* 5(1), 277-291.

Yurt, 2016 – *Yurt, E.* (2016). Examination of task values and expectancy beliefs of middle school students towards mathematics. *International Online Journal of Educational Sciences,* 8(1), 200-215.

Yurt, Sünbül, 2014 – *Yurt, E. & Sünbül, A. M.* (2014). A structural equation model explaining 8th grade students' mathematics achievements. *Educational Sciences: Theory & Practice,* 14(4), 1642-1652.

Yurt, 2014 – *Yurt, E.* (2014). The predictive power of self-efficacy sources for mathematics. *Education and Science,* 39(176), 159-169.