

Explaining Middle School Students' Mathematical Literacy with Sources of Self-Efficacy, Achievement Expectation from Family, Peers and Teachers

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ABSTRACT

The promotion of mathematical literacy depends on understanding the variables associated with mathematics learning. The purpose of the current research was to explore relationships between mathematics achievement with sources of mathematics self-efficacy and perceived mathematics achievement expectations of parents, teachers, and friends in middle school students. Participants of the research were 332 8th grade middle school students. The research findings showed that mastery experience, social persuasions, and family expectations significantly predicted mathematics achievement. Furthermore, the most powerful predictor of mathematics achievement was the mastery experience. In conclusion, mastery experience and social persuasions dimensions of sources of self-efficacy and mathematics achievement expectations from parents have associated effects on mathematics achievement.

Key words: Self-efficacy, achievement expectation, mathematics achievement, parents, middle school

INTRODUCTION

Self-efficacy is an individuals' belief about their capacity to succeed at a particular task or in a situation (Bandura, 1986). Researchers have been interested in how self-efficacy affects the functioning and behavior of human beings (Bandura, 1997; Zimmerman, 2008). One of the domains of self-efficacy is mathematics self-efficacy. It is defined as the individuals' characteristics and self-belief affecting their learning and performances in mathematics (Callejo & Villa, 2009; Williams & Williams, 2010). The point of self-efficacy is not the actual talents but what individuals believe they can do by practicing their abilities in various situations (Bandura, 1997). Self-efficacy belief develops through the experience of four sources; social persuasions, mastery experience, emotional state, and vicarious experience (Bandura, 1995, 1997; Usher & Pajares, 2008).

Studies on Bandura's theory have generally focused on the impact of sources of self-efficacy on self-efficacy (e.g., Arslan, 2012; Phan & Ngu, 2016; Usher & Pajares, 2006a; Usher & Pajares, 2008; Zimmerman & Martinez-Pons, 1990) and the impact of self-efficacy on academic performances (e.g., Bandura, 1997; Multon et al., 1991; Phan, 2012b; Schweinle & Mims, 2009;). According to Bandura's theory, self-efficacy has mediating influences on academic performance (Fast et al., 2010). Hence, it may be inferred that self-efficacy has a mediating effect between sources of self-efficacy and academic performance. On the other hand, there is limited research

focusing on the relationship between sources of self-efficacy and academic performance (e.g., Loo & Choy, 2013). Moreover, less has been known about the direct influence of sources of self-efficacy on mathematics performance. The significance of this study is focusing on the relationships between sources of self-efficacy and academic performance. Moreover, parents, teachers, and peers offer suggestions and feedback to students about what they should think and how they should behave in social situations (Ryan, 2001). Academic performance is associated with parents' expectations (Chen & Gregory, 2009; Flouri & Hawkes, 2008; Rubie-Davies et al., 2010), teachers' expectations (Prihadi et al., 2012; Sorhagen, 2013), peer interaction (Altermatt & Pomerantz, 2005; Crosnoe et al., 2003; Kindermann, 2007). The current study focused on influences of achievement expectation from parents, teachers, and peers on academic performance.

In this study, we have proposed that sources of mathematics self-efficacy may directly influence mathematics achievement. Moreover, perception of the academic achievement expectations from parents, peers, and teachers may relate to students' mathematics achievement. Accordingly, in the current study, we investigated the predictive power of sources of mathematics self-efficacy, mathematics performance expectations from parents, peers, and teachers on mathematics achievement in middle schools. In connection with the purpose of the research, we proposed the following hypothesis:

H1: Middle school students' sources of mathematics self-efficacy (psychological state, social persuasions, vicarious experience, and mastery experience) influence their mathematics performance.

H2: Middle school students' perception of mathematic achievement expectations from parents, peers, and teachers influence mathematics performance.

We also intended to answer the following research questions:

RQ1: How do middle school students' sources of mathematics self-efficacy (psychological state, social persuasions, vicarious experience, and mastery experience) predict their mathematics performance?

RQ2: How do middle school students' perception of mathematics expectations from parents, peers, and teachers predict their mathematics performance?

Conceptual Framework

Self-efficacy

Self-efficacy influences more than just task accomplishment. For example, self-efficacy determines the choices of individuals, their persistence and perseverance in struggling with difficulties, and the level of anxiety that individuals experience while engaging in different tasks in life (Usher & Pajares, 2008). Moreover, it is possible to benefit from self-efficacy in predicting students' academic achievement (Usher & Pajares, 2008), university accomplishment (Hall & Ponton, 2005), and career preferences (Brown & Lent, 2006).

Individuals direct their lives depending on their self-efficacy by preferring activities and situations within their capacity, and they prefer to withdraw from activities and situations in which they believe they may fail (Bandura, 1995). Students who have stronger self-efficacy try to accomplish a task more than those with weaker self-efficacy. Self-efficacy belief is not stable; it varies when individuals constantly evaluate new information. However, it is unlikely to change when established for a long time and is based on more experience. (Bandura, 1995).

Sources of self-efficacy

Sources of self-efficacy beliefs are social persuasions, vicarious experience, mastery experience, and emotional state (Bandura, 1995, 1997; Usher & Pajares, 2008). Though all four sources may influence the development of self-efficacy of students, they do not have a concurrent effect on self-efficacy development (Phan, 2012a).

Mastery experience, first source of self-efficacy, includes student success and failure (Bandura, 1995). After performing a task, students interpret and estimate the results. If students succeed in a particular task, they experience increased confidence that they can achieve in the equivalent task or similar tasks in the future. On the other hand, students who work hard but fail have lower self-efficacy when facing similar tasks (Bandura, 1995). Mastery experience is the most powerful and most consistent predictor of self-efficacy compared to the other three sources of self-efficacy (Arslan, 2012; Bandura, 1994; Pajares et al., 2007; Schunk

& Usher, 2012; Usher & Pajares, 2009). Maintaining success in mathematics creates high self-efficacy (Pajares & Miller, 1994). Secondly, vicarious experience, students have vicarious experience when they compare their skills to those of others. When students compare themselves to higher achievers, their self-efficacy lowers. On the other hand, comparing themselves to lower achievers increases their self-efficacy (Bandura, 1995). For example, when a peer with a similar capability solves a difficult mathematics problem, the student convinces himself that he can solve similar problems (Britner & Pajares, 2006).

Thirdly, social persuasions are support and feedback from teachers, parents, and peers. Positive feedback, support, and commendation are essential for the emergence of high self-efficacy belief (Skaalvik et al., 2015). Parent support and interaction have more impact on students than the other sources of social persuasions (Bleeker & Jacobs, 2004). Social persuasions have low long-term effects on self-efficacy (Bandura, 1997). Students' self-efficacy may rise or decline depending on getting support from peers, parents, or teachers (Hattie & Timperley, 2007). Lastly, the physiological state includes emotional state, exhaustion, worry, or stress. Students' self-efficacy is optimum when the emotional cues are neither too high nor too low (Bandura, 1997). Individuals' awareness of somatic emotions, physical feelings, and emotional state (i.e., fatigue, stress, tension, pain, and anxiety) while performing a particular task affects the assessment of competence skills (Bandura, 1997; Usher & Pajares, 2006b). As students' anxiety increases, their self-efficacy decreases, and when students' achievement decreases, self-efficacy decreases due to anxiety (Hafner, 2008).

Self-efficacy and academic achievement

Self-efficacy can affect academic achievement, one of the most critical factors in the school environment (Schweinle & Mims, 2009). A remarkable change, an increase or a decrease, in self-efficacy promotes the prediction of learning and academic performance (Phan, 2012b). There is a positive and powerful relationship between self-efficacy and achievement in low-achiever and normal-achiever students (Multon et al., 1991).

Individuals' self-efficacy is an important factor in determining their academic motivation, learning, and achievement in school settings (Bandura, 1997). Mastery experience and physiological state are the most reliable predictors of students' self-efficacy in primary and middle schools, and in high school, self-efficacy is often affected by mastery experience and social persuasions (Pajares et al., 2007). Although mastery experience and physiological state are predictors of the capability performance of high achievers, self-efficacy is affected by mastery experience and social persuasions in middle achievers, none of these sources affect capability performance in low achievers (Usher & Pajares, 2006b). The learners in remedial or low-level courses tend to describe higher nervousness and be fragile as compared to counterparts in standard or advanced courses (Hampton & Mason, 2003; Usher & Pajares, 2006b). Arslan (2013) showed that although mastery experience and vicarious experience

increased the self-efficacy level of students with high and low performance, mastery experience and social persuasions increased the self-efficacy level of students with moderate performance. Phan and Ngu (2016) stated that mastery experience and vicarious experience progressively affect learners' self-efficacy beliefs. Klassen (2004) indicated that vicarious experience and social persuasions generally motivated Indo-Canadian students compared to Anglo-Canadian students. Briefly, four sources of self-efficacy predict academic self-efficacy (Usher & Pajares, 2006a).

The comprehension of mathematics is necessary to students' readiness for life in contemporary society. The construct of mathematical literacy is defined:

An individual's capacity to formulate, employ and interpret mathematics in various contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts, and tools to describe, explain and predict phenomena. It assists individuals to recognize the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens. (OECD, 2019, p. 75)

Promoting students' literacy in mathematics helps them make connections between terminology, concepts, skills, and representations.

Mastery experience has a high predictive power over mathematics achievement (Loo & Choy, 2013). Furthermore, Pajares and Kranzler (1995) proposed that mathematics self-efficacy directly affects math anxiety and math problem-solving performance. Radday (2010) indicated that previous mathematics experience profoundly influences mathematics self-efficacy in high school mathematics. Students who are successful in mathematics and have high scores generally have a high level of mathematics self-efficacy in the coming years (Pajares & Miller, 1994). To sum up, self-efficacy beliefs are associated with academic performance.

Student perception of mathematics achievement expectations from parents, teachers, and peers

Parents, teachers, and peers offer suggestions and feedback to students about what they should think and how they should behave in social situations (Ryan, 2001). Parents' expectations affect the academic achievement of students (Benner & Mistry, 2007; Flouri & Hawkes, 2008; Neuenschwander et al., 2007). Specifically, academic achievement is highly associated with high parental expectations (Bowen et al., 2008; Rubie-Davies et al., 2010). Furthermore, when parents more encourage their children, children have greater beliefs in their math abilities (Turner et al., 2004). Chen and Gregory (2009) concluded that parents' educational expectations frequently influence their children's academic performance, even five years later.

The relationship between teacher and student may affect academic performance. For example, teachers' expectations significantly influence students from low-income families because those students often have less motivating support at home to strive for academic excellence (Sorhagen, 2013). In addition, the teachers' expectations affect students'

self-esteem and motivation to succeed (Prihadi et al., 2012), achievement level (Sorhagen, 2013), and disposition to do their best and be good citizens (Rubie-Davies et al., 2010). In addition, students increase to defiance when they are exposed to greater expectancy (Hinnant et al., 2009).

Student interactions contribute to student academic performance, and the peer's role is the key to learning how to establish friendships, work in groups, and resolve conflicts (Gruman et al., 2017). Friends play a remarkable role in the lives of children and adolescents in terms of providing support, resources, and information (Portes, 1998). Friends may support each other to improve educational results and pedagogical behaviors by assisting each other with their schoolwork or sharing knowledge covering the school, lessons, or instructors (Crosnoe et al., 2003). Peers have a crucial role in students' lives during primary and middle school (Rubin et al., 2006). They also influence academic adjustment (Altermatt & Pomerantz, 2005; Kindermann, 2007). In summary, parents', teachers', and peers' expectations influence students' educational accomplishment.

METHOD

Participants

Students from middle schools were chosen as the research group in this study since the level of education in which mathematical literacy is started to be measured by national and international exams (TIMMS, TEOG) is middle school. Participants of the study were 8th-grade middle school students in a provincial center in the Southeast area of Turkey. There are 62 middle schools in the provincial center, and we selected five of them by the purposive sampling method. According to the achievement levels ' criteria, we decided on schools representing high-level, middle-level, and low-level achiever schools. By choosing students from schools that represent three different levels of achievement, we aimed to ensure that the students represent the average achievement level in that city. Mathematics teachers administered the instruments (SMSS, TEOG mathematics results, and information form of demographic variables) to 347 students in these five schools. After we excluded fifteen incomplete data were from the data set, the data set contained 332 students—160 girls, 170 boys, and 2 with no gender marked.

Measures

Sources of mathematics self-efficacy

The Sources of Mathematics Self-Efficacy Scale (SMSS) was used to measure the participants' sources of mathematics self-efficacy. It was developed by Usher and Pajares (2009) on middle school students. Konaş and Özcan (2017) adapted the scale to Turkish culture. The scale contains 24 items ranked on a 7-point Likert from 1 "completely disagree" to 7 "completely agree." In addition, it has four sub-scales (psychological state, social persuasions, vicarious experience, and mastery experience), each of which consists of six items.

SMSS Turkish version's Confirmatory Factor Analysis (CFA) results indicated acceptable fit indexes ($\chi^2/df = 2.25$,

RMSEA = .06, CFI = .98, NNFI = .97, and SRMR = .05). The Cronbach's alpha reliability coefficient was $\alpha = .94$ for social persuasions, $\alpha = .91$ for the physiological state, $\alpha = .86$ for mastery experience, $\alpha = .75$ for vicarious experience. The test-retest reliability was $r = .67$ for mastery experience, $r = .63$ for social persuasions, $r = .48$ for vicarious experience, and $r = .41$ for the physiological state (Kontaş & Özcan, 2017). These results suggested that it is a valid and reliable scale to use on Turkish middle school students.

Mathematics achievement

The Exam of Transition from Middle School to High School Education (TEOG) is an exam applied to all students in 8th-grade middle school students in each term in Turkey. It includes 20 questions for each course (Turkish, Mathematics, Science, Language, Religion, and History). TEOG's mathematics test questions included subjects of multipliers and multiples, exponential numbers, and square root expressions. Moreover, the mathematics questions intend to measure students' analytical thinking, analysis, problem-solving, inference, and interpretation skills. Accordingly, it was assumed that the TEOG Mathematics exam measured mathematical literacy at a certain level. The results of the TEOG mathematics exam, which was administered to the students previously by MoNE, were obtained by asking the students.

The exams were held in two sessions within two days, and each session included 60 questions from 3 courses. In total, 120 minutes were allowed for each session. In the exams, 20 multiple-choice questions were asked for each course, and each question was evaluated as 5 points; the score ranged from 0 to 100. The exam scores obtained from each course were included in the calculation of the student's course achievement score (MoNE, 2016). TEOG mathematics subtest was administered on April 26, 2017, at 10.10. Students were needed to respond to 20 multiple-choice tests with four options in 40 minutes. The Cronbach's alpha reliability coefficient was $\alpha = .86$ for TEOG mathematics subtest (MoNE, 2017).

Mathematics achievement expectations from parents, peers, and teachers

The researchers developed the one-item scale to measure students' perceived mathematics achievement expectations from parents, peers, and teachers. When deciding to use single-item measures, the measured construct needs to be precise (Wanous et al., 1997), a holistic impression needs to be informative (Youngblut & Casper, 1993), and the item needs to be positively written (Alexandrov, 2010). The measuring students' mathematics achievement expectations from parents, teachers, and peers with a single item can be asserted to meet the above criteria.

The single item *What is the expectation level of your parents related to your TEOG mathematics achievement?* was asked to measure the students' mathematics achievement expectations from their families. The item for teachers' expectations was *What is the expectation level of your teachers related to your TEOG mathematics achievement?* The item

for friends' expectations was *What is the expectation level of your friends related to your TEOG mathematics achievement?* Students were asked to rate the items on a 7-point Likert-type scale from 1 "very low" to 7 "very high."

RESULTS

The scores for the relationship of sources of mathematics self-efficacy (psychological state, social persuasions, vicarious experience, and mastery experience) and perceived mathematics performance expectations from parents, teachers, and peers with mathematics achievement were examined in middle schools. Descriptive statistics and correlations values are in Table 1.

TEOG mathematics achievement were significantly positively correlated with mastery experience ($r = .74, p < .001$), social persuasions ($r = .67, p < .001$), parent expectations ($r = .58, p < .01$), teacher expectations ($r = .47, p < .001$), peer expectations ($r = .47, p < .001$), physiological state ($r = .42, p < .001$), and vicarious experience ($r = .37, p < .001$) (see Table 1). The findings represented that when the scores of mathematics achievement increased, scores of mastery experience, social persuasions, parent expectations, teacher expectations, peer expectations, physiological state, and vicarious experience increased as well.

We employed stepwise multiple regression to find the best combination of independent variables (psychological state, social persuasions, vicarious experience, mastery experience, mathematics achievement expectations from parents, teachers, and peers) to predict the TEOG mathematics performance. Details of each regression model are presented in Table 2. Moreover, we did not observe any evidence for multicollinearity, as tolerance values were higher than 0.1 (the lowest was 0.280). When the tolerance value is lower than 0.1, it is a sign of a collinearity problem (Hair et al., 2014). We decided on five residuals as outliers using the Casewise Diagnostics value greater than ± 3 cut-off criteria.

The full model of mastery experience, social persuasion, and parents' expectation statistically significantly predicted mathematics achievement (Model 3), $R^2 = .607, F(3, 323) = 166.01, p < .001$; adjusted $R^2 = .603$ (see Table 2). This result showed that mastery experience, social persuasion, and parents' expectations explained 60% of the total variance linked to mathematics performance. The relative order of significance amongst predictors on mathematics performance according to standardized regression coefficient (β) involved mastery experience ($\beta = .45$), perceived achievement expectations from parents ($\beta = .24$), and social persuasions ($\beta = .19$), respectively. Specifically, the addition of the social persuasions to the prediction of mathematics achievement (Model 2) led to a statistically significant increase in R^2 of .015, $F(1, 324) = 10.864, p < .01$. Furthermore, the addition of perceived achievement expectations from parents to the prediction of mathematics achievement (Model 3) also led to a statistically significant increase in R^2 of .042, $F(1, 323) = 34.143, p < .001$. On the other hand, vicarious experience, physiological state, and perceived achievement expectations from teachers and peers did not statistically

Table 1. Descriptive statistics and correlations for variables

	1	2	3	4	5	6	7	8
Math achievement (1)	1.00							
Sources of self-efficacy								
Mastery experience (2)	0.74**	1.00						
Vicarious experience (3)	0.37**	0.55**	1.00					
Social persuasions (4)	0.67**	0.83**	0.56**	1.00				
Physiological state (5)	0.42**	0.63**	0.45**	0.53**	1.00			
Perceived expectations								
Parent expectations (6)	0.58**	0.54**	0.31**	0.49**	0.27**	1.00		
Teacher expectations (7)	0.47**	0.57**	0.35**	0.54**	0.35**	0.63**	1.00	
Peer expectations (8)	0.47**	0.50**	0.30**	0.48**	0.27**	0.51**	0.62**	1.00
<i>M</i>	68.38	30.30	31.68	26.88	32.90	5.63	5.41	5.35
<i>SD</i>	19.99	8.45	7.36	10.31	10.57	1.17	1.20	1.21

N=327, **P*<0.05, ***P*<0.001

Table 2 . Stepwise multiple regression illustrating the predictors of mathematics performance

Model	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>	<i>R</i> ²	<i>Adj. R</i> ²	<i>SE of Estimate</i>	<i>F Chg.</i>
1.Constant	15.20	2.77		5.49	0.000	0.550	0.549	13.423	397.890**
Mastery experience	1.76	0.09	0.74	19.95	0.000				
Social persuasions			0.22	3.30	0.001				
Vicarious experience			-0.05	-1.05	0.293				
Physiological state			-0.07	-1.48	0.140				
Parent expectation			0.25	6.02	0.000				
Teacher expectation			0.06	1.47	0.143				
Friend expectation			0.13	3.03	0.003				
2.Constant	16.89	2.77		6.09	0.000	0.565	0.562	13.223	10.864*
Mastery experience	1.32	0.16	0.56	8.41	0.000				
Social persuasions	0.43	0.13	0.22	3.30	0.001				
Vicarious experience			-0.09	-1.89	0.060				
Physiological state			-0.07	-1.53	0.127				
Parent expectation			0.24	5.84	0.000				
Teacher expectation			0.05	1.08	0.281				
Friend expectation			0.11	2.64	0.009				
3.Constant	0.273	3.59		0.76		0.607	0.603	12.595	34.143**
Mastery experience	1.07	0.16	0.45	6.85	0.000				
Social persuasions	0.37	0.12	0.19	3.01	0.003				
Parent expectation	4.14	0.71	0.24	5.84	0.000				
Vicarious experience			-0.09	-1.99	0.047				
Physiological state			-0.05	-1.02	0.309				
Teacher expectation			-0.09	-1.78	0.076				
Friend expectation			0.04	0.88	0.379				

N=327 **p*>0.01 ***p*>0.001

significantly predict middle school students' mathematics achievement.

DISCUSSION

The research results suggested that mastery experience, perceived achievement expectations from parents, and social

persuasions statistically significantly predicted mathematics performance in 8th-grade middle school students. Moreover, predicting power of the predictor variables aligned with mastery experience, perceived achievement expectations from parents, and social persuasions, respectively. Specifically, mastery experience was the most powerful predictor of mathematics performance.

The findings of the relationships between sources of self-efficacy and mathematics performance align with the results of previous studies (Multon et al., 1991; Phan, 2012a). Sources of mathematics self-efficacy directly influence mathematics performance. Furthermore, the finding, mastery experience was the most powerful predictor of mathematics achievement aligns with the results of other studies (Keşan & Kaya, 2018; Özcan & Konaş, 2020; Özcan & Kültür, 2021). and the most powerful predictor of self-efficacy (Bandura, 1994; Pajares et al., 2007; Schunk & Usher, 2012; Usher & Pajares, 2009) that supported this result.

The findings related to relationships between social persuasions and mathematics test performance align with the results of other studies (Keşan & Kaya, 2018; Özcan & Kültür, 2021), but it did not relate to mathematics course performance (Özcan & Konaş, 2020; Özcan & Kültür, 2021). That variance leads us to consider that the social environment is more interested in the results of standardized tests performance than course performance. Additionally, the social environment attributes more value to standardized tests performance than course performance. We might explain this finding by the tendency of students' social environment to use more social encouragement for standardized tests. Accordingly, students attribute more value to social persuasions in standardized tests performance.

Based on the findings of this research, sources of mathematics self-efficacy (mastery experiences, vicarious experience, social persuasions, and physiological state), directly influencing mathematics achievement and self-efficacy belief, may also influence mathematical literacy in middle schools. Therefore, it is recommended to conduct studies that would reveal the relationship between sources of mathematics self-efficacy and mathematical literacy. In addition, mastery experiences, vicarious experience, social persuasions, and physiological state should be used in designing materials and learning activities for the development of mathematical literacy.

Of the perceived mathematics achievement expectations from teachers, parents, and friends, only perceived parents' achievement expectations statistically significantly predicted the mathematics achievement. Parents' achievement expectations influenced academic achievement to align with the results of other studies (Benner & Mistry, 2007; Bowen et al., 2008; Flouri & Hawkes, 2008; Rubie-Davies et al., 2010; Turner et al., 2004). The relationships between parents' expectations and students' academic achievement showed that closed social environments influence individuals' academic achievement. Ecologically, the family system has been significantly more effective in determining students' academic achievement than teacher and peer systems. It can be explained with the characteristics of Turkish culture having a collectivist structure and close family relations. Turkish culture assigns priority importance to close family relationships (Kağıtçıbaşı, 2017; Uskul et al., 2004). Consistent with this, perceived achievement expectations from parents have influenced mathematics achievement in Turkish culture.

Although perceived achievement expectancy from friends and teachers has shown a moderately positively significant relationship with mathematics performance, it is not a

significant predictor of mathematics performance in regression models. This finding may be explained by students' tendency to choose friends with success levels close to their own. Thus, students' friends convey an expectation of achievement close to their achievement level that has a limited effect on academic performance. On the other hand, the family has expressed the highest expectation of achievement, which results in a predictive impact on students' academic performance.

CONCLUSION

In conclusion, perceived mathematics performance expectations from family, social persuasions, and mastery experience positively impact mathematics test performance. Physiological state, vicarious experience, and perceived achievement expectations from peers and teachers do not influence mathematics test performance. The sources of mathematics self-efficacy directly influence academic performance. The result of the study may be concluded the possibility of reciprocal interaction of sources of self-efficacy and academic performance.

Teachers should use the mastery experience more often during the teaching-learning process to increase students' academic achievement and develop self-efficacy beliefs. Moreover, social persuasions should be used to increase students' standardized test achievement. Finally, these encouragements should be provided by the education system stakeholders, such as family, teachers, and friends, to the level needed by the students.

When the perceived achievement expectations from family, peers, and teachers on the student are evaluated, the effect of family expectations on achievement is the most important in Turkish culture. Accordingly, awareness of family expectations' impact on achievement should be increased so that families have more realistic and higher expectations. The school system should be organized so that parents can participate more in the education process of their children. Training programs should be scheduled for the families to convey more realistic and higher expectations for their children within the school system. Students' mathematics achievement may be improved if parents recognize the positive effect of communicating balanced achievement expectations to their children in Turkish culture. In short, families should convey realistic and high mathematics achievement expectations to middle school students.

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