International Journal of Human Research and Social Science Studies

ISSN(p): 3050-547X, ISSN(e): 3050-5488

Volume 03 Issue 08 August, 2026

DOI: https://doi.org/10.55677/ijhrsss/01-2026-Vol03I08

Page No : 697-708

An Investigation of Students' Attitudes Toward the Mathematics Course

Cevdet Epçaçan[1], Seher Baydemir[2]

[1]Siirt University, Faculty of Education, Siirt, Türkiye, ORCID: 0000-00018926-3226

[2]Teacher, Ministry of National Education, Diyarbakır Provincial Directorate of National Education, Diyarbakır, Türkiye, ORCID: 0000-0002-0606-3905

ABSTRACT: This study aims to determine fourth-grade primary school students' attitudes toward the mathematics course and to examine whether these attitudes differ according to gender, achievement level, and self-perceived adequacy in mathematics. The study was designed using the relational survey model, one of the quantitative research approaches. The sample consisted of 401 fourth-grade students attending primary schools in the center and districts of Diyarbakır, selected through convenience and criterion sampling. Data were collected using the Attitude Toward Mathematics Scale developed by Önal (2013), and analyzed through independent samples t-tests and one-way ANOVA. Findings revealed that students generally held a positive attitude toward mathematics, although mild anxiety was observed regarding exams and board performance. No significant difference was found in attitude scores according to gender. However, students who reported higher achievement levels and who perceived themselves as adequate in mathematics displayed significantly more positive attitudes, with large effect sizes for both variables. These results suggest that achievement perception and self-efficacy, rather than gender, are the primary determinants of students' attitudes toward mathematics. Recommendations are offered for reducing mathematics anxiety, strengthening self-efficacy, and designing inclusive, achievement-oriented instructional practices.

Corresponding Author:
Cevdet Epçaçan

Published Online:
August 05, 2026

KEYWORDS:
mathematics attitude, primary school students, academic achievement, self-efficacy, gender

Cite the Article: *Epçaçan, C., Baydemir, S. (2026). An Investigation of Students' Attitudes Toward the Mathematics Course. International Journal of Human Research and Social Science Studies,3(8),697-708. https://doi.org/10.55677/ijhrsss/01-2026-Vol03I08*

INTRODUCTION

The primary school period is a critical developmental stage in which children's desire to explore their environment and their curiosity for learning are at their peak. During this process, the teaching and learning activities carried out in the school environment aim to help students develop both their academic skills and the attitudes and behaviors necessary for adapting to social life. However, because the attention spans of children in this age group have not yet fully matured, it is quite difficult for them to sustain their focus in traditional classroom environments in which the teacher is at the center and the student sits passively for long periods (Çaycı, 2018). Ensuring that children participate actively in the learning process at the physical, affective, and cognitive levels facilitates their ability to concentrate on the lesson and to maintain focus for extended periods (Kula, 2018). Active learning environments in which the student is placed at the center play a determining role in academic achievement and attitude.

Attitude is defined as an individual's tendency to display a positive or negative reaction toward a particular object, event, situation, or person. In the literature, it is possible to encounter various definitions that emphasize different aspects of the concept of attitude. For example, Smith (1968) described attitude as an internal tendency that shapes an individual's thoughts, feelings, and behaviors toward a psychological phenomenon in a particular pattern (as cited in Kağıtçıbaşı, 1996). Similarly, Tavşancıl (2005) elaborated on attitude as a positive or negative tendency that an individual learns in response to stimuli in the environment, that shows consistency over time, and that guides behavior. From this perspective, it can be argued that attitude is not merely an instantaneous reaction but a persistent affective variable that directly influences an individual's learning processes.

Mathematics is one of the disciplines in which the quality of attitude and the learning environment is most clearly reflected during the educational process. Many students develop prejudice toward the mathematics course even before learning takes place

and experience failure due to a fear of making mistakes (Songur, 2006). Numerous factors play a role in students developing such prejudices and experiencing difficulty in the mathematics course. Foremost among these factors are socio-cultural influences, deficiencies in study habits, the density of the curriculum, insufficient tools and materials, time constraints, the persistence of traditional teaching methods, and excessive emphasis on the abstract/formal aspects of mathematics (Tıraş, 2024).

In particular, the density of abstract concepts in the mathematics course does not always correspond to the mental schemas of primary school students, and this situation gives rise to various learning difficulties. These difficulties reduce students' academic motivation, leading them to adopt a negative attitude toward the course (Balaban & Kesicioğlu, 2024). In addition, the frequent revision of curricula, teachers' lack of knowledge regarding the updated curriculum, and disruptions in the instructional process are additional factors that trigger failure. Furthermore, the content-related inadequacy of primary school mathematics textbooks (Işık et al., 2008) and the absence of sufficient supplementary resources and concrete instructional materials in classrooms also diminish students' interest in the course and negatively affect academic achievement (Baş, 2019).

These problems experienced in mathematics teaching are, to a large extent, also related to the traditional teaching approaches applied. In traditional mathematics education, the teacher presents knowledge as ready-made packages to be memorized, while students are expected to repeat this knowledge rather than make sense of it and construct it for themselves. In this structure, in which individual differences are disregarded, the focus is on questions with a single correct answer rather than on discovery-based learning. The process by which students arrive at knowledge, or the strategies they use, is pushed into the background; only the student who provides the fastest and most accurate answer is considered successful, resulting in an outcome-oriented evaluation (Filiz, 2023).

Another important factor underlying mathematical failure is language skills, particularly reading comprehension proficiency. Students who have not sufficiently developed their reading comprehension skills in the Turkish language course make mistakes at the problem-solving stage because they cannot correctly interpret mathematical problems and instructions (Tural, 2005). In addition, exam-oriented assessments within the education system also negatively affect students' perspectives on mathematics. Centralized examinations administered for the purpose of transitioning to a higher level of education encourage a rote-learning approach rather than equipping students with mathematical and analytical thinking skills. This situation leads students, particularly those who learn at a slower pace, to experience a sense of failure, develop a negative attitude toward the mathematics course, and lose motivation, thereby becoming disengaged from the course (Işık et al., 2018).

Attitude toward the mathematics course, which begins to take shape from the very first years of schooling, encompasses the totality of the cognitive, affective, and behavioral tendencies that students develop toward the discipline of mathematics, the course teacher, and mathematical activities. In the literature, attitude is accepted as consisting of three basic components:

Cognitive Component: Beliefs, thoughts, and mental acceptances regarding mathematics.

Affective Component: Feelings such as love, anxiety, fear, or displeasure toward mathematics.

Behavioral Component: Observable actions such as participating in mathematics-related activities, exerting effort, or avoiding them.

These three components are in a continuous and dynamic interaction with one another. For example, a cognitive belief that mathematics is very difficult may, over time, turn into an affective reaction such as high anxiety, and this anxiety may in turn translate into behavioral outcomes such as avoiding the course and not completing assignments.

Considering the role of affective characteristics in the teaching-learning process, mathematics appears to be one of the courses most affected by this situation (Suinn & Edwards, 1982). Students' belief in their mathematical abilities and their development of positive feelings toward the course increase their academic achievement (Yücel & Koç, 2011). Conversely, negative feelings and a high level of anxiety toward mathematics cause a decline in achievement (Aiken, 1970; Çoban, 1989; Minato & Yanase, 1984). Accordingly, attitude stands out as a direct predictor of academic achievement. Yücel and Koç (2011), in a study conducted with primary school students, found that attitude toward mathematics significantly explained achievement. İlhan and Öner Sünkür (2012) likewise emphasized that mathematics anxiety is a critical affective variable that limits achievement. While students with a positive attitude display greater effort and persistence in the face of difficulties, students with a negative attitude tend to avoid the course. Therefore, attitude is not merely a product of the teaching process but also a fundamental process variable that either fosters or hinders cognitive achievement.

Numerous environmental and individual factors play a role in shaping students' attitudes toward the mathematics course. Foremost among these factors are teacher attitude and the quality of classroom interaction. Fisher and Rickards (1998) noted a strong relationship between teachers' interpersonal behaviors and the attitudes students develop toward mathematics, stating that a supportive, empathetic, and understanding teacher attitude reinforces the development of a positive attitude. Baykul (1990), demonstrating that attitude is not a fixed construct, revealed that students' attitudes toward mathematics and science courses shift from positive to negative over the course of schooling from primary school through the final year of secondary education, and that this negative shift becomes particularly pronounced during the middle school years. This finding demonstrates that attitude is a dynamic process shaped throughout students' educational experiences.

Another variable considered to influence attitude is gender; however, the findings in the literature do not present full consensus on this issue. While some studies find no significant difference between male and female students in terms of attitude and anxiety, other studies report gender-related differences. This situation indicates that gender alone is not an explanatory variable and that it should be examined in interaction with other environmental factors such as family attitude, socioeconomic status, teacher expectations, and school climate. In particular, the value the family places on mathematics and the educational support provided in the home environment form the basis of the attitude the child will develop at an early age (Yenilmez & Özabacı, 2003).

In this process, which takes shape from the very first years of schooling, it is known that the academic self-efficacy perceptions of students with a negative attitude also decline (Peker & Mirasyedioğlu, 2003). However, a negative attitude and low self-efficacy perception are not immutable; at this point, the quality of the mathematics education provided is of vital importance. Teachers' involvement of students in the process through contemporary methods and techniques, concrete materials, and active learning approaches can reduce anxiety and transform the course into a motivating experience (Tural, 2005).

Every child in the learning environment differs in terms of interests, needs, learning pace, motivation level, and mode of social interaction. In light of these individual differences, determining in depth the attitudes of primary school students toward the mathematics course and the characteristics that shape these attitudes is a critical requirement for designing effective teaching environments. Accordingly, the problem addressed by the present study is the determination of primary school students' attitude characteristics toward the mathematics course and the processes associated with these attitudes.

Purpose of the Study

The main purpose of this study is to determine the level of fourth-grade primary school students' attitudes toward the mathematics course. In line with this purpose, answers were sought to the following sub-problems:

1. What is the overall level of fourth-grade primary school students' views regarding their attitudes toward the mathematics course?
2. Is there a significant difference between fourth-grade primary school students' views regarding their attitudes toward the mathematics course in terms of the gender variable?
3. Is there a significant difference between fourth-grade primary school students' views regarding their attitudes toward the mathematics course in terms of the achievement variable in the mathematics course?
4. Is there a significant difference between fourth-grade primary school students' views regarding their attitudes toward the mathematics course in terms of the variable of perceiving oneself as adequate/inadequate in the mathematics course?

METHOD

This section presents the research model, the population and sample, the measurement tools used for data collection, the data collection process, and the analysis of the data.

2.1. Research Model

Since attitude toward mathematics was examined in this study in terms of various variables, the survey model, one of the quantitative research designs, was employed. Survey research is a process applied to describe an existing situation as it is and to bring about the desired behaviors in individuals. The relational survey model, in turn, is an approach that determines the covariation among variables (Bahtiyar & Can, 2016).

2.2. Population and Sample

The population of the study consists of fourth-grade primary school students in the province of Diyarbakır and its districts. Convenience sampling was used to determine the sample of the study. Students were selected through convenience sampling due to factors such as the central location of the schools included in the sample and ease of access. Views were obtained from 500 fourth-grade primary school students attending different primary schools in the center and districts of Diyarbakır. Since classrooms in which game-based instruction was used were preferred during sample selection, students were also selected through criterion sampling. After 99 irrelevant and incompletely completed forms were eliminated, the remaining 401 forms were used in the study.

Table 1. Frequency and Percentage Values of the Students Participating in the Study

Gender	Frequency	Percent
Female	198	49.4
Male	203	50.6
Total	401	100

When Table 1 is examined, it is seen that the sample group consists of a total of 401 students. Of the students participating in the study, 49.4% are female and 50.6% are male, indicating that the number of male and female students is close to one another.

2.3. Data Collection Tool

In this study, the 'Attitude Toward Mathematics Scale' developed by Önal (2013) was used as the data collection tool. Information regarding this scale used in the study is presented below under separate headings.

The Mathematics Attitude Scale was developed by Önal (2013). This scale consists of a total of 22 items and comprises four factors. The first factor was named interest, the second anxiety, the third study/work, and the fourth necessity. The scale was constructed as a 5-point Likert-type scale. The scale items were scored as 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree. The Cronbach's alpha coefficient for the overall scale was found to be .93. Since items 2, 6, 11, 12, 13, 14, 15, 18, 20, 21, and 22 of this scale are reverse-coded, the arithmetic means were calculated accordingly and reverse-scored in the table titled 'Students' Views Regarding Their Attitudes Toward the Mathematics Course' presented in the findings section. In addition, the level of agreement corresponding to the arithmetic mean values was evaluated as follows:

1-1.80: strongly disagree
1.81-2.60: disagree
2.61-3.40: undecided
3.41-4.20: agree
4.21-5: strongly agree

Table 2. Reliability Analysis of the Mathematics Attitude Scale

	Cronbach's Alpha Reliability Coefficient	Number of Items
Overall Scale	.93	22

When Table 2 is examined, the Cronbach's alpha reliability coefficient of the 22 items comprising the overall scale is found to be .93, indicating that internal consistency is high.

2.4. Data Collection Process

In order to collect the data for the study, the necessary permissions were obtained from the Diyarbakır Provincial Directorate of National Education, and primary schools in the center and districts of Diyarbakır were visited. Scale forms were distributed to the students and the necessary information was provided. Students completed the scales within approximately one class hour. The forms were collected on the same day after completion. The scales used in the study were administered in November and December of the 2023-2024 academic year.

2.5. Data Analysis

The data obtained in the study were analyzed using a computer-based statistical software package. Skewness and kurtosis values were examined to determine whether the scales used in the study showed a normal distribution in terms of the students' gender, achievement, and self-perceived adequacy variables.

Table 3. Normality Test Results

	Skewness	Kurtosis
Mathematics Attitude Scale	-.76	-.07

In the normality test, skewness and kurtosis values between -2 and +2 indicate a normal distribution (Adnan & Gezgin, 2016). When Table 3 is examined, it is seen that each scale shows a normal distribution, as the skewness and kurtosis values fall between -2 and +2. Furthermore, parametric tests are used when the number of data points is ≥ 30 (Karagöz, 2021). Since the number of participants in the groups in the study exceeded 30, it was concluded that parametric tests could be used. Within this framework, among the parametric tests, the independent samples t-test was applied to analyze the data between two independent groups, and the ANOVA test was applied to analyze the data among more than two groups, for the questions addressed in the study.

FINDINGS

In this section of the study, the findings obtained in line with the purposes of the research are presented, and the necessary interpretations are provided.

3.1. Findings Regarding the First Sub-Problem of the Study

This section presents the statistics obtained to answer the first sub-problem of the study, namely, "What is the overall level of fourth-grade primary school students' views regarding their attitudes toward the mathematics course?"

Table 4. Students' Views Regarding Their Attitudes Toward the Mathematics Course

Items	$\bar{X}$	SD	Level of Agreement
1. Mathematics is an easy course.	3.65	1.34	Agree
2. I get bored while studying mathematics.	2.24	1.44	Disagree
3. Mathematics is among the courses I like very much.	3.86	1.33	Agree
4. I feel comfortable in mathematics lessons.	3.67	1.29	Agree
5. I enjoy solving mathematics problems.	3.75	1.30	Agree
6. I do not like the mathematics course.	2.09	1.38	Disagree
7. The mathematics course helps people develop creative ways of thinking.	3.99	1.20	Agree
8. Solving mathematics problems increases my self-confidence.	3.91	1.23	Agree
9. Using mathematical concepts in other courses makes me happy.	3.80	1.21	Agree
10. I enjoy solving mathematics puzzles.	3.96	1.16	Agree
11. Mathematics exams are an important source of stress for me.	2.76	1.54	Undecided
12. Solving problems on the board in the mathematics course makes me anxious.	2.63	1.48	Undecided
13. I am afraid of mathematics exams.	2.39	1.45	Disagree
14. I think my friends are more successful than me in mathematics.	3.22	1.48	Undecided
15. I think I will not be able to understand mathematics.	2.52	1.52	Disagree
16. At the end of the day on which I have a mathematics lesson, I regularly review the topics covered.	3.73	1.40	Agree
17. I listen to my teacher attentively during the mathematics course.	4.02	1.23	Agree
18. I do not mind getting a low grade on mathematics exams.	2.08	1.40	Disagree
19. I review the topics before mathematics exams.	3.92	1.33	Agree
20. Mathematics lessons are boring.	1.97	1.34	Disagree
21. If I were not obliged to, I would not want to learn mathematics.	2.00	1.39	Disagree
22. I do not use mathematics in any area of my social life.	1.92	1.33	Disagree
Overall Scale Mean	3.07	0.37	Undecided

Since the scale items contain both positive and negative statements, the evaluation in the analysis was conducted by taking into account the dimensions of affective orientation (positive/negative attitude), course/exam anxiety, and learning behaviors.

When the findings in Table 4 are examined, it is seen that the mean score obtained by primary school students on the overall scale is ($\bar{X}$ = 3.07, Sd = 0.37). Although this overall mean corresponds to the "undecided" level, analyzing the positive and negative items separately reveals that students display a fairly positive attitude toward mathematics and strong academic behaviors.

The rate of agreement is quite high on items 1, 3, 4, 5, 7, 8, 9, 10, 16, 17, and 19, which measure students' perception of and affection for mathematics. On all of these items, students expressed their views at the level of "agree," which is an indicator of their positive attitude toward mathematics. This finding suggests that students are aware of the contribution mathematics makes to their mental development.

On items 2, 6, 11, 12, 13, 14, 15, 20, 21, and 22, which carry negative meaning, the arithmetic means remained at low levels (mostly at the "disagree" level). This finding suggests that students reject negative feelings/thoughts toward the mathematics course.

Students' "disagree"-level responses to the statements M6 (I do not like the mathematics course), M18 (I do not mind getting a low grade), M20 (Mathematics lessons are boring), M21 (I would not want to learn mathematics if I were not obliged to), and M22 (I do not use mathematics in any area of my social life) may lead to the conclusion that students like mathematics, embrace its relationship with daily life, and value achievement in the course. The "agree"-level responses given to the items M16 (I regularly review the topics covered at the end of the day), M17 (I listen to my teacher attentively during the mathematics course), and M19 (I review the subject matter before exams) lead to the conclusion that students' study behaviors both during and after the course are quite high and that they make an active effort toward achievement in the course. The items M11 (Exams are an important source of stress) and M12 (Solving problems on the board makes me anxious) indicate that, despite the generally positive attitude, a moderate degree of hesitation or anxiety is experienced during "evaluation" moments such as exams and being called to the board.

3.2. Findings Regarding the Second Sub-Problem of the Study

This section presents the statistics obtained to answer the second sub-problem of the study, namely, "Is there a significant difference between fourth-grade primary school students' views regarding their attitudes toward the mathematics course in terms of the gender variable?"

Table 5. Findings Regarding Attitudes Toward the Mathematics Course in Terms of the Gender Variable

Groups	N	$\bar{X}$	SD	t	df	p
Female	198	3.82	.85	1.19	399	.23
Male	203	3.71	.89			

According to the results of the analysis, the mean attitude score toward the mathematics course of female students ($\bar{X}$ = 3.82; Sd = .85) was found to be higher than that of male students ($\bar{X}$ = 3.71; Sd = .89). However, the independent samples t-test revealed that this difference was not statistically significant (t = 1.19, p = .23). This finding indicates that fourth-grade primary school students' attitudes toward the mathematics course do not differ significantly according to gender. Therefore, it can be argued that the gender variable does not have a determining effect on attitude toward the mathematics course.

3.3. Findings Regarding the Third Sub-Problem of the Study

This section presents the statistics obtained to answer the third sub-problem of the study, namely, "Is there a significant difference between fourth-grade primary school students' views regarding their attitudes toward the mathematics course in terms of the achievement variable in the mathematics course?"

Table 6. Descriptive Statistics Findings on Attitudes Toward the Mathematics Course According to the In-Class Achievement Level Variable in Mathematics

Groups	N	$\bar{X}$	SD
High	172	4.32	0.53
Medium	169	3.70	0.58
Low	60	2.34	0.63
Total	401	3.76	0.87

The findings obtained show that there is a significant relationship between students' achievement levels in the mathematics course and their attitudes toward the course. When Table 6 is examined, it is seen that the mean attitude score toward the mathematics course of students who rated their achievement level as high ($\bar{X}$ = 4.32) was the highest. In contrast, the mean attitude score of students who rated their achievement level as medium was lower ($\bar{X}$ = 3.70), and that of students who rated their achievement level as low was considerably lower ($\bar{X}$ = 2.34). This indicates that as students' perceptions of achievement in the mathematics course

increase, their positive attitudes toward the course also increase. ANOVA was employed to determine whether there was a significant difference among the groups.

Table 7. Findings Regarding Attitudes Toward the Mathematics Course in Terms of the Achievement Variable in the Mathematics Course

Source of Variance	Sum of Squares	df	Mean Square	p*	η²	Source of Difference	p
Between Groups	176.24	2	88.12				
Within Groups	130.08	398	0.32	0.00	0.57	High-Low	0.00
Total	306.32	400					

When Table 7 is examined, a significant difference is found among the groups' views regarding their attitudes toward the mathematics course ($p < .05$). Post-hoc LSD tests were conducted to determine between which groups this difference occurred. The results of the analysis revealed a significant difference ($p < .05$) in favor of students who perceived their in-class achievement level in mathematics as high, compared to those who perceived it as low. In addition, the effect size ($\eta^2 = 0.57$) indicates that mathematics achievement has a very large effect on attitude toward the mathematics course (Cohen, 1988). This finding supports the conclusion that achievement level is one of the important variables determining students' attitudes toward mathematics.

3.4. Findings Regarding the Fourth Sub-Problem of the Study

This section presents the statistics obtained to answer the fourth sub-problem of the study, namely, "Is there a significant difference between fourth-grade primary school students' views regarding their attitudes toward the mathematics course in terms of the variable of perceiving oneself as adequate/inadequate in the mathematics course?"

Table 8. Findings on the Differences in Views Regarding Attitudes Toward the Mathematics Course According to Feeling Adequate/Inadequate in the Mathematics Course

	N	$\bar{X}$	SD	t	df	p	η²
Adequate	310	4.09	.60	19.07	399	.00	0.47
Inadequate	91	2.65	.71				

When Table 8 is examined, a significant difference is found in favor of the attitude scores toward the mathematics course of those who feel adequate in the mathematics course ($p < .001 < .05$). Accordingly, it can be argued that the views of students who feel adequate in the mathematics course regarding their attitudes toward the course are more positive. Moreover, the calculated effect size ($\eta^2 = 0.47$) indicates a large effect according to Cohen's (1988) classification. This result shows that students' feeling adequate or inadequate in the mathematics course has a fairly strong effect on their attitudes toward the course.

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

4.1. CONCLUSION AND DISCUSSION

In this section of the study, the conclusions reached on the basis of the information obtained from the findings are presented, along with discussions related to relevant studies in the literature and recommendations.

4.1.1. Conclusion and Discussion Regarding the First Sub-Problem of the Study

When the findings regarding the first sub-problem are examined, it is seen that students generally hold a positive attitude toward the mathematics course. This indicates that the mathematics course is well liked by students at the primary school level. When the quantitative findings obtained are evaluated as a whole, it is seen that primary school students generally display a high level of interest and a positive affective attitude toward the mathematics course. Students behave quite willingly in listening to their teachers, reviewing regularly, and solving puzzles/problems. On the other hand, it can be concluded that situations such as the exam process and performing at the board should not be underestimated as an independent evaluation dimension, and that the mild-to-moderate anxiety that arises in these moments should be managed with constructive methods in the teaching process (e.g., a supportive classroom climate, process-oriented assessments).

One reason students develop a positive attitude toward the mathematics course, as found in various studies, may be that they have not yet experienced exam anxiety at the first level of primary education and therefore have not developed a negative

attitude. When the study by Taşdemir (2009) on students' attitudes toward the mathematics course is examined, it is seen that attitude scores toward the mathematics course decrease as students' grade level increases. Tıraş (1999), in his study, found that teacher attitudes, the methods and techniques used in the course, textbooks, and the concrete treatment of topics had a considerable effect on attitude (as cited in Taşdemir, 2009). Based on this, it can also be considered that students' attitudes toward mathematics vary depending on factors such as how teachers conduct the course and the content of textbooks.

4.1.2. Conclusion and Discussion Regarding the Second Sub-Problem of the Study

When the findings regarding attitude toward the mathematics course in terms of the gender variable are examined, it is seen that the views of female and male students regarding attitude are similar and that there is no notable difference between them. This indicates that students' affective characteristics regarding the mathematics course do not differ by gender.

The finding obtained as a result of the study is consistent with various studies revealing that attitude toward the mathematics course does not differ significantly according to the gender variable. For example, Ma and Kishor (1997), in their meta-analytic study, reported that there is a relationship between attitude toward mathematics and achievement, but that gender is not a determining variable in mathematics attitude. Similarly, Hyde, Fennema, and Lamon (1990), in their meta-analysis of mathematics performance and attitudes, stated that no significant differences were found between genders. In a study examining research conducted in different countries, Else-Quest, Hyde, and Linn (2010) likewise concluded that gender differences related to mathematics are quite small and that these differences may be influenced by cultural factors. Cvencek, Brečić, Gaćeša, and Meltzoff (2021), in a study conducted with primary school students, reported that there was no significant difference between the explicit mathematics attitudes of female and male students, and that students' self-perceptions were more determinant in explaining mathematics achievement.

Similar results have also been found in studies conducted in Turkey. Studies conducted by Akgül (2008) and Yenilmez and Duman (2008) determined that students' attitudes toward mathematics did not differ significantly according to the gender variable. Similarly, in the study conducted by Avcı, Coşkuntuncel, and İnandı (2011) on students' attitudes toward the mathematics course, no significant difference was found according to the gender variable either. In the study conducted by Işık and Çağdaşer (2009) on students' attitudes toward the mathematics course, no significant difference was found between attitude toward mathematics and the gender variable. Likewise, in the study conducted by Yücel and Koç (2011) examining attitude toward the mathematics course in terms of achievement and gender, it was similarly found that the gender variable did not create a difference in attitude toward the mathematics course. This situation shows that, rather than gender, students' learning experiences, teacher attitudes, family support, and academic experiences may be more influential in the formation of positive or negative attitudes toward the mathematics course.

In contrast to these studies, Duru and Savaş (2005), in their study examining gender differences in mathematics teaching, reported that attitude toward mathematics differed by gender. Kurdal and Kaplan (2023) stated that middle school students' mathematics attitudes generally did not differ by gender, with only a limited difference in favor of female students found in the problem-solving sub-dimension.

In conclusion, when the findings of the present study are evaluated together with current studies in the literature, it can be argued that primary school students' attitudes toward the mathematics course are influenced more by variables such as students' learning experiences, teacher support, family attitudes, and mathematics self-efficacy perceptions than by the gender variable.

4.1.3. Conclusion and Discussion Regarding the Third Sub-Problem of the Study

When the findings regarding the third sub-problem are examined, it is seen that students who perceive their in-class achievement level in mathematics as high also have high attitudes toward the mathematics course. In other words, it can be considered that those who are successful in the mathematics course have a high attitude toward the course, whereas those who are unsuccessful have a low attitude toward the course.

This finding indicates that there is a strong, reciprocal relationship between mathematics achievement and attitude toward mathematics. Students who are successful in the mathematics course show greater interest in the course, participate more willingly in mathematics activities, and develop more positive academic self-perceptions. In contrast, the emergence of anxiety, a perception of inadequacy, and course-avoidance behaviors among students who consider themselves unsuccessful in mathematics may lead to the development of a negative attitude toward the mathematics course.

The result obtained from the study is consistent with many studies conducted in recent years. For example, in a study conducted with primary school students by Özdemir and Yıldız (2021), a positive and significant relationship was found between mathematics achievement and mathematics attitude. Similarly, Awofala (2022) stated that an increase in students' mathematics achievement levels also increases their positive attitudes toward the mathematics course. The PISA 2022 results published by the OECD likewise reveal that there are strong relationships among enjoyment of mathematics, mathematics self-efficacy, and mathematics achievement (OECD, 2023).

Studies conducted over the past five years show that students' mathematics achievement is closely related not only to cognitive factors but also to affective characteristics. For example, Cai and Hwang (2020) stated that mathematics achievement is significantly related to students' mathematics self-efficacy, interest in the course, and attitudes. In addition, Zhang and colleagues

(2023) revealed that positive attitudes toward mathematics significantly predict students' problem-solving skills and academic achievement.

Similar results have also been obtained in recent studies conducted in Turkey. Demir and Akça (2022) determined that as primary school students' mathematics achievement levels increase, their positive attitudes toward the mathematics course also increase. Similarly, Karakuş and Yılmaz (2024) stated that students' mathematics self-efficacy perceptions and achievement levels are important predictors of mathematics attitudes. In the study conducted by Peker and Mirasyedioğlu (2003) examining the relationship between mathematics attitude and academic achievement, a significant difference was likewise found between mathematics attitude and mathematics achievement. In the study conducted by İlhan, Gemcioğlu, and Poçan (2021) examining the relationship between mathematics attitude and mathematics achievement, a significant difference was also found between mathematics attitude and mathematics achievement.

4.1.4. Conclusion and Discussion Regarding the Fourth Sub-Problem of the Study

When the findings regarding attitude toward the mathematics course in terms of the variable of perceiving oneself as adequate/inadequate in the mathematics course are examined, it can be said that those who perceive themselves as adequate in the mathematics course also have a more positive attitude toward the course. Based on this result, it is possible to say that attitude affects student achievement or self-efficacy. When students perceive themselves as adequate with respect to the course, their anxiety will decrease to a minimum level, they will like the course more, participate more, and thus develop a positive attitude toward the course.

This finding shows that students' attitudes toward the mathematics course are closely related to their perceptions of adequacy in the field of mathematics. It can be said that students who feel adequate in the mathematics course develop a more positive attitude toward the course, participate more willingly in mathematics activities, and have higher motivation in the mathematics learning process. In contrast, students who feel inadequate are thought to develop mathematics anxiety, a fear of failure, and course-avoidance behaviors.

This finding of the study is consistent with the results of many studies in the literature. The PISA 2022 results published by the OECD (2023) also show that there is a strong relationship between students' mathematics self-efficacy and their level of enjoyment of mathematics. The report states that students who are self-confident and believe they can succeed in mathematics develop more positive attitudes toward the mathematics course. Studies examining the relationship between mathematics self-efficacy and mathematics attitude have found that as self-efficacy perception increases, students' positive attitudes toward the mathematics course also increase (Pajares & Miller, 1994; Ma & Kishor, 1997). Similarly, Namkung, Peng, and Lin (2022), in their study examining the relationships among mathematics anxiety, self-efficacy, and mathematics achievement, stated that students' adequacy perceptions significantly affect their mathematics attitudes.

Similar results have also been reached in current studies conducted in Turkey. For example, Yıldız and Arslan (2023) determined that primary school students' mathematics self-efficacy perceptions significantly predict their attitudes toward the mathematics course. Similarly, Demir and Aydın (2024) revealed that students' feeling adequate in mathematics increases their interest, motivation, and positive attitudes toward the mathematics course. Özcan and Kültür (2021), in a study conducted with primary school students, determined that mathematics self-efficacy perception is an important predictor of attitude toward mathematics. In the study conducted by Taşdemir (2009) examining students' attitudes toward the mathematics course, a similar finding was obtained, namely, that those who are adequate in terms of achievement in the mathematics course have more positive attitudes. In the study conducted by Peker and Mirasyedioğlu (2003) examining the relationship between students' attitudes toward the mathematics course and their achievement, a similar finding was obtained, namely, that those who are adequate in terms of academic achievement in the mathematics course have positive attitudes toward the course. In the study conducted by İlhan, Gemcioğlu, and Poçan (2021), it was likewise concluded that those with adequate academic achievement in the mathematics course have more positive attitudes toward the course.

4.2. Recommendations

In line with the results obtained in the study, various recommendations have been developed for both practitioners and researchers.

Recommendations for Practitioners

Emphasis should be placed on practices aimed at reducing students' anxiety levels in the mathematics course. The research results show that, although students generally hold a positive attitude toward the mathematics course, they experience anxiety related to exams and achievement status. For this reason, it is recommended that teachers adopt process-oriented assessment, game-based activities, the creation of a classroom climate in which making mistakes is regarded as a natural part of learning, and the use of alternative measurement and assessment methods. These practices may help reduce students' mathematics anxiety and contribute to the maintenance of their positive attitudes toward the course.

In line with the research findings, it was determined that fourth-grade primary school students' attitudes toward the mathematics course did not differ significantly according to the gender variable. Therefore, in developing positive attitudes toward the mathematics course, it is recommended that emphasis be placed on inclusive teaching activities for all students, learning

environments that increase student motivation, and teaching processes that take individual differences into account, rather than on gender-based practices.

Successful students hold a positive attitude toward the course, while unsuccessful students hold a negative attitude. This may lead students to develop prejudices regarding the course. To prevent this, students' prejudicial thinking toward the course can be prevented by explaining the positive aspects of the course and giving examples of its use in daily life when the course is introduced. In addition, students can be informed that achievement alone does not determine attitude.

Activities that strengthen students' self-efficacy perceptions should be included in mathematics teaching. The study determined that students who consider themselves adequate in mathematics have a more positive attitude toward the course. For this reason, it is recommended that teachers organize graduated activities that allow students to experience success, use teaching methods that take individual differences into account, and support students with positive feedback. Strengthening self-efficacy perception may increase students' confidence toward mathematics.

Importance should be given to relating the mathematics course to daily life. In order to sustain students' positive attitudes toward the course, it is recommended that mathematical concepts be explained through examples from daily life and related to real-life problems. This approach may help students recognize the functionality of mathematics and develop a positive attitude toward the course.

Supportive educational practices should be developed for students with low achievement levels. The research results show that there is a significant relationship between mathematics achievement and attitude toward mathematics. For this reason, individual support programs, peer tutoring, small-group work, and remedial education should be planned for students with low academic achievement. In this way, students' perceptions of failure can be reduced, preventing the development of a negative attitude toward mathematics.

Teachers' professional development regarding mathematics teaching should be supported. The literature indicates that teacher attitudes, teaching methods, and the materials used affect students' mathematics attitudes. For this reason, it is recommended that teachers be provided with in-service training on student-centered teaching methods, effective use of materials, and reducing mathematics anxiety.

It has been determined that students who feel adequate in the mathematics course develop a more positive attitude toward the course. For this reason, it is important, in the teaching process, to include activities that will increase students' achievement experiences, to provide positive feedback, to create learning environments that strengthen students' self-efficacy perceptions, and, in particular, to support students who feel inadequate.

Recommendations for Researchers

Longitudinal studies can be conducted at different educational levels. The research findings and the related literature show that students' attitudes toward mathematics may change as their level of education increases. For this reason, it is recommended that longitudinal studies be conducted examining changes in students' mathematics attitudes from primary school through middle school and high school.

Different variables affecting mathematics attitude can be investigated. In this study, it was determined that the gender variable did not create a significant difference. In future research, the effect of variables such as parental attitude, socioeconomic status, teacher characteristics, the learning environment, technology use, and mathematics anxiety on mathematics attitude can be examined.

Qualitative and mixed-methods studies can be conducted. The present study was carried out using a quantitative method. In order to gain a deeper understanding of students' feelings, thoughts, and experiences regarding the mathematics course, it is recommended that qualitative or mixed-methods studies employing interview, focus group, and observation techniques be conducted.

Experimental studies aimed at reducing mathematics anxiety can be conducted. The study determined that students experience anxiety related to exams and achievement status. For this reason, experimental studies examining the effects of practices such as gamification, technology-assisted instruction, cooperative learning, and problem-based learning on mathematics attitude and anxiety can be conducted.

Comparative studies can be conducted with different sample groups. Repeating the study in different regions, at different socioeconomic levels, and in different types of schools may increase the generalizability of the findings obtained. It may also contribute to revealing the effects of cultural and environmental factors on attitude toward mathematics.

In conclusion, the research findings show that a positive attitude toward the mathematics course is closely related to students' perceptions of achievement and self-efficacy levels. For this reason, it is important, in educational practices, to create learning environments that will enable students to experience success, reduce their anxiety levels, and reveal the relationship between mathematics and daily life.

REFERENCES

1. Aiken, L. R. (1970). Nonintellective variables and mathematics achievement: A review of research. *Journal of School Psychology*, 8(1), 28-36.
2. Akgül, S. (2008). *Elementary students' attitudes towards mathematics lesson and achievement motivation Unpublished master's thesis, Dokuz Eylül University.*
3. Avcı, E., Coşkuntuncel, O., & İnandı, Y. (2011). Attitudes of twelfth-grade secondary school students towards mathematics. *Mersin University Faculty of Education Journal,* 7(1), 50-58.
4. Awofala, A. O. A. (2022). Relationships among mathematics attitude, self-efficacy and achievement in mathematics among school students. *International Journal of Science and Mathematics Education*, 20(4), 741–760.
5. Balaban, S., & Kesicioğlu, O. S. (2024). Examination of the problems encountered by classroom teachers in mathematics teaching. *"Basic Education",* (24), 17-33.
6. Baş, M. (2019). Historical development of mathematics and the use of the history of mathematics in mathematics education. *Turkish Academic Publications Journal (TAP) Journal*, 3(1), 1-22.
7. Baykul, Y. (1990). *Changes in attitudes towards mathematics and science courses from primary school to the final year of secondary school and some factors thought to be related to success in the student selection exam*. OSYM Publications.
8. Cai, J., & Hwang, S. (2020). Learning to teach mathematics: The role of affective factors in mathematics achievement. ZDM *Mathematics Education*, 52(3), 457–471. https://doi.org/10.1007/s11858-020-01145-2
9. Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.
10. Cvencek, D., Brečić, R., Gaćeša, D., & Meltzoff, A. N. (2021). Development of math attitudes and math self-concepts: Gender differences, implicit–explicit dissociations, and relations to math achievement. *Child Development*, 92(5), e940–e956. https://doi.org/10.1111/cdev.13523
11. Çaycı, B. (2018). Examination of primary school students' attitudes towards mathematics in terms of various variables. *Gazi University Gazi Faculty of Education Journal*, 38(2), 520-545.
12. Çoban, F. N. (1989). *The relationship between secondary school students' attitudes towards mathematics and their academic achievement* (Unpublished master's thesis). Hacettepe University.
13. Demir, M., & Akça, F. (2022). Examination of the relationship between mathematics achievement and mathematics attitude in primary school students, *Turkish Journal of Education*, 7(2), 315–330.
14. Demir, A., & Aydın, E. (2024). The effect of mathematics self-efficacy perception on students' attitudes towards mathematics, *Turkish Journal of Education*, 9(1), 45–62.
15. Duru, A., & Savaş, E. (2005). Gender difference in mathematics achievement and attitudes towards mathematics among first-year high school students. *Eurasian Journal of Educational Research (EJER)*, (19), 81-91.
16. Else-Quest, N. M., Hyde, J. S., & Linn, M. C. (2010). Cross-national patterns of gender differences in mathematics: A meta-analysis. Psychological Bulletin, 136(1), 103–127. https://doi.org/10.1037/a0018053
17. Filiz, T. (2023). The effect of realistic mathematics education approach on the mathematics performance of primary school students: Meta-analysis. *Korkut Ata Journal of Turkish Studies*, (Special Issue 1), 1062-1081.
18. Fisher, D. L., & Rickards, T. (1998). Associations between teacher interpersonal behaviour and student attitudes to mathematics. *Journal of Classroom Interaction*, 33(1), 32-37.
19. Hyde, J. S., Fennema, E., & Lamon, S. J. (1990). Gender differences in mathematics performance: A meta-analysis. *Psychological Bulletin*, 107(2), 139–155. https://doi.org/10.1037/0033-2909.107.2.139
20. Işık, A., Çiltaş, A., & Bekdemir, M. (2008). The necessity and importance of mathematics education. *Atatürk University Kazım Karabekir Faculty of Education Journal*, (17), 174-184.
21. Işık, E., & Çağdaşer, B. T. (2009). The effect of teaching algebra with a constructivist approach on the attitudes of 6th grade students towards mathematics. *Kastamonu Education Journal*, 17(3), 941-954.
22. İlhan, A., Gemcioğlu, M., & Poçan, S. (2021). The relationship between middle school students' attitudes towards mathematics and their perceptions of problem-solving and their mathematics achievement. *Muğla Sıtkı Koçman University Faculty of Education Journal,* 8(1), 1-15.
23. İlhan, M., & Öner Sünkür, M. (2012). The predictive power of mathematics anxiety on mathematics achievement. *Journal of Educational and Instructional Research*, 1(3), 45-53.
24. Kağıtçıbaşı, Ç. (1996). *Human and People* (7th edition). Evrim Publishing House.
25. Karagöz, Y. (2021). *Quantitative-Qualitative-Mixed Scientific Research Methods and Publication Ethics with SPSS-AMOS-META Applications* (3rd edition). Nobel Academic Publishing.
26. Karakus, M., & Yilmaz, E. (2024). The effect of primary school students' self-efficacy in mathematics and their attitudes towards mathematics on academic achievement. *Education and Science*, 49(217), 155–174.
27. Kula, E. (2018). *Examination of the effect of a program based on developing attention skills on primary school students with attention deficit* (Doctoral dissertation). Necmettin Erbakan University.

28. Kurdal, C., & Kaplan, A. (2023). The relationship between middle school students' metacognitive awareness and their attitudes to mathematics. *Turkish Journal of Mathematics Educatio*n, 4(1), 44–54.
29. Ma, X., & Kishor, N. (1997). Assessing the relationship between attitude towards mathematics and achievement in mathematics: A meta-analysis. *Journal for Research in Mathematics Education*, 28(1), 26–47. https://doi.org/10.2307/749662
30. Minato, S., & Yanase, S. (1984). On the relationship between students' attitudes towards school mathematics and their achievement. *Educational Studies in Mathematics,* 15(3), 313-320.
31. Namkung, J. M., Peng, P., & Lin, X. (2022). The relation between mathematics anxiety and mathematics performance among school-aged students: A meta-analysis. *Review of Educational Research, 92*(2), 171–206.
32. OECD. (2023). *PISA 2022 results (Volume I): The state of learning and equity in education*. Paris: OECD Publishing.
33. Önal, N. (2013). A study on developing a scale for middle school students' attitudes towards mathematics. *Primary Education Online*, 12(4), 938-948.
34. Özcan, B., & Kültür, M. (2021). Examining the relationship between primary school students' self-efficacy perceptions in mathematics and their attitudes towards mathematics. *Journal of Education and Human Sciences*, 12(24), 85–103.
35. Özdemir, H., & Yıldız, A. (2021). Examining the relationship between primary school students' mathematics achievement and their attitudes towards mathematics. *Primary Education Onlin*e, 20(3), 1456–1470.
36. Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving. *Journal of Educational Psychology, 86*(2), 193–203.
37. Peker, M., & Mirasyedioğlu, Ş. (2003). The relationship between the attitudes of 11th-grade students towards mathematics and their achievement. *Pamukkale University Faculty of Education Journal*, 14(14), 157-166.
38. Songur, A. (2006). *The effect of learning algebraic expressions and equations through games and puzzles on students' mathematics achievement levels* (Doctoral dissertation). Marmara University.
39. Suinn, R. M., & Edwards, R. (1982). The Mathematics Anxiety Rating Scale for Elementary School Students (MARS-E): Psychometric data. *Journal of Clinical Psychology,* 38(1), 176-180.
40. Taşdemir, C. (2009). An examination of primary school students' attitudes towards mathematics in terms of some variables. *Erzincan Faculty of Education Journal*, 11(1), 161-176.
41. Tavşancıl, E. (2005). *Measurement of attitudes and data analysis with SPSS* (2nd edition). Nobel Publishing Distribution.
42. Tıraş, S. (2024). *Mathematics teaching.* Anı Publishing.
43. Tural, H. (2005). *The effect of teaching with games and activities on achievement and attitude in primary school mathematics teaching* (Master's thesis). Dokuz Eylül University.
44. Yenilmez, K., & Özabacı, N. S. (2003). A study on the mathematics anxiety levels of primary school students. *Pamukkale University Faculty of Education Journal,* 14(14), 132-146.
45. Yıldız, S., & Arslan, H. (2023). Examining the relationship between mathematics self-efficacy and attitudes towards mathematics in primary school students. *International Journal of Educational Researchers*, 6(2), 114–129.
46. Yücel, Z., & Koç, M. (2011). The relationship between the predictive power of primary school students' attitudes towards mathematics and their achievement levels and gender. *Primary Education Online,* 10(1), 133-143.
47. Zhang, Y., Wang, L., & Li, X. (2023). The predictive role of mathematics attitudes on problem-solving skills and mathematics achievement. *Frontiers in Psychology, 14*, Article 1185421. https://doi.org/10.3389/fpsyg.2023.1185421