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THE RELATION BETWEEN ACADEMIC BOREDOM OF STUDENTS WITH MATHEMATICS SELF-EFFICACY AND MATHEMATICS ANXIETY[1]

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Abstract: The aim of this study is to determine the relationship between academic boredom with academic self-efficacy and mathematics anxiety of 280 middle school students. Both the descriptive and correlational survey models were used in line with the sub-problems of the study. In this study, Level of Boredom Scale, Sources of Middle School Mathematics Self-Efficacy Scale, and Revised Fennema-Sherman Mathematics Anxiety Scale-Elementary were used as data collection tools. It was found that 5th, 6th, 7th and 8th grade students had middle level academic boredom in mathematics classes regardless of their grade levels. It was concluded that the self-efficacy perceptions related to performance accomplishments, vicarious experience and verbal persuasion were high in each class level, whereas the self-efficacy perceptions of emotional arousal were low. In general, it was relevealed that the anxiety of students in mathematics lessons was low while 8th grade students' mathematics anxiety was higher than the 5th, 6th and 7th grade students. Moreover, findings also revealed that there was a low positive relationship between students' boredom in mathematics lessons and vicarious experience which is used in lessons. No relation was found between the boredom and mathematics anxiety of students.

Key words: Academic boredom; self-efficacy; mathematics anxiety; mathematics education

1. Introduction

Learning, which is one of the most basic needs of human life, is the result of different experiences. The subjective effort of the individual in learning is vital. There are different variables affecting learning, such that genetic and environmental factors are the most prominent ones. Studies on learning have always attracted attention and focus on psychological factors affecting learning. There are many theories about learning in the literature. For instance, the control-value theory reveals that in the learning process, sense of achievement is important for students' cognitive, motivational, and regulatory processes. It is also known that the success in mathematics lesson is related to reciprocal relations with enjoyment and boredom which are called as emotions of success (Putwain, Becker, Symes & Pekrun, 2018).

When it comes to effective learning, it is possible to talk about three different approaches such as deep, surface and strategic (Marton & Saljö, 1997). Students with a deep learning approach are strong in their learning ability, interested in working, and willing to do the best. These students have academic and career plans. Apart from lesson, they have prelearnings about the lesson and questions to be answered. The students in the deep learning approach find answers to these questions and use the responses to configure knowledge in their minds. Usually, individuals who are self-learners and need very little instructional support are with deep learning approach (Biggs & Tang, 2011). The students with a surface learning approach do not have feelings for a lesson such as curiosity and determination to specialize, but they are willing to have the necessary qualifications for a profession. They also do not have sufficient prelearnings about the new subjects. Moreover, these students do not have any questions about the lesson

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and just worry about passing the class. This kind of students adapt the idea that the information they learn in the lessons are a little reminder to recall another information instead of making sense in their minds. Their essential goal is passing the exams. Therefore, such students are not interested in the subject and are only focused on remembering the details they read. When they are asked about the subject, they concentrate on the details. This kind of students cannot distinguish between principles and examples, evidence and results, and main ideas and side ideas (Ramsden, 2004). Most prominent features of the surface learners are their lack of enthusiasm and the academic boredom in the lessons. Some studies suggest that boredom is a powerful predictor of surface learning (Sharp, Hemmings, Kay & Sharp, 2017). For this reason, it is necessary to take precautions against possible academic boredom and the situations that negatively affect the lesson.

1. 1. Academic Boredom

This research focused on examining relations of academic boredom with sources of self-efficacy and anxiety in the context of mathematics lesson. Therefore, it is useful to examine the situations and concepts related to academic boredom. The concept of boredom, which is frequently used in daily life, emerges with many different concepts such as indifference, lethargy, fatigue, unwillingness (Raffaelli, Mills & Christoff, 2018). The academic boredom is based on studies on distress in the workplace that continued until the 1980s and conducted by psychologists, psychotherapists and psychiatrists (Maroldo, 1986; Smith, 1981). The fact that boredom is related to learning processes enabled this concept to study on education (Acee et al., 2010). It is stated that boredom is generally negative and obstructive situation in the way of participation, learning and general performance of students (Linnenbrink-Garcia & Pekrun 2011; Schutz & DeCuir 2002). The boredom observed on students is attributed to four basic reasons (Eastwood, Frischen, Fenske & Smilek, 2012):

- Arousal-related: Stems from failure to meet the individual's need for arousal properly
- Attention-related: Stems from inability to maintain focus due to the cognitive processes of the individual
- Psychodynamic: Stems from the processes that the individual unwittingly formed. Suppression of the desire to do something meaningful, for example
- Existential: Stems from the sense of void and lack of purpose for the life

When the basic sources of boredom are examined, it is seen that the reasons are originating from individual's self and his/her environment. This necessitates teachers to take measures on both the processes originating from the student and the processes originating from the educational environment. Boredom has been investigated in many studies related to the subject of learning. The results of these studies have been revealed that there is a relationship between boredom and students' academic achievement (Linnenbrink-Garcia & Pekrun 2011; Maroldo, 1986; Sharp, Hemmings, Kay & Atkin, 2018). In addition, subjects such as time perception within the process of boredom (London & Monell, 1974), curiosity levels, and agency are also examined (Martin, Sadlo & Stew, 2006; Mercer-Lynn, Bar & Eastwood, 2014; Steinberger, 2016). There are also studies which are examining the relationship between boredom and dropping out or school attendance (Maroldo, 1986). In this study, it is aimed to examine the relationship between academic boredom and sources of self-efficacy and anxiety in the context of mathematics lesson. It is thought that the study will provide effective results in taking measures related to the academic boredom experienced by students at middle school level.

1. 2. Sources of Self-Efficacy

The concept of self-efficacy may be associated with boredom. Self-efficacy is defined as an individual’s perceptions and beliefs of his/her own ability to organize and conduct the actions necessary to carry out the tasks assigned to him/her (Bandura, 1977). The self-efficacy beliefs of individuals affect the levels of effort for these actions, their level of persistence on the obstacles they face, and their level of concern. According to Bandura (1977), self-efficacy of individuals consists of 4 basic sources of information. These are performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal. The most reliable of these resources is the performance accomplishments of the individual.

Vicarious experience, which affects the self-efficacy belief, consists of the judgments that individuals acquire by observing other important individuals such as their parents, teachers, siblings and peers. In this process, individuals compare their performance results and performances of people with similar characteristics and develop self-efficacy beliefs accordingly. Self-efficacy belief developed in this way may be positive or negative. Another source affecting self-efficacy beliefs is verbal persuasion, which consists of encouragement and advice of individuals related to a task. Such remarks may affect the self-efficacy beliefs positively or negatively. The last source of affecting self-efficacy beliefs is emotional arousal, which is the effect of individuals' expectations of their ability to achieve a task on self-efficacy beliefs.

The perception of mathematics self-efficacy is students' own perception of themselves in the conclusion of tasks, activities or problems related to mathematics (Hackett & Betz, 1989). Self-efficacy perception also points to the control power on a task. Lack of control usually results in boredom. This situation, which is also encountered in the school process, presents a boredom when students feel a lack of control over their learning subjects. Self-efficacy, commonly used to explain the control of action, refers to the perception of individuals about their capacity to perform the task of learning (Pekrun, 2006). For this reason, it is thought to be related to self-efficacy perception to persist on a job, activity or task. For this reason, there is a close relationship between self-efficacy and boredom experienced in the absence of achievement on any task (Leong, 1993; as cited in Belton & Priyadharshini, 2007). In the light of these theoretical explanations, it is accepted that self-efficacy perception is an important variable in the teaching of mathematics lesson, which is among the hardest to learn. The theoretical explanations of mathematics anxiety are given below.

1. 3. Mathematics Anxiety

Mathematics anxiety is one of the affective variables that was studied for quite a long time and mostly associated with achievement. Richardson and Suinn (1972), who are pioneers of the field, defined mathematics anxiety as having feelings of tension during manipulating the numbers and solving mathematical problems in daily or academic life. Similarly, Fennema and Sherman (1976) described mathematics anxiety as “feelings of anxiety, dread, nervousness, and associated bodily symptoms related to doing mathematics” (p. 326). There are some reasons that enhancing the level of mathematics anxiety. For instance, Wilson and Gurney (2011) have stated that mathematics anxiety is relevant with inappropriate learning activities and widespread believing that mathematics achievement is specified by ability. Furthermore, attitudes of teacher, family, and peers influence students’ mathematics attitudes positively or negatively which causes increase or decrease the level of confidence and lack of self-confidence toward mathematical activities also originates mathematics anxiety.

Although, mathematics anxiety usually studied with mathematics achievement, some studies associate anxiety with boredom (Sommers & Vodanovich, 2000; Vodanovich & Watt, 1999). Sommers and Vodanovich (2000) analyzed the association with boredom and heath-symptoms which include anxiety. Boredom Proneness Scale and Hopkins Symptom Checklist were completed by 200 undergraduate students. The Hopkins Symptom Checklist consists of five subscales that are relevant with somatization, obsessive-compulsive, interpersonal sensitivity, anxiety, and depression. Findings have shown that there is a significant relationship between boredom and anxiety scores. According to literature, mathematics anxiety may be an important variable that affects boredom level of students. Therefore, mathematics anxiety was assumed as another variable that caused boredom. There are two mathematics anxiety scales mostly preferred. These are The Fennema-Sherman Mathematics Anxiety Scale (FSMAS) (Fennema & Sherman, 1976) and Mathematics Anxiety Rating Scale (MARS) (Richardson & Suinn, 1972). FSMAS measures students’ mathematics anxiety levels in classrooms, while MARS is not specific to school mathematics and it measures general mathematics anxiety level (Lim & Chapman, 2013). We used Revised Fennema-Sherman Mathematics Anxiety Scale (Lim & Chapman, 2013) translated and adapted to Turkish by Hacıömeroğlu and Kutluca (2016) in order to measure middle school students’ mathematics anxiety levels.

1. 4. Aim of the Study

The main purpose of this research is to determine the relationship between the academic boredom observed in middle school students with sources of self-efficacy and mathematics anxiety. The answers for following questions were sought for this general purpose:

1. What level of academic boredom are middle school students experiencing in mathematics?
2. Does the boredom that middle school students experience in mathematics lessons differ significantly according to their grade levels?
3. What are the sources of self-efficacy used by middle school students in mathematics?
4. Do the self-efficacy sources used in middle school students' mathematics lessons differ significantly according to their grade levels?
5. What level of anxiety do middle school students have in mathematics?
6. Do the anxiety levels of middle school students show a significant difference according to their grade levels?
7. Is there a significant relationship between middle school students' self-efficacy sources and academic boredom?
8. Is there a significant relationship between middle school students' mathematics anxiety and academic boredom?

2. Method

In this research, descriptive and correlational survey models were used (Karasar, 2002). These survey models were used in line with the sub-problems of the study. With the descriptive survey model, the academic boredom levels of middle school students in mathematics lessons, their self-efficacy sources, and mathematics anxieties were determined. The correlational survey model was used to examine the relationship between academic boredom, mathematics anxiety, and sources of mathematics self-efficacy.

2. 1. Study Group

The study group of this research was composed of students from a middle school at Turkey in Afyonkarahisar province. In total, 280 middle school students participated in the study. The data were collected in one session. The study group included students from 5th, 6th, 7th and 8th grade levels. Their ages range from 10 to 11 for 5th graders, 11 to 12 for 6th graders, 12 to 13 for 7th graders and 13 to 14 for 8th graders. Distribution of students in terms of grades were given in the Table 1.

Table 1. *Distribution of students by grade levels*

Grade Levels	Age Range	f	%
5	10 – 11	39	13.9
6	11 – 12	95	33.9
7	12 – 13	61	21.8
8	13 – 14	85	30.4

2. 2. Data Collection Tools

The data of the study were collected with three different instruments. Firstly, Level of Boredom Scale (LBS) developed by van Tilburg & Igou (2012) and adapted to Turkish by Eren (2016), was used as a data collection tool. The LBS is five-likert type, single dimension, designed for mathematics lessons and consists of seven items. According to van Tilburg and Igou (2012), there is a high correlation between total scores of items of the LBS and boredom levels (r=0.78). Another data collection tool used in the study is Sources of Middle School Mathematics Self-Efficacy Scale (SMSES), developed by Usher and Pajares (2009) and adapted to Turkish by Yurt and Sünbül (2014). The SMSES is six-likert

type scale with 24-item and it focuses self efficacy sources of middle school students for mathematics. The SMSES has a four-factor structure including performance accomplishments, vicarious experience, verbal persuasion and emotional arousal as sources of self efficacy. Lastly, for the sub-problems related to mathematics anxiety, Revised Fennema-Sherman Mathematics Anxiety Scale-Elementary (RMAS) developed by Lim and Chapman (2013) and adapted to Turkish by Hacıömeroğlu and Kutluca (2016) was used. The RMAS is composed of two dimensions and 8 items. The RMAS is intended to measure feelings of anxiety, dread, nervousness, and associated bodily symptoms related to doing mathematics. The dimension ranges from feeling at ease to feeling distinct anxiety. The scale is not intended to measure confidence in, or enjoyment of, mathematics (Fennema & Sherman, 1976).

2. 3. Data Analysis

The quantitative data were collected within the scope of this study via the LBS, SMSES and RMAS. The data were checked for normality and assumptions for parametric test in preanalysis. As a result of these preanalyses, therefore, one-way analysis of variance was conducted to answer research questions. While analyzing the data obtained from the five-likert-type scales, the four evaluation levels were determined via interval coefficient (5-1=4 and 4/5=0,80). Accordingly, the intervals for the evaluation of the scales are given in Table 2. In addition, for the six-likert-type scale five evaluation levels were determined, and a 5/6 = 0.83 range coefficient was used as intervals. The evaluation intervals given in Table 2 were used to interpret the research data.

Table 2. *Interval of coefficients for the evaluation levels of the data obtained from the scales*

Scale Type	Evaluation Criteria	Evaluation Intervals
Five-likert-type	Very Low	1.00 – 1.79
	Low	1.80 – 2.59
	Medium	2.60 – 3.39
	High	3.40 – 4.19
	Very High	4.20 – 5.00
Six-likert-type	Very Low	1.00 – 1.83
	Low	1.84 – 2.67
	Partially Low	2.67 – 3.50
	Partially High	3.50 – 4.33
	High	4.34 – 5.17
	Very High	5.17 – 6.00

3. Results

Data related to boredom levels, self-efficacy sources and anxiety levels of middle school students in mathematics lessons were analyzed in accordance with the research questions and the findings are given below.

3. 1. The Level of Academic Boredom in terms of Grade Levels

Descriptive analysis of the data obtained from the LBS was presented in the Table 3. This table showed general overview of boredom levels in mathematics lessons for the middle school students who participated in the study.

Table 3. *Boredom levels of middle school students in mathematics lessons*

Variable	Grade	N	M	SD	Skewness	Kurtosis
Academic Boredom	5	39	3.10	0.71	-0.86	0.52
	6	95	2.91	0.68	-0.34	-0.08
	7	61	3.02	0.63	0.09	0.55
	8	85	2.92	0.64	-0.18	-0.42
	Total	280	2.96	0.66	-0.29	-0.06

Preanalysis of the data showed that the data satisfied normality assumption for parametric tests in terms of skewness and kurtosis values (Table 3). Levene test results also showed that the data satisfied homogeneity of variances assumption (LF=0.32, p=0.81). Therefore, ANOVA was conducted to examine whether boredom levels of middle school students state a significant difference according to grade levels, and the results of ANOVA were presented in the Table 4.

Table 4. *ANOVA results for the relationship between grade levels and academic boredom of middle school students in mathematics lessons*

Source of Variance	SS	df	MS	ANOVA	
				F	p
Between groups	1.39	3	0.46	1.06	0.37
Within groups	120.39	276	0.44		

According to ANOVA results in the Table 4, there was no significant difference between the levels of boredom in mathematics lessons and the grade levels of the middle school students participating in the study ($F_{(3, 276)} = 1.06$, $p = 0.37$). According to this result, middle school students' perceptions of boredom towards mathematics lesson were at medium level (2.60 – 3.39) and did not significantly differ regarding their grade levels.

3. 2. Self-efficacy Sources of Students in terms of Grade Levels

The data obtained from the SMSES were used to determine the self-efficacy sources of middle school students. Since this scale included four dimensions as performance accomplishments, vicarious experience, verbal persuasion and emotional arousal, these dimensions were taken into consideration while reporting results. The describtive data for this scale were given in the Table 5.

Table 5. *Self-efficacy sources used in mathematics lessons*

Sources of Self-efficacy	Grade	N	M	SD	Skewness	Kurtosis
Performance accomplishments	5	39	4.85	1.01	-0.49	-0.81
	6	95	4.52	1.10	-0.30	-0.99
	7	61	4.74	1.03	-0.39	-0.75
	8	85	4.26	1.00	0.18	-0.97
	Total	280	4.53	1.06	-0.19	-0.99
Vicarious experience	5	39	5.35	0.85	-0.91	0.95
	6	95	4.94	1.05	-0.91	0.36
	7	61	4.80	1.10	-0.62	-0.58
	8	85	4.66	0.98	-0.45	-0.47
	Total	280	4.88	1.03	-0.75	-0.30
Verbal persuasion	5	39	4.68	1.19	-0.71	-0.59
	6	95	4.40	1.18	-0.39	-0.86
	7	61	4.67	1.13	-0.58	-0.54
	8	85	4.18	1.22	-0.06	-0.95
	Total	280	4.43	1.19	-0.36	-0.93
Emotional arousal	5	39	2.54	1.64	0.54	-0.94
	6	95	2.63	1.53	0.48	-0.98
	7	61	2.55	1.48	0.34	-0.98
	8	85	2.94	1.56	0.29	-0.97
	Total	280	2.69	1.55	0.39	-0.98

The preanalysis for the data showed that the skewness and kurtosis values range between -1 and +1, and therefore, the data about sources of self-efficacy were assumed to satisfy normality assumbtion of parametric tests. Moreover, Levene tests for each self-efficacy source revealed the data satisfied homogeneity of variances assumption. In detail, scores of performance accomplishment (LF = 0.48, p =

0.70), vicarious experience (LF = 1.87, p = 0.13), verbal persuasion (LF = 0.205, p = 0.89) and emotional arousal (LF = 0.41, p = 0.75) met the assumptions of homogeneity of variance. Therefore, the ANOVA tests were used for each self-efficacy source (Table 6).

Table 6. *ANOVA results related to grade levels and self-efficacy sources in mathematics lessons*

Sources of Self-efficacy	Variance Source	SS	df	MS	ANOVA		Tukey
					F	p	
Performance accomplishments	Between groups	13.06	3	4.36	4.02	0.01	5 and 8 7 and 8
	Within groups	298.83	276	1.08			
Vicarious experience	Between groups	13.62	3	4.54	4.46	0.01	5 and 8 5 and 7
	Within groups	281.12	276	1.02			
Verbal Persuasion	Between groups	11.54	3	3.85	2.75	0.04	7 and 8
	Within groups	386.47	276	1.40			
Emotional arousal	Between groups	7.77	3	2.59	1.09	0.36	-
	Within groups	658.13	276	2.39			

According to the ANOVA results for sources of self-efficacy, performance accomplishments ($F_{(3, 276)}$ = 4.02, p <0.05), vicarious experience ($F_{(3, 276)}$ = 4.46, p <0.05), and verbal persuasion ($F_{(3, 276)}$ = 2.75, p <0.05) showed significant differences for different grade levels. On the other hand, there was no significant difference students in different grade levels in terms of for self-efficacy source of emotional arousal ($F_{(3, 276)}$ = 1.09, p = 0.36). In order to analyze these significant differences, Tukey HSD Post-Hoc technique was performed following ANOVA. According to the results of Tukey HSD Post-Hoc analysis, self-efficacy regarding performance accomplishments differentiated between the 5th grade (M=4.85, SD=1.01) and 8th grade (M=4.26, SD=1.06) and there were also significant difference between the 8th grade (M=4.26, SD=1.06) and the 7th grade (M=4.74, SD=1.03). In the self-efficacy related to the vicarious experience as a source, it was observed that there was a significant different between the 5th grade students (M=5.35, SD=0.85) with 7th and 8th grade students (M=4.80, SD=1.10; M=4.66, SD=0.98). In addition, the findings about verbal persuasion as a self-efficacy source revealed a significant difference between 7th graders (M=4.67, SD=1.13) and 8th graders (M=4.18, SD=1.22).

3. 3. Level of Anxiety in Mathematics Lessons in terms of Grade Levels

The data obtained from the RMAS were used to determine the anxiety level of middle school students in mathematics lessons. Since this scale included two opposite dimensions as comfort levels and anxiety levels in mathematics, these dimensions were taken into consideration while reporting results. The describtive data for this scale were given in the Table 7.

Table 7. *Students' levels of comfort and anxiety in mathematics lessons*

Anxiety Dimensions	Grade	N	M	SD	Skewness	Kurtosis
Comfort	5	39	3.73	0.67	-0.12	0.62
	6	95	3.40	0.90	-0.54	-0.10
	7	61	3.48	0.79	-0.68	0.23
	8	85	3.07	0.89	-0.14	-0.34
	Total	280	3.36	0.87	-0.45	-0.13
Anxiety	5	39	1.82	0.70	0.86	0.36
	6	95	2.03	0.83	0.98	0.38
	7	61	2.19	0.85	0.39	-0.64
	8	85	2.46	0.89	0.17	-0.81
	Total	280	2.17	0.86	0.59	-0.48

It is seen that the comfort levels of the middle school students in mathematics lessons were generally at medium level with 3.36 and the anxiety levels were at low level with 2.17. According to these results,

it was seen that the comfort levels of the students were 3.73 in the 5th grade, 3.40 in the 6th grade and 3.48 in the 7th grade, which indicate high level and comfort levels of the 8th grade students were 3.07, which indicates a medium level. Moreover, it was found that the anxiety levels of 5th graders were 1.82, 6th grades were 2.03, 7th grades were 2.19 and 8th grade were 2.46 indicating low level of anxiety at all grade levels. These comfort and anxiety levels of the students were examined with ANOVA because these scores met the assumptions of normality and homogeneity of variance (comfort: LF=2.41, p=0.07; anxiety: LF=1.49, p=0.22) (Table 8).

Table 8. *ANOVA results for the relationship between comfort and anxiety levels of students in terms of grade levels*

Anxiety Dimensions	Source of Variance	SS	df	MS	ANOVA		Tukey
					F	p	
Comfort	Between groups	13.55	3	4.52	6.32	0.001	5 and 8 6 and 8 7 and 8
	Within groups	197.33	276	0.72			
Anxiety	Between groups	13.81	3	4.60	6.55	0.001	5 and 8 6 and 8
	Within groups	193.81	276	0.70			

According to the ANOVA results in the Table 7, it was found that there was a significant relationship between the level of comfort in mathematics lessons and grade levels of the students ($F_{(3, 276)}$=6.32, p<0.05). In order to analyze these significant differences, Tukey HSD Post-Hoc technique was performed following ANOVA. It was found that the significant relationship between comfort levels and grade levels were between 8th grade students (M=3.07, SD=0.89) with 5th grade students (M=3.73, SD=0.67), 6th grade students (M=3.40, SD=0.90) and 7th grade students (M=3.48, SD=0.79). According to this result, it was found out that the 8th grade students were the least comfortable students in mathematics lessons among middle school students. On the other hand, it was found that there were significant relationships between anxiety levels of students in mathematics lessons and their grade levels ($F_{(3, 276)}$=6.55, p<0.05). According to the results of Tukey HSD Post-Hoc analysis, it was seen that these differences were caused by the significant relationship of anxiety levels of the 8th graders (M=2.46, SD=0.89) with 5th graders (M=1.82, SD=0.70) and 6th graders (M=2.03, SD=0.83). Accordingly, it was found that the anxiety levels of the 8th grade students were higher than the 5th and 6th grade students in mathematics lessons.

3. 4. The Relationship Between Academic Boredom with Mathematics Anxiety and Sources of Mathematics Self-Efficacy

One of the aims of this study was to reveal the level of academic boredom of middle school students in mathematics lessons and the relations of boredom levels with mathematics anxiety levels and sources of self-efficacy of students. For this purpose, The Pearson correlation analysis was performed and the results of the analysis were given in the Table 9 and the Table 10.

Table 9. *The relationship between academic boredom and anxiety-comfort levels of middle school students in mathematics lessons*

Boredom – Anxiety Dimensions	Academic Boredom	Comfort
Academic Boredom	1	
Comfort	-0.047	1
Anxiety	0.009	-0.229**

** p<0.05

As a result of the Pearson correlation analysis in the Table 9, it was seen that there was no significant relationship between academic boredom of middle school students in mathematics lessons and comfort (r = -0.047) or anxiety levels (r = 0.009).

Table 10. *The relationship between academic boredom and sources of mathematics self-efficacy of middle school students*

Boredom – Self-efficacy Sources	**1**	**2**	**3**	**4**
1. Academic Boredom	1			
2. Performance accomplishments	0.060	1		
3. Vicarious experience	0.169**	0.603**	1	
4. Verbal persuasion	0.024	0.737**	0.563**	1
5. Emotional arousal	0.018	-0.511**	-0.316**	-0.346**

** p<0.05

The results on the Table 10 for the relationships between sources of self-efficacy used in mathematics lessons and the level of academic boredom in the lessons showed that, there were no significant relationships between academic boredom and sources of self-efficacy; performance accomplishments (r = 0,060), verbal persuasion (r = 0,024) and emotional arousal (r = 0,018). On the other hand, a significant and positive relationship was found between vicarious experience and academic boredom levels of students. The correlation coefficient was calculated as r=0.169. According to this, it was seen that there was a low level of correlation between academic boredom experienced by the students in mathematics lessons and the vicarious experience which is one of the sources of self-efficacy used in the lessons.

4. Discussion

In this study it was aimed to determine the relationships between academic boredom of middle school students with sources of self-efficacy and mathematics anxiety levels. These issues were seen as one of the common problems of the middle school students in mathematics teaching process. Throught this study, it was concluded that students in this study from 5th, 6th, 7th, and 8th grades have medium-level academic boredom in the mathematics lessons. Findings showed that the students' boredom levels did not show any significant difference according to their grade level, and they experienced medium level academic boredom at all grade levels. Previous studies show that the students in both middle school level and different education levels experience boredom in mathematics lessons even if it is occasional (Mann & Robinson, 2009; Sharp, Hemmings, Kay, Murphy & Elliott, 2017). In the literature, it is noteworthy that academic boredom experienced by the students in mathematics lessons is preventive in effective learning and participation in the lesson. Because students who experienced more boredom in the lessons than the other students showed less behavioral and cognitive engagement to mathematics (Pekrun, Goetz, Daniels, Stupnisky & Perry, 2010; Pekrun, Goetz, Frenzel, Barchfeld & Perry, 2011).

When the self-efficacy sources of the students were examined, it was concluded that the self-efficacy perceptions related to performance accomplishments, vicarious experience and verbal persuasion were at high level in each grade levels, whereas the self-efficacy perceptions related to emotional arousal was at low level. According to the findings of the study, there were significant differences between self-efficacy sources of students and grade levels of them. Self-efficacy perceptions of students in the 5th and 7th grade were higher than those in the 8th grade. The self-efficacy perceptions of students from vicarious experiences were higher in favor of the 5th graders. It can be thought that this is due to the fact that the 5th grade students are closer to the period of concrete operational stage defined by Piaget than the 7th and 8th grade students in terms of their developmental characteristics. Furthermore, it was concluded that self-efficacy perception levels based on verbal persuasion between 7th and 8th grades were in favor of 7th grade students. It was thought that this case may have a similar developmental reason. In other words, 8th grade students, who are closer to adolescence, may have a tendency to be less affected verbally.

According to the findings of the study, it was concluded that the comfort levels of middle school students in mathematics lessons were at a medium level and the anxiety they experienced was at a low level. Furthermore, 8th grade students' mathematics anxiety was higher than the 5th, 6th, and 7th grade students. This case could stem from the presence of high school entrance exams for 8th grade students in Turkey. In the literature, it was seen that the anxiety levels of middle school students experience in mathematics lessons were not exactly clear in terms of differentiation according to grade levels. For example, Yenilmez and Özbey (2006) found that mathematics anxiety levels differentiated among 5th, 6th, 7th and 8th grade students in favor of 5th grade students. In addition to this, it is found that 6th

grade students have lower anxiety levels towards mathematics lessons than 7th and 8th grade students (Bindak & Dursun, 2011; Aydın, 2011). The low level of anxiety of middle school students should be provide a positive result for their mathematics achievement. There are many studies, which showed that there was an inverse relationship between the mathematics anxiety levels of students and their achievements (Alkan, 2011; Peker & Şentürk, 2012; Yenilmez & Özbey, 2006). These studies have shown that as students' level of anxiety increases, their mathematics achievement decreases.

In this study, low positive relationship between middle school students' academic boredom in mathematics lessons and vicarious experience, which is one of the sources of self-efficacy used in the lessons, was found. Some studies were in line with this conclusion. In these studies, the self-efficacy perception was found to be one of the predictors of the academic boredom (Pekrun, Goetz, Frenzel, Barcfeld & Perry, 2011). It was also stated that there was a relation between academic boredom and persistence on a task which is thought to be related to their self-efficacy levels (Leong, 1993; as cited in Belton & Priyadharshini, 2007). Students' self-efficacy perceptions of any subject have a direct interaction with their sense of success from that task. For the student, the answer to the question "Can I succeed?" reveals his self-efficacy perception. In this case, in the process of teaching-learning, students' feeling themselves successful about the subject can be seen as effective for a high self-efficacy perception. Results also showed that there was no relationship between mathematics anxiety levels of students and boredom. Although no significant relationship between academic boredom and mathematics anxiety was found in the study, there are studies showing that mathematics achievement was inversely related to anxiety and boredom (Putwain, Becker, Symes & Pekrun, 2018). Moreover, factors related to academic boredom and anxiety could also be related to the difficulty of task or activity given to the student in the lessons. While there was no meaningful relationship between the students' academic boredom and anxiety on activities students perceive as easy, it could be concluded that there was a positive relationship between academic boredom and anxiety levels on activities since they perceive as hard (Acee et al., 2010). Furthermore, students' negative emotions can be factors of academic boredom, anxiety and frustration in lessons (Ramirez-Arellono, Acosta-Gonzaga, Bory-Reyes & Hernandez-Simon, 2018). As a way to reduce students' academic boredom in mathematics lessons, improving self-efficacy perception could be suggestested. Thus, taking measures to reduce students' mathematics anxiety could lead effective way to increase their academic achievement in mathematics. Therefore, it is suggested to make mathematics lessons interesting for students in order to make them curious about mathematics and actively involve into the lesson.

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