

THE RELATIONSHIP BETWEEN THE LEARNING STYLES OF 7th GRADES STUDENTS AND THEIR ATTITUDES AND ANXIETIES TOWARDS MATHEMATICS

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Abstract

This study investigates the correlation between 7th grade students' learning styles and their attitudes and anxiety toward mathematics. The research surveyed 7th-grade students from a state middle school in the Mezitli district, Mersin province, during the second semester of the 2022-2023 academic year. The sample consisted of 100 students from a middle school. The Kolb Learning Styles Inventory, Mathematics Anxiety Scale, and Mathematics Attitude Scale were utilised to identify students' learning styles, math anxiety levels, and attitudes towards mathematics. The data was analysed using the SPSS program. The study sample was determined through the use of frequencies and percentages. The Chi-square independence test was applied to find the relationship between the variables of the research. It was revealed that 45% of 7th-grade students exhibited a "Divergent" learning style, while 24% were "Assimilative," 17% were "Convergent," and 14% were "Accommodator." The study noticed no significant correlation between the learning style of 7th-grade students, their attitudes towards mathematics, and their anxiety. It observed moderate attitudes towards mathematics and mathematics anxiety levels among the students participating.

Keywords: learning styles, mathematics anxiety, mathematics attitude

INTRODUCTION

After the 1980s, the importance began to be given to individual differences in the field of education throughout the world. On the other hand, many researchers were and are still interested in learning and teaching mathematics (Ersoy & Güner, 2014; Altun, 2006) as well as studying students' behavior during the learning process (İncebacak & Ersoy, 2016). Additionally, many studies have been conducted examining the reasons why students are not successful in their academic education (Başarır, 1990; Bostancı, 2020; Reçber, 2011; Şentürk, 2010). The results of one of these studies have shown that mathematics can cause anxiety and stress in certain individuals. Also, studies have shown that students' negative attitudes towards mathematics are a significant factor contributing to their failure in that subject. David Kolb's 1984 learning styles theory posits that learning occurs due to the interaction between an individual's innate characteristics and their environment. Kolb says that individuals acquire knowledge through life experiences, with the ultimate goal of interacting with society. Kolb developed theory and an inventory of learning styles that are distinct from each other. Kolb's learning styles are influenced by Dewey, Lewin, and Piaget's models (Turan, 2009). This model's learning styles are explained as follows (Gencel, 2006).

Converging: Converging is a process that focuses on logical analysis of ideas, systematic problem-solving, decision-making, and planning.

Diverging: Divergers are people who use their emotions, imagination, sense, and feelings in learning situations. They like group work and give their own opinions in every learning situation.

Assimilating: Assimilators maintain the theory of information processing at the forefront. Creating conceptual models is its most important feature. It focuses on learning through abstract concepts and ideas.

Accommodating: Accommodator learners are those who prefer learning through experiencing things by themselves and using their emotions and their understanding to solve learning issues and problems.

Learning styles, mathematics anxiety, and attitudes toward mathematics are important concepts in mathematics teaching. Learning styles theory has been widely discussed in many educational fields to know and understand the individual differences in learning styles. In this context, a lot of research has been done on individual differences in learning styles (Aydın, 2016; Banaga, 2018; Coşkun & Demirtaş, 2015; Gündüz & Çelik, 2016; Çetinkaya, 2017; Erol, 2013; Koca, 2010; Özgen et al., 2014; Peki, 2003; Tufan, 2016). On the other hand, some studies have revealed that mathematics anxiety, which manifests itself as feelings of tension, fear, and nervousness in some students, is related to their learning styles. It has been shown that the level of mathematics anxiety varies based on the student's learning style (Ahmadi & Ahmadi, 2012; Cook, 1997; Çetinkaya, 2017; Esa & Mohamed, 2017; Gresham, 2007; Koca, 2011; Shirvani & Guerra, 2015; Solan et al., 2002; Tumminello, 1994). Some studies indicate that students' learning styles do not significantly impact their mathematics anxiety (Berber, 2021; Demirtaş & Coşkun, 2014). Additionally, some studies have shown that students' attitudes toward mathematics are related to their learning styles (Aydın, 2016; Koca, 2012; Özgen et al., 2017; Tufan, 2016). In contrast, some studies have shown that students' learning styles do not affect their attitudes toward mathematics (Anuar et al., 2020; Çelik & Gündüz, 2016; Elçi, 2008; Özgen & Alkan, 2014; Rojas, 2020; Sirmaci, 2010). Furthermore, students who know their own learning style can display a positive attitude towards mathematics in their academic performance. But these studies on the impact of learning styles on students' attitudes and anxiety towards mathematics are limited and insufficient, particularly among middle school students.

The 7th grade is an important stage of physical, social, and mental development, characterized by significant changes in students' thinking, reasoning, and learning styles. During this stage, students' abstract thinking skills have been developed which is crucial for their academic and social evolution as well as their formation of identity. Referring to the literature provided, most studies focus on other learning styles rather than the relationship between students' anxiety and attitudes towards mathematics, neglecting Kolb's learning styles. Since the experiential learning theory is a theory with a comprehensive perspective that combines experience, perception, knowledge, and behavior, this study comes to search for the existence or absence of a relationship between Kolb's learning methods and the attitudes of seventh-grade students towards mathematics. This study supports previous research with similar results and serves as a reference for future research on this topic. In addition, this problem presented in this research arises from the importance and necessity of such research in the field of mathematics teaching due to the intense presence of mathematics in daily life. The present study offers valuable insights for mathematics teachers regarding students' learning styles, mathematics anxiety levels, and attitudes towards mathematics. Through this study, teachers can create early interventions to reduce students' anxiety and negative attitudes towards mathematics by determining their learning styles, mathematics anxiety levels, and their attitude towards mathematics at the beginning of the academic year. Additionally, it aims to help individuals with mathematics anxiety overcome their difficulties by analyzing their preferred learning styles and focusing on them to enhance their understanding of the subject. Also, the current study will be supportive of other studies on this topic and will help future researchers in examining this topic. According to the present study goals, the problems of the research are as follows:

1. What are the learning styles of 7th grade students?
2. What is the level of mathematics anxiety of 7th grade students?
3. What are the attitudes of 7th grade students towards mathematics?

4. Is there a statistically significant relationship between the learning styles of 7th grade students and their mathematics anxiety?

5. Is there a statistically significant relationship between 7th grade students' learning styles and their attitudes towards mathematics?

METHOD

Research Design

In the study, the correlational survey design is used to examine the relationship between the learning styles of 7th grade students and their attitudes and concerns towards mathematics. A correlational survey model is used to determine the change or degree between two or more variables (Bekman, 2022).

Population and Sample

The research is conducted in a middle school in Mezitli district, Mersin, in Turkey, on 100 students of the 7th grade. They were chosen randomly to guarantee the accuracy and reality of the results of the present study, like in all quantitative research. The research's value lies in its ability to generalize results by involving a large sample of the community being studied (Özen & Gül, 2007). The study employed random sampling, a method that guarantees an equal and independent selection of each member of the population (Özen & Gül, 2007). Table 1 provides a gender-specific description of the sample.

Table 1. Distribution of the sample by gender

Gender	<i>n</i>	%
Female	57	23.3
Male	43	23.8

Measurements

Kolb's Learning Styles Inventory

The Learning Styles Inventory (LSI-III) in this research was used, which was developed by Kolb in 1999 and adapted to Turkish by Gencel (2006). This version of the Kolb scale was chosen because it is the most current and widely used. The Turkish adaptation of this inventory was found to be valid for students aged 13–14 (Gencel, 2006). The inventory consists of 12 items, each item containing four options indicating the learning mode of abstract conceptualization (AC), concrete experience (CA), active experience (AC), and reflective observation (RO). The options were rated from the most appropriate to the least appropriate for the student, with scores of 4, 3, 2, and 1, respectively. The student's lowest score on this scale is 12, while the highest score is 48. The points given to students who answered the inventory are combined and added together. The student's learning style in Kolb's model is reached by subtracting the degree of concrete experience from the degree of abstract conceptualization on the vertical axis and subtracting the degree of reflective observation from the degree of active experimentation on the horizontal axis.

The Mathematics Attitude Scale

In the study, the Mathematics Attitude Scale developed by Aşkar (1986) was used to measure the attitudes of 7th grade secondary school students towards mathematics. The scale is a 5-point Likert type with 20 items, consisting of 10 positive and 10 negative items. The scale has positive items (1, 4, 5, 8, 11, 13, 14, 17, 18), and negative items (2, 3, 6, 7, 9, 10, 12, 15, 16), respectively. The responses given for each item in the attitude scale used in the study ranged from "completely appropriate," "appropriate," "I am undecided," "not appropriate," and "not appropriate at all." The scale's reliability coefficients were determined to be .96. This study found a Cronbach alpha internal consistency coefficient of .929 for the scale. The process of scoring positive and negative items was followed as follows:

Table 2. Scoring of positive items of the five-point likert mathematics attitude scale

Completely appropriate	Appropriate	Undecided	Not Appropriate	Not appropriate at all
5	4	3	2	1

Table 3. Scoring of negative items of the five-point likert mathematics attitude scale

Completely appropriate	Appropriate	Undecided	Not Appropriate	Not appropriate at all
1	2	3	4	5

The Mathematics Anxiety Scale

The Mathematics Anxiety Scale, developed by Bindak (2005), was utilized to assess the levels of mathematics anxiety among 7th grade secondary school students. The scale comprises 10 items, 9 positive and 1 negative, using a 5-point Likert type. Students can select from five options for each item on the scale: always, most of the time, sometimes, hardly ever, and never. The scale has a maximum score of 5, and the lowest score is 1. Accordingly, students who respond to the scale with higher scores are the ones who have higher levels of mathematics anxiety, and the opposite is true. The scale's reliability coefficients were determined to be .85. In this study, the Cronbach alpha internal consistency coefficient of the scale was found to be .90.

Data Analysis

The researcher utilized the SPSS 20.0 package program to analyze the quantitative data. In this study, frequencies and percentages were used to describe the research sample, while for descriptive statistics, the arithmetic mean, standard deviation, evaluation, and graphs were used. The chi-square test for independence was also applied to find the relationship between the study variables.

RESULTS

Results of the First Problem

In this study, the percentage and frequencies are calculated to answer the first problem of this research which is identifying the learning styles of the participants who are 7th grade students. The following Table 4 show descriptive statistics related to the first problem of the research.

Table 4. Frequencies and percentages for learning styles of primary school 7th gradee students

Learning Styles	f	%
Diverging	45	45
Assimilating	24	24
Converging	17	17
Accommodating	14	14
Total	100	100

In Table 4, it is reviewed that the learning styles of 45% of the students are diverging, 24% are assimilating, 17% are converging, and 14% are accommodating. In other words, the study found that most students applying Kolb's learning styles scale had a "diverging" learning style, while the lowest percentage had an "accommodating" learning style.

Results of the Second Problem

The second problem is about "the levels of mathematics anxiety of 7th grade students." To answer this problem, the arithmetic means, standard deviation, and evaluation of each item of the scale were used to determine the mathematics anxiety levels of the students. Then, the general arithmetic means of the scale used in the study was calculated. Table 5 shows descriptive statistics related to the second problem of the research.

Table 5. Descriptive statistics of the items of the mathematics anxiety scale

Learning Styles	Mean	Std.Dev.	Evaluation
1. When it is said mathematics, incomprehensible and complex things come to my mind.	3.31	1.26	Sometimes
2. I find it difficult to get up to the board in math classes.	3.08	1.42	Sometimes
3. I always worry that I will be asked questions in math classes.	2.75	1.41	Sometimes
4. I understand math now, but I'm worried that it will become increasingly difficult.	3.26	1.31	Sometimes
5. I am not afraid of anything else as much as I am afraid of math exams.	2.71	1.53	Sometimes
6. I'm afraid I won't pass my class because of math.	2.51	1.61	Hardly ever
7. When I enter a math class, I feel like I'm shrinking with fear.	2.34	1.64	Hardly ever
8. I don't know how to study for math exams	2.72	1.57	Sometimes
9. Mathematics is very fun for me	3.13	1.55	Sometimes
10. I am afraid to ask questions in math class	2.38	1.41	Hardly ever
General arithmetic mean	2.81		Sometimes

It is understood from Table 5 that the arithmetic means of the seventh-grade students' mathematics anxiety scale for the presented research sample vary between 2.34 and 3.31. In this study, the total arithmetic means of the seventh-grade students' mathematics anxiety scale "Sometimes" level was obtained as 2.81. The first item on the scale reached "sometimes" with a high arithmetic mean of 3.31 and a standard deviation of 1.26. The seventh item on the scale reached "sometimes" with the lowest arithmetic mean of 2.34 and a standard deviation of 1.64.

Table 6. Descriptive statistics on the mathematics anxiety level of 7th grade students

Depended Variable	n	Min	Max	Mean	Std.Dev.
Mathematics Anxiety	205	100	173	100	128

The Table 6 shows that the highest math anxiety score for seventh grade students is 46.00 out of 50.00, while the lowest math anxiety score is 14.00 out of 50.00. Also, it is seen that seventh-grade students have a medium level of math anxiety, with an arithmetic mean of 27.93.

Results of the Third Problem

The third problem is "What are the attitudes of 7th grade middle school students towards mathematics?" To answer this question, the arithmetic mean, standard deviation, and evaluation of each paragraph of the scale were used to determine the attitudes of seventh grade students towards mathematics. Then, the general arithmetic means of the scale used in the study was calculated. Table 7 and Table 8 show the descriptive statistics related to the third problem of the research.

Table 7. Descriptive statistics of positive items of the attitude scale towards mathematics

Items of the Scale	Mean	Std.Dev.	Evaluation
1. Math is my favorite subject	2.97	1.32	I am undecided
4. I enjoy discussing math with my friends	2.88	1.52	I am undecided
5. I wish there were more hours allocated to mathematics	2.45	1.51	Not appropriate
8. I like math	2.93	1.50	I am undecided
11. Mathematics is interesting to me	2.80	1.54	I am undecided
13. If I studied mathematics for years. I would not get bored	2.30	1.45	Not appropriate
14. I study mathematics with more love than other subjects	2.34	1.31	Not appropriate
17. Mathematics class is a fun class	2.97	1.49	I am undecided
18. I feel joy in math class	2.58	1.36	Not appropriate
20. I want to devote most of my study time to mathematics	2.41	1.48	Not appropriate
General arithmetic mean	2.66		I am undecided

When looking at Table 7 above, it was noticed that the arithmetic means of the positive items of the mathematics attitude scale of the 7th grade middle school students varied between 2.30 and 2.97. The first and seventeenth items on the scale, "Mathematics is my favorite subject," and "Mathematics class is a fun class," have the highest score on the arithmetic mean of 2.97 and standard deviation of 1.32 and 1.49, respectively. The thirteenth item on the scale, "If I studied mathematics for years, I would not get bored," had the lowest arithmetic mean of 2.30 and a standard deviation of 1.45. The study revealed that seventh grade students have a positive attitude towards mathematics, with a total arithmetic mean of 2.66 from the "Undecided" level.

Table 8. Descriptive statistics of negative items of the attitude scale towards mathematics

Items of the Scale	Mean	Std.Dev.	Evaluation
2. I feel great distress when I enter a math class.	3.26	1.40	I am undecided
3. A Student's life would be more enjoyable if there were no math classes	2.45	1.39	Appropriate
6. I get bored while studying math	2.45	1.43	Appropriate
7. A math classe is a chore for me.	3.00	1.42	I am undecided
9. A math class time never passes	2.40	1.44	Appropriate
10. I am afraid of the math exam.	3.15	1.49	I am undecided
12. Mathematics is the subject I fear the most among all subjects.	3.03	1.68	I am undecided
15. A math class makes me restless	2.89	1.45	I am undecided
16. Mathematics scares me.	3.36	1.48	I am undecided
19. Math is the most annoying subject of all.	2.94	1.64	I am undecided
General arithmetic mean	2.89		I am undecided

When looking at Table 8 above, it was noticed that the arithmetic means of the negative items of the mathematics attitude scale of the 7th grade middle school students varied between 2.40 and 3.36. The sixteenth item on the scale, "Mathematics scares me," had the highest score on the arithmetic mean of 3.36 and standard deviation of 1.48 with the level of "I'm undecided". The ninth item on the scale, "a math class time never passes," had the lowest arithmetic mean of 2.40 and a standard deviation of 1.44 with the level of "Appropriate." The study revealed that seventh grade students have a negative attitude towards mathematics, with a total arithmetic mean of 2.89 from the "I am undecided" level.

Results of the Fourth Problem

The fourth problem is "Is there a statistically significant relationship between the learning styles of 7th grade students and their mathematics anxiety?"

The Chi-square test of independence was used to answer this question and determine whether there is a relationship between the learning styles of 7th grade students and their mathematics anxiety. The tables below provide the results of the Chi-square independence test for the fourth problem of the research.

Table 9. Results of the Chi-Square test of independence

Chi-Square Value	Chi-Square Critical Value	Degrees of Freedom	Chi-Square Probability Value
17.239	21.026	12	.141

The statistical analysis in Table 9 reveals that learning styles and mathematics anxiety are independent, with a Chi-square value " $X^2 = 17.239$ " smaller than the critical value " $X^2 = 21.026$ " and a significance level above .05 with 12 degrees of freedom. In other words, this result means that there was no relationship between the learning styles of 7th -grade students and their mathematics anxiety.

Table 10. Chi-Square test anxiety levels according to learning styles

Learning Styles		Anxiety Levels				
		Not anxious at all	A little anxious	Middle level anxious	Highly anxious	Very highly anxious
Accommodating	<i>n</i>	2	7	2	2	1
	%	14.3%	22.6%	7.7%	10.0%	11.1%
Diverging	<i>n</i>	5	11	11	13	5
	%	35.7%	35.5%	42.3%	65.0%	55.6%
Converging	<i>n</i>	6	4	4	1	2
	%	42.9%	12.9%	15.4%	5.0%	22.2%
Assimilating	<i>n</i>	1	9	9	4	1
	%	7.1%	29.0%	34.6%	20.0%	11.1%
Total	<i>n</i>	14	31	26	20	9
	%	100.0%	100.0%	100.0%	100.0%	100.0%

It is noted from Table 10 that students with a “diverging” learning style have different levels of anxiety towards mathematics. In other words, the students who are most anxious about mathematics are those with a diverging learning style, while students with an accommodating learning style have the lowest level of mathematics anxiety compared to other students with other learning styles.

Results of the Fifth Problem

The fifth problem is “Is there a statistically significant relationship between 7th grade students' learning styles and their attitudes toward mathematics?” The Chi-square test of independence was used to answer this question and determine whether there is a relationship between the learning styles of 7th grade students and their attitudes toward mathematics. The tables provide the results of the Chi-square independence test for the fifth problem of the research.

Table 11. Results of the Chi-Square test of independence

Chi-Square Value	Chi-Square Critical Value	Degrees of Freedom	Chi-Square Probability Value
10.779	21.026	12	.548

The statistical in Table 11 analysis reveals that learning styles and attitude towards mathematics are independent, with a Chi-square value " $X^2 = 10,779$ " smaller than the critical value " $X^2 = 21,026$ " and a significance level above .05 with 12 degrees of freedom. In other words, this result means that there was no relationship between the learning styles of 7th grade students and their attitudes towards mathematics.

Table 12. Attitude levels according to learning styles in Chi-Square test

Learning Styles		Attitude levels				
		Bad Attitude	Little Bad Attitude	Medium Level Attitude	Good Level Attitude	Highly Level Attitude
Accommodating	<i>n</i>	2	3	6	1	2
	%	10.0%	15.0%	16.7%	6.3%	25.0%
Diverging	<i>n</i>	11	11	16	4	3
	%	55.0%	55.0%	44.4%	25.0%	37.5%
Converging	<i>n</i>	2	2	5	6	2
	%	10.0%	10.0%	13.9%	37.5%	25.0%
Assimilating	<i>n</i>	5	4	9	5	1
	%	25.0%	20.0%	25.0%	31.3%	12.5%
Total	<i>n</i>	20	20	36	16	8
	%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 12 reveals that students with a "diverging" learning style exhibit varying attitudes towards mathematics, while those with a "convergent" learning style exhibit a positive attitude towards mathematics.

DISCUSSION, CONCLUSION, and RECOMMENDATIONS

The results of the first problem, after applying the third version of Kolb's learning style inventory, adapted to Turkish by Gencel (2006), to 7th grade students, showed that the most common learning

style of the students was the "Diverging" style, and the reason why this style is more common between those students is that middle school students may tend to use sensory experiences and reflective thinking. In this research, the rates of the students' learning style came as follows: 45% of the students had the "diverging" learning style. 24% of them were with the "assimilating" learning style, and 17% were converging learning style students. The least common was the "accommodating" learning style, with only 14%. In the study conducted by Koca (2010) about the learning styles of 8th grade primary school students and their mathematics anxiety and attitude toward mathematics and mathematics achievement. It was observed that they had the learning style of "diverging," "assimilating," "according," and "accommodating," respectively. These results are parallel to the results of the current study. The literature (Coşkun & Demirtaş, 2015; Çelik & Gündüz, 2016; Erol, 2013; Özgen & Alkan, 2014) indicates that there are parallel results to the results of the current study, indicating that students are the most common "diverging" learning style according to Kolb. The majority of these studies have been applied to middle school students. On the other hand, some studies (Aydın, 2016; Çelik & Gündüz, 2016; Altun, 2016; Tufan, 2016) show that students generally adopt the most common assimilating learning style. Çetinkaya (2017) determined in her study that high school students have the most common learning styles of "accommodating," "assimilating," "diverging" and "converging" respectively. Banaga (2018) showed in her study that 7th grade students have the most common learning styles of "Converging", "Accommodating", "Diverging" and "Assimilating", respectively. From these results, some studies show that there are differences in students' learning style preferences according to Kolb's classification, while others show that students prefer the most dominant "Diverging" learning style. This disparity may stem from various factors such as class and school level, socio-economic status, cultural differences, and other factors. The research lacks a comprehensive study on the factors influencing students' learning styles, including age, grade level, social status, parents' learning level, cultural differences, school type, and course preference.

The study found that 7th grade students' mathematics anxiety levels were moderate after applying the Bindak (2005) scale. The arithmetic means of each item of the anxiety scale related to the study were statistically examined and according to the answers of the students participating in the study, it was revealed that the general arithmetic mean of the anxiety scale was 2.81. This means that students sometimes suffer from math anxiety. Comparing the presented results with previous literature, it is shown that most studies conducted on students showed that students have medium or low levels of mathematics anxiety (Ağdacı, 2021; Banaga, 2018; Esa & Mohamed, 2017; Koca, 2012; Ruchi, 2019) or low levels (Banaga, 2018; Karaşahin, 2020; Ohipeni Ablode, 2020). Most studies conducted in the literature indicate that students have moderate levels of math anxiety and these results support the existing research result that the seventh-grade students participating in the research have a moderate level of math anxiety. The literature indicates that seventh grade students exhibit moderate levels of math anxiety, which aligns with existing research findings. Most studies conducted on the mathematics anxiety subject indicate that students have moderate levels of mathematics anxiety and these results support this present research results that the seventh-grade students participating in the research have a moderate level of math anxiety.

After applying the Aşkar scale (1986) to seventh grade students, the results of the third problem revealed that the students' attitude towards mathematics was average. The arithmetic means of each item of the Aşkar scale related to the study were statistically examined, and according to the answers of the students participating in the study, it was revealed that the general arithmetic mean of the mathematics attitude scale was 2.66. According to these results, it can be said that students' attitudes towards mathematics are at a moderate level for both positive and negative items. In other words, the attitudes of the students participating in the research towards mathematics are at the "undecided" level according to the scale. Considering the positive items of the mathematics attitude scale, the items with the highest arithmetic means are the first "Math is my favorite subject" and seventeenth "Mathematics class is a fun class" items of the mathematics attitude scale, with an arithmetic mean of 2.97. According to these results, 7th grade students frequently exhibit a lack of enthusiasm and enjoyment for their mathematics lessons. Among the negative items of the attitude scale towards mathematics,

the item 16, "Mathematics scares me," has the highest arithmetic means, with an arithmetic mean of 3.36. Considering this result, it can be stated that one of the main factors of students' negative attitudes towards mathematics is the fear of mathematics. In some previous studies similar to this result (Demirgören, 2010; Yaşar, 2016), it is stated that students' attitudes towards mathematics were at a moderate level. The results obtained support the results of other studies. Some studies, on the other hand, revealed different results and found that students' attitudes towards mathematics were high and good (Katrancı & Şengül, 2019; Yücel & Mustafa, 2011). Other studies have not only determined the attitude levels of students towards mathematics but also have assessed students' attitudes towards mathematics and their attitudes towards the subject based on various variables. Previous literature shows that students' attitudes towards mathematics vary based on gender (Gill, 1994; Göç, 2010; Katrancı & Şengül, 2019; Norman, 1977; Reçber, 2011), education level of parents (Akın, 2002; Göç, 2010), and grade level (Akın, 2002; Demirgören, 2010; Göç, 2010; Katrancı & Şengül, 2019) being significant factors in these studies.

Using the Chi-square independence analysis, the fourth problem revealed no relationship between the 7th grade students' learning styles and mathematics anxiety. That is, students may or may not experience math anxiety when they prefer any learning style. There are studies in the literature similar to this result (Berber, 2021; Demirtaş & Coşkun, 2014). Several studies (Ahmadi & Ahmadi, 2012; Cook, 1997; Çetinkaya, 2017; Esa & Mohamed, 2017; Gresham, 2007; Koca, 2011; Shirvani & Guerra, 2015; Solan, vd., 2002; Tumminello, 1994) have found a relationship between learning styles and mathematics anxiety, or significant differences in anxiety based on students' learning styles, contrary to the findings of this study. Previous literature has shown a contradiction regarding the relationship between learning styles and mathematics anxiety.

Through Chi-square analysis, the fifth problem revealed no relationship between the 7th grade students' learning styles and their attitudes toward mathematics. In other words, students' learning styles do not significantly impact their attitudes towards mathematics. Other studies have showed similar results (Anuar et al., 2020; Çelik & Gündüz, 2016; Elçi, 2008; Özgen & Alkan, 2014; Rojas, 2020; Sirmaci, 2010). In some studies (Aydın, 2016; Koca, 2012; Özgen et al., 2017; Tufan, 2016), on the contrary, it was found that students' learning styles and attitudes towards mathematics were affected. Previous studies show variations in results, with some indicating a correlation between learning styles and students' attitudes towards mathematics, while others do not. Considering the different results in the literature on whether there is a relationship between students' Kolb learning styles and their attitudes towards mathematics, more studies are needed on this subject as the research on this subject is insufficient.

One of the aims of this study is to determine the level of mathematics anxiety of 7th grade students, but since it is not known what causes students' mathematics anxiety, it is recommended that researchers conduct scientific research by investigating the reasons underlying students' mathematics anxiety in the Republic of Turkey and other countries in a single study, compare the reasons, and improve the quality of education by benefiting from the results.

The researcher suggests that teachers should understand the nature of differences among students, provide excellent care for them, and work hard to relieve their stress from mathematics. It is also recommended that teachers prepare their lessons beforehand so that teachers' anxiety does not negatively affect their students.

The researcher also suggests examining the reasons behind differences in learning styles to identify solutions that enhance the education levels of both students and teachers in the educational setting. It is recommended that mathematics teachers raise their awareness of dealing with students who are negative towards mathematics or at an average level, and investigate why they do not like mathematics, and understand students' attitudes towards mathematics by reading this research or other studies on mathematics attitudes. Parents are also advised to observe their children's behaviors in any lesson, change their negative behaviors, not neglect their weak points in lessons, and learn the level of their children by constantly communicating with their teachers. Considering the lack of literature investigating the existence of the relationship between learning styles and mathematics anxiety in

Turkey, the researcher recommends to do more studies on this subject with larger samples and in different schools, considering factors like age, parental education level, gender, and educational differences between countries so that the results can be generalized as much as possible.

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Ethics and Conflict of Interest

All ethical rules were observed at each stage of the research. The authors declare that he acted in accordance with ethical rules in all processes of the research. The authors declare that they do not have any conflict of interest with other persons, institutions or organizations.

Data Availability

The data that support the findings of this study are available on request from the author.

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