

Mathematics self-efficacy beliefs and sources of self-efficacy: A Descriptive Study with two Elementary School Students

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Abstract

The purpose of this study is to examine the relationship between mathematics self-efficacy beliefs and sources of self-efficacy in two elementary school students whose mathematics achievement are at different levels. Case study design, which is one of the qualitative research designs, was used in the study. Two 4th grade elementary school students have participated in the study, one with high mathematics achievement and the other with low mathematics achievement. Participants have been selected according to purposive sampling method. Mathematics achievement of the students have been determined through their mathematics scores and the information obtained from their teachers. Data was collected through semi-structured interviews conducted with the students. Descriptive analysis was used in the analysis of the data. As a result of the research it was found that students' mathematics achievement is parallel to their mathematics self-efficacy beliefs. It was found that the student, whose mathematics achievement is high, has positive experiences concerning the sources of self-efficacy, whereas the student, whose mathematics achievement is low, mostly encounters negative experiences.

Keywords: Self-efficacy beliefs, sources of self-efficacy, mathematics achievement

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INTRODUCTION

Self-efficacy, is a key concept that was emphasized in Social Learning Theory (Bandura, 1977). This concept is also expressed as self-efficacy perception, belief or judgement (Aşkar & Umay, 2001). Bandura (1994) has defined self-efficacy as, individuals' self-beliefs about the capacity to produce determined behaviors on the events that affect their lives. On the other hand, Zimmerman (2000) has defined the concept as the judgments of an individual about the ability to be able to carry out, to perform a task. From this perspective, self-efficacy shows the judgements of an individual about carrying out an activity. In other words, it is the individual's belief that he/she can or can't do (Siegle, 2003). According to Bandura (1982; 1989; 1994) the beliefs of the individuals, the effects of the events on them and their behaviors depend on what they believe rather than the actual situation. Therefore, the individual's beliefs about own ability may be more deterministic than his/her actual ability and play in important role in deciding what he/she will perform with the abilities that he/she possesses (Pajares and Miller, 1995). This fact plays an important role in explaining the differences between the performance of the individuals who have similar abilities.

Self-efficacy beliefs determine how individuals feel, think, motivate themselves and behave (Bandura, 1994). Individuals may have low or high self-efficacy beliefs. The self-efficacy beliefs that are lower than existing abilities prevent the individual to use the abilities that he/she possesses properly, whereas higher self-efficacy beliefs usually have a positive impact on the performance of the individual (Diseth, 2011; Fackler & Malmberg, 2016; Feldman & Kubota, 2015; Honicke & Broadbent, 2016; Komarraju & Nadler, 2013; Tschannen-Moran, Hoy & Hoy, 1998). Individuals with high self-efficacy beliefs tackle challenging tasks rather than fleeing from them. In case of failure, they continue and increase the efforts that they put. They are persistent and patient against negativities. They can recover their self-efficacy beliefs swiftly after failures or losses. They explain the cause of the failure with insufficient efforts (or imperfect knowledge) and acquirable skills (Bandura, 1994; Fackler & Malmberg, 2016; Komarraju & Nadler, 2013; Umay, 2001). On the other hand, individuals with low self-efficacy beliefs flee from difficult tasks that they see as a threat for them, they reduce the efforts that they show in case of encountering a challenge, they give up easily and explain the reason of their failure with lack of ability (Bandura, 1994).

Bandura (1994) has defined four main sources that shape self-efficacy of the individuals as: mastery experiences, vicarious experiences, social persuasion and emotional and physiological states. Mastery experiences are the most effective tools in the formation of self-efficacy beliefs because they are based on real experiences. The successes increase self-efficacy beliefs whereas repeated mistakes decrease them (Bandura, 1982). If someone believes that his/her efforts are successful, then the belief that he/she would be successful in similar or related tasks in the future increases. If the individual fails to create the desired effect, the belief that he/she will be successful in similar situations that he/she will face in the future decreases. Mastery experiences have the longest lasting effect on the individual's self-efficacy (Usher & Pajares, 2006).

Another important source that constitutes self-efficacy beliefs is vicarious experiences. An individual can evaluate his/her own ability as a result of observations. But the information from the external environment is also effective in the evaluation of the behavior. For example, a student will take the scores of his/her friends as a criterion in deciding whether the grade that he/she received on a test is good or bad (Bandura, 1977). In the formation of self-efficacy beliefs, the information taken from the experiences of the others are not as effective as the ones obtained from the individual's own mastery experiences. However, if someone has no experience in the related area, he/she is deeply affected by the experiences of the others in the formation of self-efficacy. Other's experiences are more effective if the person taken as the model shows similarities with the individual. If there are similarities between the individual and the model in terms of demographic characteristics, such as age, education level, gender, the success of the model creates a sense of I can do. On the other hand, the failure of the model may cause to have doubts about the capacity of the person's own achievement (Pajares, 2002). If the model is very different from the individual, he/she cannot be affected very much by the model and the results produced by her/him (Bandura, 1994). Another source affecting

individuals' self-efficacy is social persuasion. Individuals are affected from the reactions of other individuals while developing their self-efficacy beliefs. This mostly includes oral reviews of the others about certain skills that the individual possesses. It is known that a review from outside about accomplishing a task positively affects the efforts that the individual makes for his/her self-efficacy beliefs. On the other hand, negative comments weaken self-efficacy of the individual (Pajares, 2002). Bandura (1994) suggested that weakening individuals' self-efficacy beliefs through social persuasion is easier than planting high self-efficacy beliefs on them. This fact causes individuals who are persuaded that they don't have sufficient capacity to flee from challenging activities and to give up easily in the face of difficulties (Bandura, 1994). Individuals can assess their beliefs about their performance on an issue through emotional and physiological states that they exhibit while accomplishing this task. In other words, someone's perception about his/her emotional and physiological states during his/her performance is effective on assessing his/her performance. Strong emotional reactions exhibited by the individual during any action, such as excitement, stress, anxiety and fear, provide clues about the success or failure of the result. In addition, positive emotions enhance someone's self-efficacy beliefs, whereas negative emotions weaken them (Bandura, 1994, 1977).

Problem Status

Bandura's view that self-efficacy beliefs affect an individual's selection of activities, his/her persistence against challenges, the level of his/her efforts and his/her performance, is the subject of numerous researches. Researches show that individuals with high self-efficacy beliefs show great effort to accomplish a job, they do not give up easily when faced with negativity, they are persistent and patient. From this perspective, self-efficacy belief is one of the characteristics that should be considered on the education (Aşkar & Umay, 2001).

The research conducted in the field of mathematics education show that self-efficacy belief is a significant predictor of mathematics achievement (Hackett, 1985; Hackett & Betz, 1989; Honicke & Broadbent; Lent, Lopez, Brown & Gore, 1997; Pajares & Graham, 1999; Pajares & Miller, 1994). Hackett and Betz (1989) defined mathematics self-efficacy beliefs as; situational or problem-based assessment of the individual's self-confidence in accomplishing a mathematical task or a problem successfully. Students' achievement or failure in the mathematics course are in-line with their self-efficacy beliefs towards mathematics. It is known that students who are successful in mathematics course have higher self-efficacy beliefs than other students (Hackett, 1985; Hackett & Betz, 1989; Pajares & Miller, 1994).

Bandura (1977), stated that mastery experiences is the most effective source in the formation of self-efficacy beliefs. Studies analyzing the relationships between mathematics self-efficacy beliefs and the sources of self-efficacy also show that mastery experience is the strongest source that feed students' mathematics self-efficacy (Lent, Lopez & Bieschke, 1991; Lopez & Lent, 1992). Lent et al. (1991) has conducted a research with university students and found that mastery experience explains 36% of the mathematics self-efficacy, whereas other sources of self-efficacy explained only 2% of it. In addition, past achievements in mathematics were found to have a direct effect on mathematics grades and an indirect effect on mathematics self-efficacy.

In the literature there are studies suggesting that emotional states are more effective on the mathematics self-efficacy of the students compared to other sources. In the study of Phan and Walker (2000) conducted with 383 3rd and 4th grade elementary school students, emotional state was observed to be the most effective source in determining mathematics self-efficacy. In addition, the outcomes showed that mastery experience was the third source in predicting mathematics self-efficacy. Researchers suggested that this was emerged from the fact that mastery experience of younger students are less than older students. In addition, in the study of Klassen (2004) conducted with 7th grade Anglo-Canadians and Indo-Canadians, emotional and physiological states (Anglo-Canadian) and indirect learnings (Indo-Canadian) were found to be important sources shaping mathematics self-efficacy. The majority of the researches show that vicarious experience has the lowest impact on

mathematics self-efficacy (Joët, Usher & Bressoux (2011); Klassen, 2004, Lopez & Lent, 1992). Anderson and Betz (2001), suggested that since vicarious experience mostly reflect indirect experiences, they are not often a significant self-efficacy source.

The overall review of the researches featuring the relations with mathematics self-efficacy beliefs and mathematics achievement shows that mathematics self-efficacy is an important affective factor for mathematics achievement. On the other hand, different results were obtained regarding the relationships between the sources of mathematics self-efficacy and mathematics achievement. In this research, mathematics self-efficacy beliefs and self-efficacy sources of two elementary school students, one with low mathematics achievement and the other with high mathematics achievement, will be compared and their associations with mathematics achievements will be deeply analyzed. In this regard, two cases where mathematics self-efficacy beliefs and mathematics self-efficacy sources differentiate according to mathematics achievements were selected.

METHODOLOGY

Research Design

Case study design, which is one of the qualitative research designs, was used in the study. Case study is a method for gaining an in-depth understanding about the facts with clearly definable boundaries and for comparing more than one cases (Creswell, 2007; Punch, 2005). In this research, the differences between mathematics self-efficacy beliefs and self-efficacy sources (mastery experiences, vicarious experiences, social persuasion, emotional and physiological states) of two elementary school students, one with low mathematics achievement and the other with high mathematics achievement were deeply analyzed

The research was carried out in a middle-level school in terms of socio-economic status and mathematics achievement. The purpose of qualitative research is to get a holistic picture by in-depth examination of the subject to be studied rather than making a generalization. Purposive sampling methods have emerged from the qualitative research tradition on this basis (Yıldırım & Şimşek, 2011). In purposive sampling method, the cases considered to provide rich data for the purpose of the study are included in the study (Patton, 2002). Thus, the study was conducted with two 4th grade elementary school students who have different mathematics achievement levels. In order to identify these students criteria sampling method was employed. In the selection of the students to be included in the study, first of all 6 students from the same class, 3 with high-level and 3 with low-level mathematics achievements were identified. Mathematics achievement levels of the students were defined according to their mathematics scores and the information taken from their teachers. Preliminary interviews were conducted with these students; then Burcu and Derya, who were able to share their ideas freely, were included in the research. Mathematics achievement of Burcu was low, whereas Duygu's was high. For the sake of confidentiality, code names were used for both students instead of their real names.

Data Collection

The data of the research was collected through the interviews, personally conducted with the students. A total of three semi-structured interviews were conducted with the students, which were preliminary interview, interview I and interview II. Data collected in the preliminary interview was for getting familiar with the students, whereas the purpose of the interviews I and II was gaining detailed information about students' mathematics self-efficacy beliefs and self-efficacy sources.

First interviews were kept shorter in order to allow students to get used to the researcher, whereas further interviews were longer. Each interview lasted about 40 minutes; they are recorded with audio recorder. Below, some questions asked in the interviews are outlined:

- What is your thoughts about mathematics? (What do you feel when you think about mathematics?)
- Can you please tell me about a moment that you thought being successful or unsuccessful in math class?
- Can you please tell me about a friend that you thought being very good in mathematics?
- What kind of reactions do you get from the people around you about your math achievement? Can you talk about it?
- Your teacher wrote a math question on the black board. You are invited to the board for solving this question. Can you tell me your feelings?

Data Analysis

The main objective of data analysis is analyzing, explaining and interpreting self-efficacy beliefs and the sources feeding the self-efficacy of two elementary school students with low and high mathematics achievement. The data was analyzed through descriptive analysis, in which research findings are presented such that they are organized and interpreted according to some pre-defined themes. In addition to the descriptions, research data are supported with direct quotations to make the comments more meaningful (Creswell, 2007; Patton, 2002).

During data analysis, first of all interview data were organized and audio records were decoded and a data set was formed for each student. Afterwards, decoded data were divided into themes for self-efficacy beliefs and sources of self-efficacy. In the last stage of the data analysis, themed data was defined and interpreted. The findings of the research are presented under mathematics self-efficacy, mastery experiences, vicarious experiences, social persuasion and affective states. Description process includes direct quotations from students' statements providing evidences of data analysis. Afterwards, the presented data are interpreted and associated with students' self-efficacy beliefs and sources through direct quotations.

FINDINGS

The findings obtained in the research are presented under two main headings; first of them contains the findings about students' self-efficacy, whereas the second shows the findings associated with their self-efficacy sources. The findings about self-efficacy sources are analyzed under the following sub-headings; mastery experiences, vicarious experiences, social persuasion and emotional and physiological states.

Findings about Mathematics Self-Efficacy Beliefs of the Students

The analysis of the findings about mathematics self-efficacy beliefs of the students showed that there are clear differences between self-efficacy of Burcu, whose mathematics achievement is low, and Derya, whose mathematics achievement is high. Derya believes in being successful in mathematics and has self-confidence because she can answer math questions correctly

Researcher: What do you feel when you think about mathematics?

Derya: I like mathematics. Finding the correct answer makes me happy. I like it because I can solve. I can solve the questions that my friends fail.

Researcher: Can you answer all questions correctly?

Derya: Yes, most of the time. I often answer immediately.

Researcher: Do you have difficulties in solving the questions? What do you do in such cases?

Derya: Yes, it happens from time to time, I work harder. I can solve when I work harder. If I fail again, I ask to my teacher. I solve as soon as I get the issue.

The statements of Derya shows that her mathematics self-efficacy is high. Her statements such as "... I like it because I can solve. I can solve the questions that my friends fail" support this fact. Since her self-efficacy is high, she persists and continues her efforts in the questions that challenge her, which was expressed as "...I can solve when I work harder".

On the other hand, Burcu believes that she is unsuccessful in mathematics. Similar to Derya, Burcu associates her achievement in mathematics with being able to solve the questions correctly. She defines herself as unsuccessful in mathematics because she can only solve a few questions correctly in the exam.

Researcher: What do you think about mathematics?

Burcu: A tough course... I don't like it much.

Researcher: Do you think you are successful in mathematics?

Burcu: I'm not successful. I'm failing in math. It sounds like I will fail no matter how much I studied. I can only solve 1-2 questions that my teacher asked on the exam. Thus, I feel unsuccessful.

"... It sounds like I will fail no matter how much I studied" statement of Burcu shows that her mathematics self-efficacy is low. In addition, the statement that she made in the following part of the interview "... I believe that I will fail no matter how much exam I take" supports this fact. Burcu thinks that she cannot solve the questions correctly and she expressed this thought as "... I say to myself, why I work on it since I won't be able solve this problem". These statements can be considered as an indication that Burcu doesn't want to make efforts for solving the questions because her mathematics self-efficacy is low.

Findings about Mathematics Self-Efficacy Sources of the Students

Mastery Experiences

The findings show that Burcu had failures related to mathematics. In the statements below Burcu talks about the negative experiences that she lived in math exams and in the class.

"In math, I always get low scores from the exams. I think that I cannot make it even I work hard. During the exam, I remember previous exams. I believe that I will fail no matter how much exam I take. I get angry when I cannot solve the math questions that my teacher asks in the class. I say to myself, here another math questions and I won't be able to solve it again. Why I make efforts, I won't be able to solve it. Consequently, I cannot solve the problem correctly" (Burcu)

The negativities that Burcu experienced during the exams and course process are negatively reflected in her beliefs about being successful in similar situations of the future. "I believe that I will fail no matter how much exam I take" statement clearly shows this. It is observed that she is desperate as a result of the experiences that she lived. It can be said that this fact poses a barrier to achieving any success that she desires.

On the other hand, Burcu has lived few successful experiences but they lasted short. As a result of the negativities that she encountered after successful experiences, she sank into despair again.

Researcher: Can you please tell me about a moment that you thought being successful in math class?

Burcu: Once, my teacher asked a question, he said “Anybody solved it?”. Only I raised hand. My teacher invited me to the board and I solved the question. He said “bravo Burcu”. I was so happy that day. On the school bus, while returning to the village I asked myself if this is a coincidence. I got desperate again the day after, when I encountered questions that I couldn’t solve.

Derya has positive and successful experiences in mathematics. She stated that in the exams she answers most of the questions correctly. She believes that correctly solving a question that was not solved by other students increases her faith in herself.

Researcher: What makes you believe that you are successful in math class?

Derya: I answer most of the questions correctly. In the exams, I get maximum 2 faults over 20 questions.

Researcher: Can you please tell me about a moment that you thought being successful?

Derya: Once, our teacher has instructed fractions, after the instruction he asked a question. Nobody answered correctly, except me.

Researcher: What makes you feel to be the only one who answered this question?

Derya: I mean, I can solve tough questions as well. I believe that I can solve when I face with a difficult problem.

Researcher: Can you solve it correctly?

Derya: Yes.

Derya’s statements shows that this experience enhanced her belief that she can success and played a role in her achievement. On the other hand, it was observed that when faced with negativities Derya doesn’t lose her faith and try to accomplish the task. In addition, she believes that she will be successful in more difficult tasks that she will face in the future.

Researcher: Is there any cases that you couldn’t solve the question in the class? Can you talk about it?

Derya: Our teacher was instructing the fractions. He wrote a question on the blackboard and came next to me while we were working on the question in our desk. I wasn’t able to solve the question. But I didn’t sink into despair. Because these things happen from time to time. I can solve after studying on it. I try to understand where I made a mistake. It happens once a while but I overcome.

Researcher: Can you solve more difficult questions?

Derya: Yes... I think...

Vicarious Experiences

The findings showed that Burcu and Derya assess their own achievement by following achievement level of their peers. Burcu compares her mathematics achievement with her classmates having higher performance, which reduces her self-efficacy and it is reflected negatively to her future performances.

Researcher: What do you think about the mathematics achievement of your friends?

Burcu: The scores that my friends got from the exams are important for me. Because their scores give clue about how successful I am. I follow the scores of my friends while the teacher announcing exam results.

Researcher: How that affects you?

Burcu: When they get high scores and I get low, I ask myself if I can do better than them in the future. I get upset when they get higher scores than me. Usually I turn in on myself (Burcu)

The assessments of Derya about her own achievement are reflected positively on her self-efficacy. Getting lower scores than her peers increases her success in the exams.

“The scores of my friends are important for me. I compare my score with theirs. I also got friends who get higher scores than me. Then, I say to myself that I can get better scores but I don’t hurt myself. I work harder on the questions that I missed. I say to myself I will get better scores next time and I get.” (Derya)

Burcu takes the students of the class with high mathematics achievement as a model. Among them, Ibrahim is the student with who Burcu compares herself the most. Burcu think that Ibrahim is very successful in math and believes that she cannot never be as successful as he is. Burcu expressed this though as “I ask myself why I can’t be like him. It seems impossible to me to be like Ibrahim”.

Similarly, Derya also takes the students of the class with high mathematics achievement as a model. She likens Enes to herself because of his success. She expressed this thought as “Enes is successful as I am, he solves like I do”. After comparing Enes’ achievement with herself, Derya concluded “So, successful students solve like this”. This conclusion shows that she formed a similarity with successful students and herself.

Social Persuasion

The responses of the teacher and the peer are more effective on the self-efficacies of Burcu and Derya, compared to the responses they got from their parents. Their teacher and friends give information to Burcu and Derya about their mathematics achievement. Burcu gets negative assessments from some friends, which makes her upset.

“My peers who don’t like me much, says that Burcu fails in math. I have a friend from the village; one day we were playing together, he said “You know, Burcu get this score from a very simple test. This irritated me a lot.” (Burcu)

On the other hand, Burcu wishes to hear motivating words from her teacher about her mathematics achievement. She expressed this wish as “I wish my teacher tells me “Burcu you can do it, you are a clever girl, there is nothing you can’t do, you will success if you work”. In addition, she added “If he had told these words maybe I would believe that I will succeed and I might be successful

after working. In this case (lacking encouraging words) I don't want to study", which shows that this fact is reflected on her self-efficacy and achievement negatively.

Derya gets positive comments from her teachers and friends, which make her happy and they are reflected positively on her performance by improving her belief of succeeding in similar situations.

"For example, my teacher tells me that I am very studious, successful. He says that I answer questions very well. When I get 95-100 from a math exam, my friends tell that I'm expected to get this score. Or they say you're quite successful, congratulations Derya. Getting such responses motivates me. I can solve problems better if I believe that I will succeed in exams." (Derya)

Emotional / Physiological States

It was found that Burcu and Derya are at different physiological states during a mathematics task. Burcu feels negative emotions in this process. For example, she doesn't want to go to the blackboard in the course. He thinks that both her teacher and her friends will react negatively against her. Burcu explains her feelings as below:

"I afraid my teacher gets mad, angry. In such a case I worry a lot. I'm wondering whether they're laughing behind my back. I'm afraid I'd be miserable. I thrill when I cannot solve such a simple question even though I know. For example, I'm wondering whether my friends talk behind my back. It has happened once. They said how Burcu couldn't answer such a simple question." (Burcu)

Regarding the statements of Burcu, it can be seen that her past experiences are effective on the negative emotions that she feels. Therefore, the fear and thrill that she feels are reflected in her self-efficacy negatively. She experiences similar feelings in mathematics exams as well. She expressed how low scores that she had increases her anxiety as "I remember the exams that I got low scores. I fear from what happens if I get a low score from this exam as well". In addition, experiencing the same anxiety both in the course and in the exam seems to reduce her faith of being successful and prevent her to achieve the success that she wishes.

On the other hand, Derya feels positive emotions while accomplishing a mathematics task. In addition, she gets successful results by controlling her emotions in this process. Therefore, her faith on being successful increases as well. She expressed her feelings while she is on the blackboard during math class and during the example as below:

"I wait a bit, since I know the answer I read the question at least three times. Then I solve slowly. I do not panic. If I panic, I cannot solve the problem on the blackboard. I have no fear because I know that I will solve it." (Derya)

"I feel happy and excited. But usually I feel comfortable. I feel a sweet excitement. I neither fear, nor feel anxious, I have joy in me. I try not to feel fear because my friends who fear cannot solve the problems that they know because of the fear" (Derya)

DISCUSSION AND CONCLUSION

The findings show that self-efficacy beliefs and mathematics achievement of the students who participated in the study are parallel. Mathematics self-efficacy beliefs of the student with high mathematics achievement (Derya) were found to be high, whereas mathematics self-efficacy beliefs of the student with low mathematics achievement (Burcu) were found to be low. The researches in the literature also indicate a strong relationship between mathematics achievement and mathematics self-efficacy beliefs. The results of the research show that self-efficacy of the students with high mathematics achievement are significantly high (Hackett, 1985; Hackett & Betz, 1989; Honicke &

Broadbent; 2016; Pajares & Graham, 1999; Lent et al. 1997; Pajares & Kranzler, 1995; Pajares & Miller, 1994). On the other hand, the analysis of the research findings shows that high mathematics self-efficacy beliefs increase the efforts made for accomplishing a mathematics task, whereas low self-efficacy beliefs create a “I won’t succeed” belief for the future and prevent the individual to put efforts to accomplish a task. Bandura (1994) stated that self-efficacy beliefs are effective on the targets of the individuals. According to Bandura, individuals with high self-efficacy beliefs make efforts for reaching the targets that they have set and do not give up when encountered with a negativity.

The findings about mathematics self-efficacy sources show that mathematics achievement of the participant students is associated with positive and successful mastery experiences. For example, Derya usually solves mathematics problems correctly whereas Burcu encounters difficulties in this process. It was observed that after these experiences Derya’s motivation was increased, whereas Burcu sank into despair, which were determinants of their following performances. From these findings it was concluded that successful experiences in mathematics are reflected positively in self-efficacy beliefs, whereas failures are reflected negatively; thus, both of them affect mathematics achievement. This outcome obtained from the research is similar to the results of the researches in the relevant literature (Lent et al., 1991; Lent et al., 1996; Lopez & Lent, 1992).

Another finding of the research is, the positive or negative assessments of the students who participated in the research about their own mathematics achievement through vicarious experiences (for example following the achievement level of their peers) have positive or negative reflections on their following performances. Burcu and Derya compare their mathematics achievements with their classmates that they believe to be very successful in mathematics. Burcu interprets this as “I will never be as successful as he is”, whereas Derya interprets it “... he is as successful as I am”. This fact allowed Derya to put more efforts and get more successful. However, Burcu could not get the success that she desires.

Another finding of the research is, the positive social persuasion that the students who participated in the research receive from their surrounding makes them to put more efforts in accomplishing a mathematics task, thus increase their mathematics achievement. In the contrary case, it was observed that social persuasions are reflected negatively in mathematics achievement. For example, the positive responses that Derya gets from her peers (you are very successful, congratulations, bravo) enhance her mathematics self-efficacy beliefs for the following mathematics tasks and increase her performance. On the other hand, the negative responses that Burcu gets (very unsuccessful, got a low score from such a simple exam) reduce her motivation and make her think that she will fail in similar tasks. Hence, this fact is negatively reflected in her performance. Social persuasion is the positive or negative assessments that someone gets from his/her close surrounding (Pajares, 2002; Usher & Pajares, 2009). This result is supported by the researches showing that positive and encouraging assessments that students get from their close surrounding let them to put more efforts and increase their mathematics achievement (Stevens, Olivárez & Hamman, 2006; Usher & Pajares, 2006; Usher, 2009; Usher & Pajares, 2009).

Findings also show that the emotional state of the participant students during a mathematics task is positively or negatively reflected in their mathematics achievement. It was observed that the emotional states of the participant students during the math course and exams is reflected in their beliefs about succeeding, thus become a determining factor of their mathematics achievement. For example, the fear, thrill, and stress that Burcu experienced during math exam reduced her success. On the other hand, Derya controlled her feelings against negative emotional states, which increased her success. The review of the literature also supports this result. Research results show that emotional states have a negative relationship with mathematics achievement (Hampton, 1998; Hampton & Mason, 2003; Kvedere, 2014; Lent et al., 1991; Lopez & Lent, 1992; Phan & Walker, 2000).

As a result, the findings of this research show that mathematics self-efficacy beliefs and sources of self-efficacy of the participant students is an important determinant of their mathematics achievement. These results obtained from this research, as well as other researches, show that

mathematics self-efficacy is an important affective factor that should be emphasized to achieve the desired success in mathematics. On the other hand, the findings indicate the necessity of new studies that will be conducted at various grade levels and with the participation of more students in order to determine the role of mathematics self-efficacy beliefs on mathematics achievement in detail. In addition, Bandura (1994) underlines that the importance that the individual assigns to the sources of self-efficacy is also significant. For example, someone may ignore the assessments of his/her surrounding even though they are positive. Therefore, his/her self-efficacy may be low even though his/her achievement is high. From this point of view, it is important to examine the source of self-efficacy from the perspective of the students with high self-efficacy beliefs and low mathematics achievements, as well as the students with low self-efficacy beliefs and high mathematics achievements.

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