THE VIEWS OF STUDENTS AT DIFFERENT SUCCESS LEVELS ON THE FACTORS AFFECTING MATHEMATICS ACHIEVEMENT

FARKLI BAŞARI DÜZEYİNDEKİ ÖĞRENCİLERİN MATEMATİK BAŞARISINI ETKİLEYEN FAKTÖRLERE İLİŞKİN GÖRÜŞLERİ

Özge CAN ARAN, Hatice EKEMEN

21

Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi
Yıl: 2025 Cilt: 34 No: 1 Sayfa: 346-365
https://dergipark.org.tr/tr/pub/cusosbil

DOI: 10.35379/cusosbil.1369822

Geliş Recieved: **02.10.2024**
Kabul Accepted **15.11.2024**

THE VIEWS OF STUDENTS AT DIFFERENT SUCCESS LEVELS ON THE FACTORS AFFECTING MATHEMATICS ACHIEVEMENT [1]

FARKLI BAŞARI DÜZEYİNDEKİ ÖĞRENCİLERİN MATEMATİK BAŞARISINI ETKİLEYEN FAKTÖRLERE İLİŞKİN GÖRÜŞLERİ

Özge CAN ARAN [2], Hatice EKEMEN [3]

Keywords:
Success,
Mathematics,
Middle school.

Anahtar Kelimeler:
Başarı,
Matematik,
Ortaokul.

ABSTRACT

The aim of this study was to explore the opinions of secondary school students with different achievement levels about mathematics course. In this study, in which qualitative research design was used, interviews were conducted with 36 middle school students, divided into three groups based on their achievement levels: high, average, and low. The interviews focused on the factors influencing their success in mathematics. The findings were presented under three themes: attitudes and beliefs towards mathematics, self-efficacy, and teaching-learning processes. Results of this study indicated that the majority of students across high, average and low achievement levels agreed that mathematics was necessary in daily life under the attitudes and beliefs theme and that they had belief of being successful in mathematics under the self-efficacy theme. In addition, for the teaching learning process theme, the most of the students stated that making lessons in enjoyable ways facilitated learning whereas the noise in the classroom hindered it. Also, in this study, high-achieving students, unlike students at other success levels, stated that they were disciplined, had meta-cognitive skills, use of reinforcement, individualized instruction, and assignment of project facilitated learning mathematics, and that difficult formulas, too much emphasis on the same content, lack of prior knowledge, and teacher quality hindered learning mathematics. Besides, only students with average success stated that mathematics was necessary for school grade point average and was a course that required memorization, that explaining the importance of the subject facilitated learning mathematics, and that students' inability to focus on the lesson hindered learning more. In addition, only low-achieving students stated that they saw mathematics as torture, a necessary and demanding course for upper grades, that participation in class and the interest of teachers facilitated learning mathematics, but that poor physical conditions, the abstract nature of mathematics, and too much writing hindered mathematics.

ÖZ

Bu çalışmanın amacı, farklı başarı düzeyine sahip ortaokul öğrencilerinin matematik dersine ilişkin görüşlerini ortaya çıkarmaktır. Nitel araştırma deseninin kullanıldığı bu çalışmada, yüksek, orta ve düşük başarı düzeyi olmak üzere üç gruba ayrılan 36 ortaokul öğrencisi ile görüşülmüştür. Görüşmeler matematik başarısını etkileyen faktörlere odaklanmıştır. Bulgular, matematik dersine ilişkin tutum ve inançlar, öz yeterlilik ve öğretme-öğrenme süreçleri olmak üzere üç tema altında sunulmuştur. Bu çalışmanın sonuçları, yüksek, orta ve düşük başarı gösteren öğrencilerin büyük çoğunluğunun tutum ve inançlar temasında matematik dersinin günlük yaşamda gerekli olduğu ve öz yeterlilik temasında matematik derslerinde başarılı olacaklarına inandıkları noktasında görüş birliğine vardıklarını göstermiştir. Ayrıca, öğretme-öğrenme süreci teması için öğrencilerin çoğu, dersin eğlenceli bir şekilde işlenmesinin matematik öğrenmeyi kolaylaştırdığını, sınıftaki gürültünün ise öğrenmeyi zorlaştırdığını belirtmişlerdir. Ayrıca bu araştırmada, yüksek başarı gösteren öğrenciler, diğer başarı düzeyindeki öğrencilerden farklı olarak, disiplinli olduklarını, meta-bilişsel becerilere sahip olduklarını, pekiştireç kullanımının, bireyselleştirilmiş öğretimin ve proje ödevi verilmesinin matematik öğrenmeyi kolaylaştırdığını, zor formüller, aynı içeriğin çok fazla vurgulanması, ön bilgi eksikliği ve öğretmen kalitesinin matematiği öğrenmeyi zorlaştırdığını da ifade etmişlerdir. Ayrıca, yalnızca ortalama başarı gösteren öğrenciler matematiğin okul not ortalaması için gerekli olduğunu ve ezber gerektiren bir ders olduğunu, konunun öneminin anlatılmasının matematik öğrenmeyi kolaylaştırdığını, öğrencilerin derse odaklanamamalarının ise öğrenmeyi zorlaştırdığını belirtmişlerdir. Ayrıca sadece düşük başarı gösteren öğrenciler matematiği işkence, üst sınıflar için gerekli ve emek gerektiren bir ders olarak gördüklerini, derse katılımın ve öğretmenlerin ilgisinin matematiği öğrenmeyi kolaylaştırdığını, fiziksel koşulların kötü olması, matematiğin soyut olması ve çok fazla yazı yazılmasının ise matematiği zorlaştırdığını ifade etmişlerdir.

[1] This study was presented at the 10th International Eurasian Educational Research Congress in Ankara on June 8-11, 2023.

[2] Assoc. Prof., Hacettepe University, Faculty of Education, ozgecanarn@gmail.com, 0000-0003-3229-4325

[3] Republic of Türkiye Ministry of Education, hatice8873@hotmail.com, 0000-0002-3122-6083

Alıntılamak için/Cite as: CAN ARAN Ö. ve EKEMEN H. (2025) The Views Of Students At Different Success Levels On The Factors Affecting Mathematics Achievement, Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 34 (1), 346-365.

INTRODUCTION

In our daily life, we often use our mathematical knowledge while calculating how long it will take to get to a place according to the speed of our vehicle, and when adjusting the amount of ingredients that we use in a meal in accordance with the recipe. At the same time, we again put our mathematical thinking to work while analyzing data for the solution of a problem and try to find the solution in the shortest way (Umay, 1996, p.145). The deeper we learn about such a discipline, the easier it makes our daily lives. Considering the relation of mathematics with other disciplines and especially with technology, the importance of mathematics teaching is an undeniable fact for better-equipped individuals and a more developed society. Mathematics lesson provides the skills of numerical processing, spatial thinking, and mathematical reasoning, and enable students to grow as individuals who can think critically, reason, think scientifically and solve problems (Kenç, 2019; Orbeyi & Güven, 2008). Behaviors that require mathematical thinking are found in curricula at all levels and fields, starting from the pre-school period, through primary school and in higher education (Baykul, 2019). Mathematics curriculum generally guides to teach the subject of numbers and operations, algebra, geometry, measurement, data analysis, and probability by following processes such as problem-solving, reasoning, and proving (Department for Education, 2020; Ministry of Education, 2005; NCTM, 2020; TIMMS and PIRLS, 2020a; TIMMS and PIRLS, 2020b).

Despite the awareness of its importance in daily life and contribution to develop higher order thinking, the number of countries that achieved above average in the TIMSS 2015 eight grade mathematics exam in which students from many countries around the world took part, was about half of the total number of countries (Republic of Turkey, 2016). National success in the PISA 2018 mathematics exam was similar (Republic of Turkey, 2019). This situation shows that the problem of increasing success in mathematics has not been solved worldwide. Mathematics is generally seen as a lesson that is at the bottom of the subjects that people love, are interested in or consider themselves successful, and is considered difficult to learn (Baykul, 2019; Umay, 1996; Wills, 2010). As a result of a survey conducted by an international survey company with 1000 participants in 2015 in the United States of America (USA), it was revealed that 37% of the participants hated mathematics at school age (Wills, 2010). At this point, it is important to examine the factors that affect students' mathematics success in depth.

Researches show that there are many variables that affect or are related to mathematics achievement and provides evidence about that these variables can be gathered under three basic factors or predictors. These are demographic factors such as sex and socio-economic status (Bloom, 2016; Dursun and Dede, 2004; Gün and Çavuş Erdem, 2014; Gupta et al., 2006; Lamb and Thomson, 2002; Sarıtaş & Akdemir, 2009), teaching factors such as teacher competence, teaching strategies and techniques and curriculum (Bloom, 2016; Sarıtaş & Akdemir, 2009;Gupta et al., 2006; Yenilmez and Duman, 2008)., and individual factors such as self-learning, arithmetic ability, and motivation. (Bloom, 2016; Sarıtaş & Akdemir, 2009). In addition to researches about motivation one of the individual affective factors (Bol and Berry, 2005; Singh et al., 2002), there are also studies in the literature showing that there is a relationship between mathematics achievement and the student's attitude towards mathematics (Savaş, Taş & Duru, 2010) or that attitude affects mathematics achievement (Gün and Çavuş Erdem, 2014; Yenilmez and Duman, 2008).

Studies also revealed that the affective characteristics of students (Dursun and Dede, 2004; Ertürk and Erdinç Akan, 2018; Gunaseelanb and Pazhanivelu, 2016; Mokhtar et al., 2012; Ölçüoğlu and Çetin, 2016; Sarıtaş and Akdemir, 2009; Schiefele and Csikszentmihalyi, 1995) and the quality of teaching (Dursun and Dede (2004; Mokhtar et al., 2012; Sarıtaş & Akdemir, 2009) were two of the factors that affected the success of mathematics most. In addition, a study on the PISA 2012 results revealed that students' success in mathematics was influenced by their socio-cultural and economic status, as well as their experiences while working on mathematics tasks (Radišić et al., 2018). Demographic factors are factors that we as educators cannot change. Instead of focusing on these factors, it is thought that focusing on factors such as student characteristics and the quality of teaching will be important

in increasing students' mathematics success. For this, students' attitudes, beliefs, perceived self-efficacy towards the lesson and also quality of instruction were examined in this research.

LITERATURE REVIEW

The differences among the students which affect student's success, are not limited to intelligence and ability Affective characteristics such as interest, attitude, belief, and self-efficacy can also affect students' success. Actually, almost every student can learn at a high level with a planned effective instruction which is sensitive to differences and considers student qualifications (Bloom, 2016). Differences in cognitive abilities among individuals manifest themselves in mathematics lessons as in other fields, and thus students with higher or lower ability levels emerge. Therefore, considering that education is aimed at all individuals, education systems should be arranged in a way that students from all levels can improve their abilities, not only highly talented students, and these differences between students should be minimized (Çelik & Şengül, 2005).

Attitudes and Beliefs Regarding Mathematics Lesson

Attitudes and beliefs are behaviors within the affective domain. The affective domain includes feelings and external expressions of feelings. Like emotions, the affective domain is also difficult to define. For this reason, there is no universal and operational definition of the affective domain in the literature. Our feelings are at the center of the affective domain. Therefore, the affective domain includes physiological, cognitive, and behavioral processes related to our emotions. The affective domain includes a person's awareness, understanding, ability to relate our own emotions to others, and the ability to manage and regulate one's emotions (Brett et al., 2012). The two most important resilient characteristics within the affective domain that are associated with students' mathematics success are attitudes and beliefs (Burrus and Moore, 2016; Hackett and Betz, 1989; McKnight et al., 1987). Actually, attitude is related to all dimensions of learning and affects how the individual behaves and their motivation to learn. Our attitudes can also be shaped according to our beliefs. For example, they may have a negative feeling about a certain area of mathematics. They may have developed a belief that the functions are difficult and complex. This belief can affect their attitude. In this case, there is a negative evaluation about the dimensions of learning mathematics. This attitude can also affect the studies they will do on this subject later. Our attitudes are shaped according to a group of our beliefs. These beliefs can be consistent with each other, or we may have inconsistent beliefs. For example, while a student evaluates their mathematics teacher positively, they may not evaluate the mathematics course positively in general (Reid and Amanat, 2020). In this context, this study investigated attitudes and beliefs that are resistant to change, which are shaped by personal emotional schemas and affect other emotional learning (Brett et al., 2012).

Mathematical beliefs, which are subjective judgments of students, based on their mathematical experiences in their previous years of education, have an important place in their mathematics learning in the following years. This situation becomes a cyclical relationship in which beliefs affect learning and learning experiences affect beliefs (Uçar et al., 2010). White et al. (2006) stated that beliefs and attitudes were related and individuals had certain attitudes related with each belief. Yetim Karaca and Ada (2018) stated that the beliefs of students about whether they could be successful in mathematics were effective on their positive attitude towards mathematics (Yetim Karaca and Ada, 2018). Students may have positive beliefs about mathematics such as it is fun and pleasurable, as well as negative beliefs such as it is difficult and boring. Considering that beliefs affect learning, determining students' beliefs about mathematics and converting negative beliefs into positive beliefs can increase mathematics success.

Self-Efficacy for Mathematics

Self-efficacy is also subjective judgment of an individual about their success level in solving problems they may encounter in their life (Senemoğlu, 2013). Perceived self-efficacy is not related to the number of skills an individual has, but to their belief about what they can do with what they have in various situations. Self-efficacy belief functions as a key factor within the productive

system of human competence. Different individuals with similar skills or the same individual in different situations may show inadequate, adequate or unusual performance depending on the change in personal efficacy beliefs (Bandura, 1997). When individuals consider themselves capable in something, they are more likely to perform that action than when they do not view themselves as competent (Arseven, 2016). Mathematics self-efficacy is the confidence or evaluation of individuals in performing a task, solving a problem or having the ability to be successful (Hackett and Bettz, 1989). In the study by Collins (1985) on the mathematical problem-solving skills of children with high or low self-efficacy, it was concluded that children who saw themselves as successful had higher self-efficacy compared with children who doubted their abilities (Cited in Bandura, 1997). Starting from their primary school years, most students have a belief that mathematics is difficult and they show a low level of self-efficacy that they cannot be successful in this course and that they are not intelligent enough to learn mathematics, and as a result, they come to the classroom with negative feelings towards the lesson (Baykul, 2020). There are studies in the literature showing that students' mathematics self-efficacy has a significant effect on mathematics success (Pietsch et al., 2003; Pitsia et al., 2017; Schunk, 1989; Suárez-Álvarez et al., 2014; Üredi and Üredi, 2005; Zhang and Wang, 2020). In addition, mathematics self-efficacy, which is among students' personality traits, predicts both mathematics anxiety and students' choice of mathematics-related fields (Hackett, 1985). Therefore, it is expected that students' mathematics success will be increased by increasing the self-efficacy levels of students for mathematics lesson.

Teaching-Learning Processes in Mathematics Lessons

Mathematics teaching which is done by using traditional methods and away from daily life, cause students not to reach the desired level of success and causes students to develop a negative attitude towards mathematics. Educators are looking for ways to endear math lessons to the students to prevent the development of prejudice and fear against them. Students' mathematical capacities can be developed by teaching mathematical thinking at an early age. At this point, teachers must give students various tasks that will enable them to practice (Umay, 1996) because it is thought that the tasks given in the mathematics teaching-learning processes affect success positively (Thelen, 2008). Teachers play an important role at this point because their attitudes towards mathematics lessons, their quality, and the importance they give to students' cognitive development, directly affect the teaching and learning processes of mathematics lesson (Yenilmez and Duman, 2008). At the same time, the quality of mathematics instruction makes students less anxious in lessons and positively affects their mathematics success (Çiftçi, 2015).

For education systems to achieve real success, no student should be left behind. Considering that there are students with mixed abilities in classes, it is important to consider the opinions of students with all success levels. In this context, in this study, it was aimed to reveal the opinions of middle school students at high, average and low success level in mathematics lesson about the factors that affected the academic success. In this context, following research questions are searched:

1. What are the opinions of high-achieving secondary school students about the factors that affect the academic success in math class?
2. What are the opinions of average-achieving secondary school students about the factors that affect the academic success in math class?
3. What are the opinions of low-achieving secondary school students about the factors that affect the academic success in math class?

This study, which thoroughly investigates the common and different aspects of the views of students with different success levels about mathematics lessons, helps to define the necessary arrangements to be made in learning environments to increase mathematics success thus a more developed society can be established by growing individuals with higher order thinking skills.

METHODOLOGY

In this study, which was conducted to determine the views of students with different success levels on factors that affected their mathematics success, a holistic multi-case design, one of the qualitative research methods, was used.

In the holistic multiple-case design, each situation is considered as holistic in itself and then compared with each other (Yıldırım and Şimşek, 2018). In this context, students at high, average and low success levels were considered as a case in the study. The common and different aspects of each student's thoughts on the mathematics lesson were tried to be revealed.

Study Group

The study group of the study comprised 36 middle school students who were receiving education at a middle school in the capital of Turkey. The school was selected by the help of convenience sampling method. In this sampling method, the researcher chooses a situation that is easy to access so that the research can be performed faster and easier (Patton, 1987; Yıldırım and Şimşek, 2018). In order to bring speed and practicality to the study (Yıldırım and Şimşek, 2018), one of the schools which was close to the school where the researcher was currently working, was selected and also this school was chosen because one of the researchers previously worked in this school. Also, the criterion and maximum variation purposive sampling techniques was used in this research (Patton,1987). While determining the students who would constitute the study group, the scores of the first written exam of the mathematics lesson commonly prepared by teachers and held throughout the school according to class levels and teacher's opinions according to students'class performance were taken into consideration. Students are grouped as at low, average and high success level according to those criteria. During this process, first of all the 5-point grade system is used and the following score criteria were taken into consideration while determining the groups:

- Students who got 1-2 point were grouped as the lower success
- Students who got 3 were grouped as average success
- Students who got 4-5 were grouped as the upper success

Among the students with the above grades, twelve students who stated that they were willing to participate to the interview, were chosen from each success level with teachers'taught and a total of 36 students were identified and they formed the study group. While study group is chosen, maximum variation was also insured by choosing students from different class levels and genders. Table 1 shows the frequency distribution of the personal information of the students participating in the study.

Table 1. Frequency Distributions of Personal Information of Students Participating in the Study

		Upper success level (f)	Average success level (f)	Lower success level (f)	Total
Sex	Girl	7	6	5	18
	Boy	5	6	7	18
Class Level	Year 5	3	3	3	9
	Year 6	3	3	3	9
	Year 7	3	3	3	9
	Year 8	3	3	3	9

When Table 1 was examined, it was seen that the distribution of the students participating in the study was equal according to their sex (f = 18). In the study group, the number of students at high, average, and low success level in each class level was equally distributed (f = 12).

Data Collection and Analysis

A semi-structured interview form was developed by the researchers to collect data in the study. After literature review, researchers wrote questions to reveal students' feelings, perceptions, opinions towards mathematics course and mathematics teachers. The trial form of this interview form consisted of a total of four sub-dimensions including views on attitudes and beliefs, teaching-learning processes, teachers, and mathematics self-efficacy. The trial form consisted of a total of 14 items; five in the sub-dimension of views about attitudes and beliefs, four in the sub-dimension of views about the teaching-learning process, three in the sub-dimension of views about the teacher, and two in the sub-dimension of views about mathematics self-efficacy. For content validity, the trial form was submitted for the opinion of two program development experts and one mathematics education expert. After making the necessary corrections, the final form was finalized with a total of 9 items. In the final form, students' views on mathematics lesson were reduced to

three sub-dimensions as “attitudes and beliefs, teaching-learning processes and thoughts on mathematics lesson self-efficacy.” The pilot version of the interview form was conducted with six students, equally selected from each success level, from year 6, who were being educated at a different middle school than the school where the main study was performed. As a result of the pilot study, it was seen that the items in the interview form were understood by the students and it was decided to continue with the main study.

The last version of the interview form was applied by using a voice recorder to record the answers to the interview questions. Interviews took approximately 10-20 minutes. The school administor allowed researcher to interview with students during school hours and students participated in the interviews during lunch breaks. During the interview, some of the students were hesitant to talk as it was their first time to have interview. In order to make students relax, the researcher repeated to say that the answers they gave would not be shared with their mathematics teachers and others and their names would not be mentioned anywhere as the researcher stated before the interview. After interview, the recordings were transcribed by the researchers. Deductive and inductive approaches were used together while transcripts were analyzed. In this stage, the researchers carefully read the transcripts to search the codes related with predefined themes and sub-themes and codes were defined from data in inductive way. Then reserchers calculated how many teachers emphasised the same code (Marshall and Rossman, 2006; Yıldırım and Şimşek, 2018).

Validity and Reliability

To ensure the credibility of the data obtained from the research, attention was paid to asking the questions in a clear way that middle school students could understand, and “reading aloud” was performed in a few volunteer students who would not participate in the final study and pre-interviews were conducted with six students. To increase the credibility of the study, the opinion of a researcher, who was an expert in qualitative data collection, was consulted at all stages of the study. In addition, after deciphering the data obtained for consistency analysis, another expert was asked to conduct a confirmation examination. While calculating the reliability coefficient between coders, the reliability coefficient formula suggested by Miles and Hubarman (1994) was used and the result was found as 83%. Then, experts discuss the inconsistent points in the matches and decipher them. They reached a common conclusion regarding the data-theme match. To ensure the transferability of the obtained data, the students were asked to explain their thoughts in detail and give examples. The research results were presented with detailed descriptions by including the quotations of the students.

At the same time, teachers and several of the students knew the interviee one of the researchers as she had previously worked at the school where the study was conducted, and communication between them was good. Therefore, it was easier to get permission from school administration, mathematics teachers, parents and students to conduct the study and also this allowed the interviews to be conducted in a more relaxed environment. Actually, conducting research in a school where the researcher interacted for a long time would contribute to the credibility of the data obtained from the research (Yıldırım and Şimşek, 2018).

FINDINGS

The results of this research showed that the opinions of students were gathered in three themes. These themes are “Attitudes and Beliefs Regarding Mathematics Lessons, Self-efficacy Regarding Mathematics Lessons and Mathematics Lesson Teaching-Learning Processes”. These themes and codes that they include were as follows:

Attitudes and Beliefs Regarding Mathematics Lessons

Results about this theme indicated that the students' attitudes and beliefs included their positive feelings about the lesson, their negative feelings about the lesson, their beliefs about the necessity of the lesson, and their general beliefs about the lesson. Table 2 shows the percentage and frequency distributions of the codes for the "attitudes and beliefs" theme of the students participating in the research:

Table 2. Percentage and Frequency Distributions of Codes of the Theme of "Attitudes and Beliefs" Regarding Mathematics Lessons

Themes	Sub-Themes	Codes	High success level		Average success level		Low success success level	
			f	%	f	%	f	%
Attitudes and Beliefs Regarding Mathematics Lesson	Positive feelings about the lesson	Finding the lesson enjoyable	6	50	5	42	1	8
		Excited for the lesson	2	17	1	8	1	8
		Feeling happy in class	6	50	4	33	4	33
		Loving numbers-operations	3	25	3	25	1	8
	Negative feelings regarding the lesson	Finding the lesson boring	1	8	2	17	6	50
		A difficult lesson	2	17	5	42	5	42
		Finding the lesson as torture	-	-	-	-	1	8
		Feeling sad in class	-	-	1	8	1	8
	Beliefs on the necessity of the course	Necessary in daily life	10	83	10	83	8	67
		Necessary in professional life	1	8	3	25	1	8
		Required to learn other lessons	2	17	-	-	1	8
		Required for school grade point average	-	-	1	8	-	-
		Required for upper class	-	-	-	-	1	8
	General beliefs regarding the course	A lesson that requires memorization	-	-	1	8	-	-
		A lesson someone has to teach	-	-	1	8	1	8
		A lesson that takes effort	-	-	-	-	1	8
		A lesson with a lot of content	-	-	2	17	1	8

In Table 2, when the views of the students with high success was examined for the theme of "attitudes and beliefs", it was seen that the code with the highest frequency was that mathematics was "necessary in daily life" (f=10). S12, one of the high achieving students, expressed this situation as follows: “Mathematics is one of the most important lessons of our life. A lesson that is required at all ages and in everything." S4 expressed the necessity in daily life as follows: "I think it is an important lesson because it is inevitably present in all areas of our lives, and if we learn, we can easily solve problems when they arise." It was possible to say that a small number of students among the high achieving students considered mathematics as difficult (f = 2) or boring (f = 1). In addition, half of the students (f = 6) stated that they found mathematics enjoyable and felt happy during the lesson.

According to these results, it could be said that students with high success generally had positive feelings towards mathematics. S11 stated that he found the lesson enjoyable as follows: “Math class goes by very fast, it’s like gym class, I get bored in other lessons, but math is fun for me and solving problems is very fun for me.” S5, supportingly, used the following expressions on this subject: "When you understand the lesson, mathematics is easy for you, I think it is fun to listen to the lesson and to do the questions."

When the views of the students at the average success level were examined in detail, it was seen that the code with the highest frequency in the relevant theme was the code indicating that mathematics was "necessary in daily life" as in the views of the students at the high success level (f = 10). According to this information, it could be said that almost all of the students at the average success level

considered mathematics as a necessary subject in daily life. Regarding this, S13 made the following sentences: "Mathematics will be useful in important things in our lives such as in the market and grocery store." S16 used the following expressions, similar to high achieving students: "I think mathematics is an important lesson because we use mathematics in many areas of our lives and mathematics helps us in many areas." It was seen that students with average success level generally had positive feelings towards the mathematics such as feeling happy in the lesson (f=4), finding the lesson enjoyable (f=5), and liking numbers and operations (f=3). On the other hand, almost half of the students at the average level (f=5), stated that they found mathematics difficult. S23 made the following statements regarding the fact that mathematics was a difficult lesson: "I think it is a difficult lesson because numerical lessons are generally difficult compared with verbal lessons." S16, on the other hand, related the importance of the lesson with its difficulty and made the following explanations: “I think it is a difficult lesson, but since it is important, it must be difficult because if it is not important, this lesson is not taken into consideration. I think it's an important lesson and a difficult lesson."

When the views of the students at the low success level were examined, it was noteworthy that the code with the highest frequency was that it was "necessary in daily life" as with the students at other success levels (f=8). It was noteworthy that half of the students at the low success level found mathematics as a boring lesson (f=6). S35 expressed this situation in the following way: "Sometimes I say [offf], that is, it sounds boring." S30 evaluated mathematics as difficult: "It is also very difficult for me, I find it boring." In addition, it was seen that students with a low success level had more negative emotions about mathematics than positive emotions. When the general beliefs of the students with low success were examined, S29 stated that mathematics lesson was a lesson that someone should teach: “I think the teacher should explain a little. Anyway, our teacher ‘lectures’ the lesson”, S33 stated that it was a lesson that required considerable effort as follows: “You have to strain your head a lot” S29, on the other hand, defined mathematics lesson as a lesson with a lot of content as follows: "It can be a little difficult because there are many subjects."

The highest code in the three student groups belonging to the theme was the "necessary in daily life" code. In other words, mathematics was seen as a necessary lesson in daily life according to the view of the majority of students at all three success levels. By contrast, nearly half of the students at high and average success levels thought that the lesson was enjoyable, whereas only one student at the low success level found the lesson enjoyable. Similarly, half of the students in the low and average success groups agreed that mathematics was difficult, whereas a small number of students at the high success level stated that the lesson was difficult. In addition, according to students with average and low success levels, there were views that the content of the mathematics lesson was excessive, they felt sad while in the lesson, and that mathematics was a lesson that one should lecture; similar opinions were not encountered among those with high success levels. Also, only average achieving students expressed that mathematics is necessary for school grade point average and a course that requires memorization. Although students with low success levels considered mathematics as ‘torture’, that it was a necessary lesson for upper grades (i.e. from sixth grade to seventh grade) and that a lesson that takes effort, these views were not encountered among students with average/high success levels.

Self-efficacy Regarding Mathematics Lessons

According to findings, the theme of Mathematics Lesson Self-efficacy consisted of the sub-themes of "general perceptions of students about themselves" and " Students’ thoughts about their mathematics ability " Table 3 shows the percentage and frequency distribution of the codes of this theme:

Table 3. Percentage and Frequency Distributions of the Codes of the Theme of "Self-efficacy" Regarding Mathematics Lessons

Themes	Sub-Themes	Codes	High success level		Average success level		Low success level	
			f	%	f	%	f	%
Self-efficacy Regarding Mathematics Lessons	General perceptions of students about themselves	Disciplined	1	8	-	-	-	-
		Persevering	1	8	1	8	1	8
		Clever	6	50	5	42	1	8
		Hardworking	9	75	6	50	3	25
		Having metacognitive skills	1	8	-	-	-	-
		Good listener	5	42	2	17	1	8
	Students' thoughts about their mathematics ability	Having the belief that he/she can be successful in mathematics	12	100	12	100	10	83
		Numerically capable	4	33	1	8	-	
		Ability to focus on mathematics	2	17	1	8	-	-

In Table 3, when the views of the students with high success in mathematics about self-efficacy were examined, it was seen that the code with the highest frequency was "having the belief that they can be successful in the lesson" (f=12). Accordingly, it could be said that all students with high success in mathematics had a belief that they could be successful in mathematics. S2 used the following statements on this subject: "Honestly, I do not work enough these days, but I know that if I work hard, I can achieve it." S3 generalized his belief that he could be successful in all lessons: "I think this applies to every lesson, so if you work for every lesson, you can be successful. I believe that if I also work, I will be more successful in both mathematics and other lessons." In addition, it was seen that at least half of the students with high success saw themselves as hardworking (f=9) and intelligent (f=6), and four students stated that they had numerical skills. S10 stated that she was hardworking: "I am a good listener, hardworking, I understand what I read, and I memorize quickly." The views of S9, who thought he was intelligent, were as follows: "I think, in fact, I think everybody has these qualities because it has been given everyone intelligence, brains, and everyone can use it."

When the views of the students at average success level regarding the self-efficacy of mathematics lesson were examined, it was seen that the code with the highest frequency was "having the belief that they can be successful in the lesson" as the students at high success level stated (f=12). Accordingly, it could be said that all of the students at the average success level believed that they could be successful in the lesson depending on their experiences in the mathematics lesson. S20 expressed this situation with the following words: "I believe my teacher, if we do the tests like this and read books like this, we can be successful." Similarly, SS23 stated: "It is ok because I could not do mathematics at first, but my thinking and experimenting skills have started to increase in mathematics. Right now, I'm answering 12-13 questions correctly in math tests and hopefully, it will go up to 18-19. It happens when you work." In addition, it could be said that students at the average success level perceived themselves as intelligent, hardworking, able to focus on the lesson, persevering, and good listeners. A student stated that she had numerical ability based on her experiences in mathematics lessons. S3 stated that he was a hardworking student as follows: "I generally have the

necessary qualifications. I understand my teacher, I work." S6 justified herself as being a hardworking person as follows: "The more you repeat it every day when you come home, the better you understand each lesson and the more you understand."

When the views of the students at low success level about mathematics self-efficacy were examined, it was noteworthy that the code with the highest frequency was "having the belief that they can be successful in the lesson" (f=10). It could be said that students with low success also believed that they could be successful in mathematics like students with high and average success levels. S30 explained his belief that he could succeed if he worked based on his experience as follows: "Last year, I studied a subject that I did not understand at all and started to understand it even more and this was easy for me and I took the exams more comfortably." Similarly, S36 used the following expressions: "I think that if I study, I can solve more questions, see different question types, and I will be more successful." As can be seen from Table 4, it was striking that a small number of students with low success levels saw themselves as intelligent, diligent, persevering, and good listeners according to their experiences in mathematics lessons.

The highest code in this theme was " Having the belief that he/she can be successful in mathematics " for all three groups. In other words, almost all of the students at the three success levels believed that they could be successful in mathematics when they worked. Moreover, at least half of the students at high and average success level held the perception that they were hardworking, and almost half of the students thought that they were intelligent. This rate was quite low for students at low success level. Similarly, students at high and average success levels thought that they could focus on the lesson and had numerical skills, whereas students at low success level did not comment on this issue. Unlike the other two groups, students with high success stated that they were disciplined and they have metacognitive skills.

Teaching-Learning Process of Mathematics Lesson

Another factor that constituted the students' views on mathematics lesson was their views on teaching-learning processes. The Students' views on " teaching-learning process of mathematics lesson " were grouped into two dimensions: Factors that made learning easier and factors that made learning difficult. Table 4 shows the percentage and frequency distributions of the codes belonging to the theme "Mathematics Lesson Teaching-Learning Processes."

Table 4. Percentage and Frequency Distribution of Codes of the Theme of "Teaching-Learning Processes" of Mathematics Lesson

Themes	Sub-Themes	Codes	High success level		Average success level		Low success level	
			f	%	f	%	f	%
Teaching-Learning Processes of Mathematics Lesson	Factors that Facilitate Learning	Use of reinforcer	1	8	-	-	-	-
		Peer teaching	1	8	1	8	1	8
		Individualized Teaching	2	17	-	-	-	-
		Using different methods	1	8	1	8	-	-
		Reading books on mathematics	1	8	1	8	-	-
		Teaching lessons in an enjoyable way	6	50	6	50	8	67
		Project Assignment	1	8	-	-	-	-
		Solving many questions in lesson	5	42	4	33	3	25
		Quiet classroom environment	4	33	2	17	2	17
		Use of technology and equipment	3	25	2	17	2	17
		Repeating the content	4	33	-	-	4	33
		Using learning strategies	2	17	2	17	1	8
		Teacher quality	9	75	8	67	2	17
		Listening to the teacher well	-	-	1	8	2	17
		Explaining the importance of the subject	-	-	1	8	-	-
		Class participation	-	-	-	-	3	25
		Teacher's caring behavior towards students	-	-	-	-	1	8
	Factors that Make Learning Difficult	Difficult formulas	1	8	-	-	-	-
		Emphasizing same content, a lot	1	8	-	-	-	-
		Structure of the content and questions	4	33	6	50	9	75
		Noise in the classroom	9	75	10	83	5	42
		Lack of prior knowledge	3	25	-	-	-	-
		The psychological state of the student	1	8	1	8	-	-
		Teacher quality	1	8	-	-	-	
		Teacher's attitude towards the student	1	8	1	8	-	-
		Inability to focus lesson	-	-	3	25	-	-
		Teacher' slighting off the content	-	-	2	17	1	8
		Poor physical conditions of the classroom	-	-	-	-	1	8
		Mathematics' being abstract	-	-	-	-	1	8
		Writing a lot in the lesson	-	-	-	-	4	33

When the views of students with high success levels regarding the theme of "teaching-learning processes of mathematics lesson" were examined in Table 4, it was seen that the two codes with the highest frequency were "noise in the classroom" and "teacher's qualification." Most of the students at high success level stated that noise in the classroom made it difficult to learn and the good quality of the teacher made it easier to learn the lesson. S5 stated that noise in the classroom made it difficult to learn with the following sentences: "It becomes difficult to understand when there is a lot of talking in class or if teachers or students cause distractions." S12 stated that the quality of the teacher facilitated learning, as follows: "The tricks given by our teacher or a more explanatory expression make it easier for me to learn mathematics." The code of "the quality of the teacher" was shown as a code in both sub-themes because it was seen by the students as a factor that both facilitated learning the lesson and made learning the subject difficult. For example, S2 stated that the quality of the teacher made it easier for them to learn the mathematics with the sentence: "I learn easier when the teacher presents the lesson in a enjoyable way." S3 stated that depending on the teacher's way of teaching, their learning in math class could be difficult with the sentence, "If the teacher could present the lesson better, it would be good. For example, we are doing operations on the board. We waste a lot of time because some students cannot do them." In addition, when Table 5 was analyzed, it was seen that the students at high success level made more comments about the factors that facilitated learning the lesson, such as teaching the lesson in an enjoyable way and solving many problems in the lesson. It was seen that they made fewer comments about factors that made learning the lesson difficult, such as the structure of the content-subject and lack of prior knowledge.

When the views of students at average success levels regarding the theme of teaching-learning processes of mathematics lesson were examined, it was seen that the code with the highest frequency was "noise in the classroom" (f =10). According to this, it was possible to say that the noise in the classroom made it difficult to learn math. S17 stated that the noise made learning difficult as follows: "For example, my class talks a little too much, I don't understand much while they are talking." S16 expressed this situation as follows: "It makes it difficult to learn the lesson when there is noise. Because we are trying to listen, but when they talk our grades drop because we cannot listen." In addition, according to the views of students at average success levels, it was seen that the content and the structure of the questions, teacher' slighting off the content, teacher's attitude towards the student, student's psychological state, and student's inability to pay attention were expressed as factors that made learning difficult. On the other hand, students at average success levels stated that the quality of the teacher, solving lots of problems in the lesson, being quiet in the classroom, having fun in the lesson, and using technological equipment made it easier for them to learn mathematics. It was noteworthy that students at average success levels generally expressed more views about the factors that facilitated learning the lesson.

When the views of the students at low success levels regarding the teaching-learning processes of mathematics lesson were examined, it was seen that the code with the highest frequency was the structure of the mathematics lesson content and questions (f=9). The structure of the content made it difficult to learn mathematics according to all students at low success levels. S34 explained this situation as follows: "The issues are getting harder, and there are new-generation questions, they get harder and I have difficulties in solving them." This statement showed that students thought that the content of the lesson became difficult as a result of the increase in the questions that required mathematical literacy and higher order thinking skills in the central exams where new-generation questions were asked. S33 referred to the deficiencies in their prior knowledge when they had been in a more junior class: "I think multiplication and division are quite difficult." In addition, as could be understood from Table 5, most of the students at low success levels wanted the math lesson to be taught in an enjoyable way (f=8). Repeating content, solving many questions in the lesson, listening to the teacher well, and being silent in the class made it easier to learn mathematics according to the views of the students at low success levels. Also, according to the students at low success levels, writing too much in the lesson, having

poor physical conditions of the classroom, being noisy in the classroom, superficial presentation of content, and the lesson being abstract made it difficult to learn mathematics.

In this theme, the code with the highest frequency in total was “the noise in the classroom” stated as a factor that makes learning difficult learning in the teaching-learning processes. In addition to this, when other sub-themes about “teaching-learning process” were analyzed in terms of highest frequent code, the opinions of students converged on that teaching lesson in enjoyable ways facilitated learning. Also, the views of students with high success focused on the quality of the teacher as the factor that facilitated learning mathematics, and noise in the classroom as the factor that made learning difficult. The opinions of the students at the average achievement level focused on the presence of noise in the classroom making learning difficult, and the opinions of the students at the lower achievement level focused on the structure of the content making learning difficult. Students at high and average success levels had a view that using different methods and reading a mathematics book made it easier to learn, a view not held by students with low success. In addition, among students at high and low success levels, there were views that the repetition of content facilitated the learning of the lesson and that teacher slighted off the content in order not to be behind the curriculum; no students with average success levels expressed a view on this subject. Unlike the other two groups, students with high success thought that using reinforcer in the lesson, individualized teaching, and project assignment made learning easier, and they thought that the difficulty of formulas, lack of prior knowledge, the quality of the teacher, and placing a lot of emphasis on the same content made it difficult to learn mathematics. Similarly, only students at low success levels stated that participation in the lesson and the teacher’s caring students made it easier to learn the mathematics lesson, and they said that the poor physical condition of the class, writing a lot in the lesson, and being abstract of mathematics made it difficult to learn the lesson. The students with average success levels stated that, unlike the other two groups, explaining the importance of the subject made it easier to learn, and the inability to focus lesson made it difficult to learn. In general, it was determined that at least half of the views at all three success levels focused on that lesson was taught in enjoyable way as a factor that facilitated learning. It was seen that the views of almost half or more of the students at all three success levels were united on noise in the classroom as the factor that made learning difficult.

DISCUSSION

The findings obtained from interview indicated that high, average and low achieving students had same opinion on some of the codes. In this context, findings about the "attitudes and beliefs" themes showed that the majority of students at high, average and low achievement level had a common opinion that mathematics course was necessary in daily life. However most of the students at high and average success levels had positive feelings such as finding the lesson enjoyable and being happy in the lesson, whereas most of students at low success levels had negative feelings such as getting bored in mathematics course and finding mathematics as a difficult subject. Similarly, the results of previous study showed that students who had a positive attitude towards mathematics, had higher mathematics success (Hackett and Betz, 1989; Pyzdrowski et al., 2013; Yenilmez and Duman, 2008) while Uçar et al. (2010)’ study revealed that students perceived mathematics as calculation and that they thought that mathematics is a difficult, boring and unpopular subject. Also, the research of Yetim Karaca and Ada (2018) indicated that although most students thought mathematics as a difficult, boring, and complicated subject, some also considered it as an easy and fun lesson. The study also showed that students at the average success level, unlike students at other success levels, found mathematics as a necessary course for school grade point averages and as a course that required memorization. Another interesting finding of the study is that students at the lower success level, unlike students at other success levels, find mathematics as torture and think it is necessary for upper grade levels and define it as a course that requires effort. In addition, half of the students in the low and average success groups agreed that mathematics was difficult, whereas a small number of students at the high success level stated that the lesson was difficult. In addition, according to students with average and low success levels, there were views that the content of the mathematics lesson was excessive, they felt

sad while in the lesson, and that mathematics was a lesson that one should teach. This situation can be explained by negative correlation between surface learning approach and students' mathematics achievement. Because the literature shows that low-success students who prefer surface learning approach in mathematics do not make sufficient and conscious effort to understand the mathematics course, prefer to memorize information, and generally consider that the minimum grade required to pass the course is sufficient (Kaya, 2020).

The findings of our study about mathematics self-efficacy indicated that students with high success level, unlike students at other success levels, stated that they were disciplined and they had metacognitive skills. Also, being able to focus on the course and having numerical ability were the codes which students with both high and average success levels stated. In addition, while almost half of the students at high and average success level thought that they were hardworking and intelligent, this rate was less than half for the students at low success level. Almost half of the students with high success level stated that they are good listeners. One of the striking findings of the study is that the majority of the students with all three success levels stated that they believed they could be successful in the course. This study also showed that students at high success level had more views on the theme of mathematics lesson self-efficacy compared with students at average and low success levels. This situation was consistent with the views in the literature that students' perception of self-efficacy positively affected mathematics success (Pietsch et al., 2003; Pitsia et al., 2017; Schunk, 1989; Suárez-Álvarez et al., 2014; Üredi and Üredi, 2005; Zhang and Wang, 2020) and students' perceptions of mathematics self-efficacy showed a significant difference in favor of students with high mathematics grades (Kurtuluş and Öztürk, 2017). Kurbanoğlu and Takunyacı (2012) determined that high school students' self-efficacy perceptions differed according to the type of school, and that academically successful Anatolian High School students had higher self-efficacy perceptions compared with other high school students.

Besides, the findings on teaching-learning processes of mathematics lesson, pointed that students at high success level stated the quality of the teacher as the factor that both facilitated and made learning mathematics difficult. They also stated that the use of reinforcer, individualized teaching, project assignment facilitated learning while difficult formulas, emphasizing same content a lot and lack of previous information made learning difficult. The only students at average success level mentioned about explaining importance of the subject as a factor that facilitate learning and students' inability to focus on lesson as a factor that made learning difficult. Besides, the students at low success level stated student participation and teacher's caring behavior towards students as the factors that faciliate learning and poor physical conditions of the classroom, mathematics' being abstract, writing a lot in the lesson as the factors that makes learning difficult. When each one of the sub-themes about "teaching-learning process" were analyzed in terms of highest frequent code, the opinions of students converged on that teaching lesson in enjoyable ways facilitated learning whereas noise in the classroom made learning difficult in the teaching-learning processes. At this point, teachers' quality such as classroom management skills (Yenilmez and Duman, 2008) related with how teachers designed teaching-learning process effectively to attract students' interest, plays an important role at mathematics learning. In this context, the research of García et al. (2016) showed that student's enjoying mathematics affected mathematics success positively. In addition, the results of Memnun and Akkaya (2010)'s research revealed that teaching the mathematics in an entertaining way with games made learning easier. According to these results, to increase the mathematics success of students, it would be beneficial to design teaching-learning process (Çiftçi,2015) that students will not find mathematics as a difficult and boring lesson but they will find it enjoyable and they have a positive attitude towards the lesson.

CONCLUSION

Our study reflected the perspectives of students at different success levels regarding mathematics. At this point, it was aimed to provide educators with a comprehensive perspective on mathematics classes. According to the results of our study, to facilitate the learning of mathematics, and not to teach lesson in boring and monotonous way by the help of designing enjoyable

activies, improving physical conditions of the classroom, changing the negative perception that mathematics consists of difficult subjects by teaching the content from simple to difficult, and providing in-service training to teachers for facilitating mathematics learning

This research enabled to understand which factors affected students'mathematics learning from their perspective. Future researches can analyze students' views on factors that affect their mathematics success longitudinally according to their class grades. By determining whether students' views on mathematics have changed at different levels of success from junior through to senior classes, early actions in the teaching-learning processes to increase the mathematics success can be done startingly from junior years.

REFERENCES

Arseven, A. (2016). Öz yeterlilik: Bir kavram analizi. *Electronic Turkish Studies*, 11(19), 63-80. http://dx.doi.org/10.7827/TurkishStudies.10001

Bandura, A. (1997). *Self efficacy: The exercise of control*. W.H. Freeman and Company.

Baykul, Y. (2020). *Ortaokulda matematik* öğretimi *(5-8. Sınıflar)*. Pegem Akademi

Bloom, B. (2016). *Human caharacteristics and school learning* (D. A. Öztürk, Trans.). Pegem Yayıncılık.

Bol, L., & Berry, R. (2005). Secondary mathematics teachers' perceptions of the achievement gap. *The High School Journal*, 88(4), 32-45. https://www.jstor.org/stable/40364254

Brett, A. & Smith, M., Price, E. & Huitt, W. (2012). Overview of the Affective Domain. file:///C:/Users/User/Downloads/Affective_Domain_1_Overview_of_the_Affective_Domai%20(1).pdf

Burrus, J. & Moore, R. (2016). The incremental validity of beliefs and attitudes for predicting mathematics achievement. *Learning and Individual Differences*, 50, 246-251. https:// doi.org/10.1016/j.lindif.2016.08.019

Çelik, N. G., & Şengül, S. (2005). Tam öğrenme yönteminin ilköğretim 6. sınıf matematik öğrencilerinin akademik başarıları ile kalıcılık düzeylerine etkisi [The Effect of mastery learning method on the achievement and retention level of 6th grade primary school students in the mathematics class]. *Journal of Uludağ University Faculty of Education,* 18(1),107-122.

Çiftci, S. K. (2015). Effects of secondary school students' perceptions of mathematics education quality on mathematics anxiety and achievement. *Educational Sciences: Theory and Practice*, 15(6), 1487-1501. doi: 10.12738/estp.2015.6.2829

Department for Education (2020). National curriculum in England: Mathematics programmes of study. https://www.gov.uk/government/publications/national-curriculum-in-england-mathematics-programmes-of-study/national-curriculum-in-england-mathematics-programmes-of-study

Dursun, Ş., & Dede, Y. (2004). Öğrencilerin matematikte başarısını etkileyen faktörler matematik öğretmenlerinin görüşleri bakımından. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, *24*(2).

Ertürk, Z., & Akan, O. E. (2018). TIMSS 2015 matematik başarısını etkileyen değişkenlerin yapısal eşitlik modeli ile incelenmesi. *Ulusal Eğitim Akademisi Dergisi*, 2(2), 14-34.

García, T., Rodríguez, C., Betts, L., Areces, D. & González-Castro, P. (2016). How affective-motivational variables and approaches to learning predict mathematics achievement in upper elementary levels. *Learning and Individual Differences*. 49, 25-31. https:// doi.org/ 10.1016/j.lindif.2016.05.021

Gunaseelan, B. and Dr. Pazhanivelu, G. (2016). Identifying factors affecting the mathematics achievement through review analysis. *International Journal of Development Research*. 6 (7), 8804-8809.

Gün, Z., & Çavuş Erdem, Z. (2014). Uyum analizi yöntemiyle matematik başarısını etkileyen faktörlerin incelenmesi. *Adıyaman* Üniversitesi *Eğitim Bilimleri Dergisi*, 4(2)

Gupta, S., Harris, D. E., Carrier, N. M., & Caron, P. (2006). Predictors of student success in entry-level undergraduate mathematics courses. *College Student Journal*, 40(1).

Hackett, G. (1985). Role of mathematics self-efficacy in the choice of math-related majors of college women and men: A path analysis. *Journal of Counseling Psychology*, 32, 47-56. https:// doi.org/ 10.1037/0022-0167.32.1.47

Hackett, G., & Betz, N. (1989). An exploration of the mathematics self-efficacy/mathematics performance correspondence. *Journal for Research in Mathematics Education*, 20(3), 261-273. doi:10.2307/749515

Kaya, D. (2020). Altıncı sınıf öğrencilerinin matematik öğrenme yaklaşımları ve algıladıkları öğretmen yapıcı duygusal desteği ile matematik başarıları arasındaki İlişki. *IBAD Sosyal Bilimler Dergisi*, (7), 358-371.

Kenç, S. (2019). *Metaphorical perceptions of middle school 8th grade students towards mathematics*

course and mathematics teacher [Master of Science Thesis]. Fırat University.

Kurbanoğlu, N. İ. ve Takunyacı, M. (2012). Lise öğrencilerinin matematik dersine yönelik kaygı, tutum ve öz-yeterlik inançlarının cinsiyet, okul türü ve sınıf düzeyi açısından incelenmesi [An investigation of the attitudes, anxieties and self-efficacy beliefs towards mathematics lessons high school students' in terms of gender, types of school, and students' grades]. *International Journal of Human Sciences*, 9(1), 110-130. https://www.j-humansciences.com/

Kurtuluş, A., & Öztürk, B. (2017). Ortaokul öğrencilerinin üstbilişsel farkındalık düzeyi ile matematik öz yeterlik algısının matematik başarısına etkisi. *Dicle* Üniversitesi *Ziya Gökalp Eğitim Fakültesi Dergisi*, (31), 762-778.

Lamb, S. ve Thomson, S. (2002). Classroom and school factors affecting mathematics achievement: A comparative study of the us and australia using TIMSS. *Australian Journal of Education*, 46(2).

Marshall, C. and Rossman, G.B. (2006). *Designing Qualitative Research*. Sage

McKnight, C. C., Crosswhite, F. J., Dossey, J. A. , Kifer, E., Swafford, J. 0., Travers, K. J. & Cooney, T. J. (1987). *The underachieving curriculum: Assessing US school mathematics from an international perspective.* Stipes Publishing Co.

Memnun, D. ve Akkaya, R. (2010). İlköğretim yedinci sınıf öğrencilerinin matematik dersi hakkındaki düşünceleri [Primary school seventh grade students' opinions about the mathematics course]. *Journal of Theoretical Educational Science*, 100-117. https://dergipark.org.tr/tr/pub/akukeg/issue/29341/313982

Miles, M. B. ve Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage Publications.

Ministry of Education (2005). *The Ontario curriculum grades 1-8 mathematics*. http://www.edu.gov.on.ca/eng/curriculum/elementary/math18curr.pdf

Mokhtar, S. F., Md Yusof, Z. and Misiran, M. (2012). Factors affecting students' performance in mathematics. *Journal of Applied Sciences Research*, 8 (8),4133-4137.

NCTM (2020). Principles, standards, and expectations. https://www.nctm.org/Standards-and-Positions/Principles-and Standards/Principles,-Standards,-and-Expectations/

Orbeyi, S., & Güven, B. (2008). Yeni ilköğretim matematik dersi öğretim programı'nın değerlendirme öğesine ilişkin öğretmen görüşleri [Teachers' perceptions related to the evaluation component of the education program of primary school education mathematıcs studies]. *Journal of Theory and Practice in Education, 4*(1), 133-147. https://dergipark.org.tr/tr/pub/eku/issue/5447/73883

Ölçüoğlu, R., & Çetin, S. (2016). TIMSS 2011 Sekizinci Sınıf Öğrencilerinin Matematik Başarısını Etkileyen Değişkenlerin Bölgelere Göre İncelenmesi. *Journal of Measurement and Evaluation in Education and Psychology*, 7(1), 202-220. https://doi.org/10.21031/epod.34424

Patton,M.Q.(1987). How to Use Qualitative Methods in Evaluation. Sage

Pietsch, J., Walker, R., & Chapman, E. (2003). The relationship among self-concept, self-efficacy, and performance in mathematics during secondary school. *Journal of Educational Psychology*, 95(3), 589–603. https:// doi.org/10.1037/0022-0663.95.3.589

Pitsia, V., Biggart, A. & Karakolidis, A. (2017). The role of students' self-beliefs, motivation and attitudes in predicting mathematics achievement: A multilevel analysis of the Programme for International Student Assessment data. *Learning and Individual Differences*, 55, 163-173. https:// doi.org/10.1016/j.lindif.2017.03.014

Pyzdrowski, L. J., Sun, Y., Curtis, R., Miller D., Winn, G. and Hensel, R. A. M. (2013). Readiness and attitudes as indicators for success in college calculus. *International Journal of Science and Mathematics Education*, 11, 529–554. https:// doi.org/10.1007/s10763-012-9352-1

Radišić, J., Videnović, M., & Baucal, A. (2018). Distinguishing successful students in mathematics-a comparison across European countries.

Psihologija, 51(1), 69-89. https:// doi.org/ 10.2298/ PSI170522019R

Reid,N. &Amanat, A. (2020). *Beliefs and Attitudes: Why Do Attitudes Matter?*. In *Making Sense of Learning* (pp.253-279). https:// doi.org/10.1007/978-3-030-53677-0_11

Republic of Turkey Ministry of National Education (2016). TIMSS 2015 Ulusal Matematik ve Fen Bilimleri Ön Raporu: 4. ve 8. Siniflar. http://timss.meb.gov.tr/wp-content/uploads/ TIMSS_2015_Ulusal_Rapor.pdf.

Republic of Turkey Ministry of National Education (2019). PISA 2018 Türkiye ön raporu. http://pisa.meb.gov.tr/wpcontent/uploads/2020/01/PISA_2018_Turkiye_On_Raporu.pdf.

Savaş, E., Taş, S., & Duru, A. (2010). Matematikte öğrenci başarısını etkileyen faktörler. İnönü Üniversitesi *Eğitim Fakültesi Dergisi*, 11(1), 113-132.

Saritas, T., & Akdemir, O. (2009). Identifying factors affecting the mathematics achievement of students for better instructional design. *International Journal of Instructional Technology and Distance Learning*, 6(12), 21-36. https://www.itdl.org/Journal/Dec_09/article03.htm

Schiefele, U., & Csikszentmihalyi, M. (1995). Motivation and ability as factors in mathematics experience and achievement. *Journal for Research in Mathematics Education*, 26(2), 163-181. https:// doi.org/10.5951/jresematheduc.26.2.0163

Schunk, D.H. (1989). Self-efficacy and achievement behaviors. *Educ Psychol Rev,* 1, 173–208. https://link.springer.com/article/10.1007/BF01320134

Senemoğlu, N. (2013). *Gelişim* öğrenme *ve* öğretim *kuramdan uygulamaya*. Yargı

Singh, K., Granville, M. & Dika, S. (2002).Mathematics and science achievement: Effects of motivation, interest, and academic engagement. *The Journal of Educational Research*,, 95 (6) (2002), pp. 323-333. https:// doi.org/ 10.1080/00220670209596607

Suárez-Álvarez, J., Fernández-Alonso, R., & Muñiz, J. (2014). Self-concept, motivation, expectations, and socioeconomic level as predictors of academic performance in mathematics. *Learning and Individual Differences*, 30, 118-123.

Thelen, S. L. (2008). *The relationship between mathematics homework and learning in middle-school students: Impact on achievement* [Master Thesis]. https://eric.ed.gov/?id=ED502096

TIMMS and PIRLS International Study Center (2020a). Singapore. http://timssandpirls.bc.edu/timss2015/encyclopedia/countries/singapore/the-mathematics-curriculum-in-primary-and-lower-secondary-grades/#:~:text=The%20Singapore%20mathematics%20curriculum%20comprises,must%20be%20learned%20in%20sequence.

TIMMS and PIRLS International Study Center (2020b). Finland. http://timssandpirls.bc.edu/Timss2015/encyclopedia/countries/finland/the-mathematics-curriculum-in-primary-and-lower-secondary-grades/

Uçar, T. Z., Pişkin, M., Akkaş, N. E., Taşçı, D. (2010). İlköğretim öğrencilerinin matematik, matematik öğretmenleri ve matematikçiler hakkındaki inançları [Elementary students' beliefs about mathematics, mathematics' teachers and mathematicians]. *Education and Science*, 35(155), 131-144.

Umay, A. (1996). Matematik eğitimi ve ölçülmesi. *Hacettepe University Journal of Education*, 12, 145-149.

Üredi, I. & Üredi, L. (2005). İlköğretim 8. sınıf öğrencilerinin öz-düzenleme stratejileri ve motivasyonel inançlarının matematik başarısını yordama gücü [The predictive power of self-regulation strategies and motivational beliefs on mathematics achievement of primary school 8th grade students]. *Mersin University Journal of The Faculty of Education*, 1, 250-260. https://dergipark.org.tr/tr/pub/mersinefd/issue/17391/181765

White, A., Way, J., Perry, B., & Southwell, B. (2006). Mathematical attitudes, beliefs and achievement in pre-service mathematics teacher education. *Mathematics teacher education and development*, 7(2006), 33-52.

Willis, J. (2010). Learning to love math: Teaching strategies that change student attitudes and get results. *ASCD*.

Yenilmez, K., & Duman, A. (2008). İlköğretimde matematik başarısını etkileyen faktörlere ilişkin öğrenci görüşleri [Students' Opinions About The Factors Which Affect The Mathematics Success in Elementary Education]. *MANAS Journal of Social Studies,*19. https://dergipark.org.tr/tr/pub/manassosyal/issue/49945/640052

Yetim Karaca, S., ve Ada, S. (2018). Öğrencilerin matematik dersine ve matematik öğretmenine yönelik algılarının metaforlar yardımıyla belirlenmesi [Determining students' perceptions regarding the mathematics course and mathematics teachers through metaphors]. *Kastamonu Education Journal*, 26(3), 789-800.

Yıldırım, A., & Şimşek, H. (2018). *Sosyal Bilimlerde Nitel Araştırma Yöntemleri.* Seçkin.

Zhang, D. & Wang, C. (2020). The relationship between mathematics interest and mathematics achievement: mediating roles of self-efficacy and mathematics anxiety. *International Journal of Educational Research*, 104. https:// doi.org/10.1016/j.ijer.2020.101648

CONTRIBUTION OF AUTHORS

In this research, 1st author's contribution rate is 51% and 2nd author's contribution rate is 49%