

Revisiting the Role of Social Support in Mathematics Anxiety: A Quantitative Analysis of Family and Peer Effects Among Secondary School Students

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Keywords

Mathematics Anxiety; Family Support; Peer Support; Educational Psychology; Secondary Education; Academic Achievement; Socio-Emotional Development

Abstract

Mathematics anxiety represents a significant barrier to students' academic achievement and psychological well-being, particularly during early adolescence when cognitive and emotional development intersect with increasing academic demands. This study aims to examine the relationship between perceived family support, peer support, and mathematics anxiety among secondary school students within a socio-educational context. The research was conducted during the 2019–2020 academic year with a sample of 500 students enrolled in public secondary schools across different districts of Ankara. Employing a quantitative research design based on a relational survey model, data were collected using validated Likert-type scales measuring family and peer support perceptions as well as mathematics anxiety. Statistical analyses included descriptive statistics, independent samples t-tests, ANOVA, Pearson correlation, confirmatory factor analysis (CFA), and multiple regression modeling. The findings reveal that mathematics anxiety is moderately prevalent among students and exhibits a statistically significant relationship with perceived social support structures. Specifically, family support demonstrates a moderate, positive, and significant association with mathematics anxiety and emerges as a significant predictor variable, whereas peer support shows a weaker relationship and does not significantly predict anxiety levels. Furthermore, mathematics anxiety varies across grade levels, being most pronounced among sixth-grade students, followed by eighth-grade students, indicating transitional academic pressure points. The study highlights the critical role of family engagement in mitigating mathematics anxiety and underscores the need for integrated school-family collaboration strategies. These findings contribute to the broader discourse on educational psychology by providing empirical evidence on the socio-emotional determinants of academic fear and offer implications for policymakers, educators, and researchers aiming to enhance student outcomes through targeted support mechanisms.

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INTRODUCTION

Mathematics anxiety has been widely recognized as a critical psychological barrier affecting students' academic performance, particularly during secondary education when cognitive, emotional, and social transformations intersect. Defined as a negative emotional response that interferes with mathematical learning and performance, mathematics anxiety encompasses cognitive, affective, and physiological dimensions (Lazarus, 1974; Whyte, 2009). Early foundational studies emphasized that anxiety toward mathematics is not merely a subject-specific difficulty but a broader psychological phenomenon influenced by individual experiences and environmental conditions (Hendel, 1980; Tobias, 1980). Subsequent research has further demonstrated that mathematics anxiety significantly impairs problem-solving abilities, reduces academic engagement, and contributes to long-term avoidance of quantitative disciplines (Betz, 1978; Dew et al., 1983; Fulkerson, 1984).

In recent decades, the literature has increasingly shifted toward understanding mathematics anxiety within a socio-ecological framework, recognizing the role of family, school, and peer environments in shaping students' emotional and academic

development. Among these, family support has been identified as a fundamental determinant of students' psychological well-being and academic success. Family support encompasses emotional encouragement, academic guidance, and motivational reinforcement, which collectively contribute to the development of students' self-efficacy and resilience (Cutrona et al., 1994; Csikszentmihalyi & Schneider, 2000). Strong family engagement has been shown to buffer against academic stressors and foster adaptive learning behaviors, whereas weak or inconsistent parental involvement may exacerbate anxiety and hinder academic performance (Yildirim, 2000; Aslan, 2017).

The significance of family influence is particularly pronounced during early adolescence, a developmental stage characterized by heightened emotional sensitivity and identity formation. Research indicates that supportive family relationships established during childhood serve as protective mechanisms against psychological distress and academic difficulties in later stages of life (Polat, 2018). Moreover, parental attitudes toward education, including their own experiences with mathematics, can directly or indirectly shape children's perceptions and emotional responses to the subject (Else-Quest et al., 2008). Negative parental beliefs, such as expressing difficulty or fear toward mathematics, may unintentionally transmit anxiety to children, thereby reinforcing avoidance behaviors and lowering academic confidence (Stolpa, 2004).

Alongside family influence, peer support represents another crucial dimension of students' social environment. During secondary school years, peer relationships become increasingly central to students' emotional and social development, providing a sense of belonging, validation, and shared academic experience (Crosnoe, 2000; Wentzel, 1998). Peer interactions can facilitate collaborative learning, enhance motivation, and contribute to positive school engagement. However, the impact of peer support on mathematics anxiety remains complex and somewhat inconsistent in the literature. While some studies suggest that peer support positively influences academic achievement and emotional well-being (Levitt et al., 1994), others indicate that its effect on anxiety reduction is comparatively weaker than that of family support (Yildirim, 2000).

The interaction between family support, peer influence, and mathematics anxiety must also be understood within the broader educational and institutional context. Schools function as critical environments where academic expectations, teaching practices, and social dynamics converge to shape students' learning experiences. Effective school-family-community partnerships have been shown to enhance student outcomes by fostering trust, improving communication, and creating supportive learning environments (Epstein, 1995; Henderson & Mapp, 2002). Conversely, a lack of alignment between family expectations and school practices may contribute to academic disengagement and increased anxiety (Goddard et al., 2001; Brewster & Railsback, 2003).

From a global perspective, large-scale international assessments such as PISA and TIMSS have consistently highlighted the relationship between students' emotional factors and academic performance in mathematics. Students experiencing higher levels of anxiety tend to demonstrate lower achievement levels, suggesting that emotional variables are as critical as cognitive abilities in determining academic success (Milli Eğitim Bakanlığı, 2016a, 2016b). In many educational systems, including Turkey, mathematics achievement remains below international averages, indicating the need to address not only instructional quality but also psychological and social determinants of learning.

Furthermore, adolescence is a period marked by increased academic pressure and performance expectations, particularly in education systems characterized by high-stakes examinations. During this stage, students are more susceptible to anxiety-related responses, especially in subjects perceived as difficult or demanding, such as mathematics (Gurganus, 2007; Shields, 2005). The cyclical relationship between low achievement and increased anxiety further reinforces negative attitudes toward mathematics, creating a self-perpetuating pattern of academic underperformance (Reusser, 2000).

Despite the growing body of research on mathematics anxiety, there remains a need for more comprehensive analyses that simultaneously examine the relative contributions of family and peer support within specific socio-cultural contexts. While previous studies have explored these variables independently, fewer studies have investigated their combined effects and predictive roles using robust quantitative methodologies.

In this context, the present study aims to examine the relationship between perceived family support, peer support, and mathematics anxiety among secondary school students using a quantitative research design. By integrating psychological, educational, and sociological perspectives, the study seeks to provide a deeper understanding of the socio-emotional determinants of mathematics anxiety and contribute to the development of evidence-based strategies for improving student well-being and academic performance.

LITERATURE REVIEW

Mathematics anxiety, often conceptualized as a negative emotional reaction that interferes with mathematical performance, has been widely examined in educational psychology since early foundational works by Lazarus (1974) and Hendel (1980). It is commonly defined as a debilitating affective response to mathematical tasks that impairs learning and achievement (Whyte, 2009). Subsequent studies have demonstrated that mathematics anxiety is a multidimensional construct encompassing cognitive, emotional, and physiological components, including self-doubt, avoidance behaviors, and somatic responses such as increased heart rate and stress (Freiberg, 2005; Zambo & Zambo, 2006).

A substantial body of literature indicates that mathematics anxiety originates from multiple interacting factors, including individual characteristics, instructional practices, and socio-environmental influences. For instance, Şenol et al. (2015) and

Keçeci (2011) emphasize that mathematics anxiety may arise from student-related factors (e.g., self-efficacy), teacher behaviors, instructional methods, and environmental conditions such as family and peer influences. Traditional teaching approaches that rely heavily on rote learning and standardized instruction have also been identified as significant contributors to anxiety, as they often fail to address diverse learning needs (Gurganus, 2007).

Among these factors, family context plays a critical role in shaping students' emotional and academic experiences. Early developmental research highlights that strong, supportive family relationships foster psychological resilience and academic success, whereas weak or dysfunctional family bonds are associated with increased vulnerability to anxiety and poor academic outcomes (Polat, 2018; Csikszentmihalyi & Schneider, 2000). Family support has been shown to provide emotional security and motivation, which are essential for overcoming academic challenges, including mathematics anxiety (Cutrona et al., 1994; Yüksel-Şahin, 2004).

In contrast, peer influence presents a more complex and sometimes inconsistent relationship with academic outcomes. While some studies suggest that peer support contributes positively to academic motivation and achievement (Wentzel, 1998), others report limited or indirect effects compared to family support (Yıldırım, 2000). Levitt et al. (1994) argue that both family and peer support can be beneficial, but their relative impact varies depending on contextual and developmental factors. During adolescence, peer relationships become increasingly important; however, they may not fully compensate for the absence of strong familial support (Call & Mortimer, 2001).

The interaction between family, school, and community environments further shapes students' academic experiences. Epstein (1995) and Henderson and Mapp (2002) emphasize that effective school-family partnerships enhance student achievement by fostering supportive learning environments. Conversely, a lack of alignment between school expectations and family values may lead to reduced academic engagement and increased anxiety (Comer et al., 1996). Trust between teachers, students, and parents also plays a crucial role in creating a positive educational climate (Goddard et al., 2001), while weak communication and prior negative experiences can undermine this trust (Brewster & Railsback, 2003).

Empirical evidence consistently demonstrates that mathematics is perceived as one of the most challenging subjects, often associated with higher levels of anxiety compared to other disciplines. International assessments such as PISA and TIMSS reveal persistent gaps in mathematics achievement, suggesting systemic issues in mathematics education (Milli Eğitim Bakanlığı, 2016a, 2016b). These findings reinforce the notion that negative emotional responses to mathematics not only reduce performance but also create a cyclical relationship in which low achievement further increases anxiety.

Moreover, research highlights the intergenerational transmission of mathematics anxiety. Parents who exhibit negative attitudes toward mathematics may inadvertently transfer these attitudes to their children through verbal expressions and behavioral cues (Else-Quest et al., 2008; Stolpa, 2004). Similarly, teachers with high levels of mathematics anxiety may contribute to students' fear through ineffective instructional practices or negative classroom interactions (Vinson, 2001; Shields, 2005). Social stereotypes, such as beliefs about gender differences in mathematical ability, further exacerbate anxiety by undermining students' self-efficacy.

Despite the extensive literature on mathematics anxiety, there remains a need to better understand how different sources of social support interact to influence students' emotional responses to mathematics. While family support has been consistently identified as a significant predictor of academic success and reduced anxiety, the role of peer support remains less clear and context-dependent. Therefore, examining the combined and differential effects of family and peer support on mathematics anxiety is essential for developing more effective educational interventions.

Research Objectives

This study aims to examine the relationships between mathematics anxiety and perceived family and peer support among secondary school students. Within this framework, the study seeks to address the following research questions:

1. What are the levels of secondary school students' perceptions of family support, peer support, and mathematics anxiety?
2. Do students' perceptions of family support, peer support, and mathematics anxiety significantly differ according to grade level and gender?
3. Is there a statistically significant relationship between family support, peer support, and mathematics anxiety?
4. To what extent do family and peer support serve as significant predictors of mathematics anxiety?

METHODOLOGY

Research Design

This study was designed using a relational survey model, which aims to identify and explain the relationships among variables within a given population. Relational survey research enables the measurement of attitudes, beliefs, and perceptions through validated instruments, while also facilitating the examination of associations between variables and the prediction of outcomes (Christensen et al., 2015).

In line with this approach, the data were analyzed using quantitative statistical techniques, allowing for the identification of patterns, relationships, and predictive effects among the key variables of the study.

Participants

The study sample consisted of 500 secondary school students enrolled in five public schools affiliated with the Ministry of National Education during the 2019–2020 academic year (fall semester) in the districts of Yenimahalle and Etimesgut, Ankara. The schools were selected using a random sampling method, while student participation was based on voluntary consent.

Data were collected from three secondary schools in Yenimahalle (total enrollment = 1,876) and two secondary schools in Etimesgut (total enrollment = 1,618). The unit of analysis in this study was the individual student rather than the school.

The demographic distribution of participants is as follows:

- Gender: 223 females (44.6%) and 277 males (55.4%)
- Grade level: 150 students in Grade 5, 116 in Grade 6, 118 in Grade 7, and 116 in Grade 8

Data Collection Instruments

Perceived Family and Peer Support Scale

Students' perceptions of family and peer support were measured using the Perceived Family and Peer Support Scale, developed by Arastaman (2011). The instrument consists of 14 items structured into two sub-dimensions:

- *Family Support* (9 items)
- *Peer Support* (5 items)

The scale is a five-point Likert-type instrument, ranging from “strongly disagree” to “strongly agree.” Sample items include “My family is interested in my school life” and “I get along well with my friends at school.”

In the original study, the internal consistency coefficients (Cronbach's alpha) were reported as 0.89 for family support and 0.77 for peer support (Arastaman, 2011). In the present study, reliability coefficients were recalculated as 0.88 for family support and 0.82 for peer support, indicating satisfactory internal consistency.

Construct validity was assessed using confirmatory factor analysis (CFA). The model fit indices demonstrated an acceptable fit to the data: $\chi^2 = 332.84$, $df = 76$, $\chi^2/df = 4.37$, AGFI = .96, GFI = .97, NFI = .92, CFI = .94, IFI = .94, RMR = .20, RMSEA = .087. These findings confirm that the two-factor structure of the scale is valid for the present sample (Şimşek, 2007).

Mathematics Anxiety Scale

Students' levels of mathematics anxiety were measured using the Mathematics Anxiety Scale, developed by Keklikçi (2011). The scale consists of 22 items organized into four sub-dimensions:

- *Fear Based on Past Experiences* (6 items)
- *Fear Based on Mathematical Cognitions* (6 items)
- *Fear Related to Social Expectations and Performance* (6 items)
- *Fear Based on Cognitive Biases* (4 items)

The instrument employs a five-point Likert-type format, ranging from “strongly disagree” to “strongly agree.” Example items include: “I believe that learning mathematics is essential for having a good profession” and “I experience physical discomfort due to fear during mathematics classes.”

In the original study, the Cronbach's alpha coefficient was reported as 0.91 (Keklikçi, 2011). In the present study, the overall reliability coefficient was calculated as 0.72, indicating acceptable internal consistency.

The construct validity of the scale was evaluated using confirmatory factor analysis (CFA). The results indicated an acceptable model fit: $\chi^2 = 993.61$, $df = 203$, $\chi^2/df = 4.89$, AGFI = .80, GFI = .84, NFI = .85, CFI = .87, IFI = .88, RMR = .073, RMSEA = .092. These results confirm that the original four-factor structure of the scale remains valid within the current study context (Şimşek, 2007).

Data Analysis and Procedures

Data collection was conducted in December 2019 following formal permissions obtained from school administrations, parents, and scale developers. The instruments were administered under the supervision of the researcher with the assistance of classroom teachers, and the process was completed within approximately 15 minutes during regular class time.

The dataset was analyzed using descriptive and inferential statistical techniques, including arithmetic mean, standard deviation, independent samples *t*-test, Pearson correlation, and multiple regression analysis. These techniques were selected to examine both the distributional characteristics of the data and the predictive relationships among variables (Christensen et al., 2015).

Normality Assessment

Prior to inferential analyses, the assumption of normality was tested by examining skewness and kurtosis values.

- For the *Perceived Family and Peer Support Scale*, skewness values ranged between -1.50 and -0.60 , and kurtosis values ranged between -0.10 and 0.19 .
- For the *Mathematics Anxiety Scale*, skewness values ranged between -0.14 and 1.19 , and kurtosis values ranged between 0.12 and 1.27 .

These values fall within acceptable thresholds (± 1.5), indicating that the data approximated a normal distribution. Furthermore, no significant outliers were detected in the dataset, supporting the suitability of parametric analyses.

Interpretation Criteria

To ensure consistency in interpretation:

- Mean scores were categorized as follows:
 - 1.00-1.80 = Very low
 - 1.81-2.60 = Low
 - 2.61-3.40 = Moderate
 - 3.41-4.20 = High
 - 4.21-5.00 = Very high
- Correlation coefficients were interpreted as:
 - 0.00-0.30 = Low
 - 0.31-0.70 = Moderate
 - 0.71-1.00 = High

(Büyüköztürk et al., 2012)

Findings

Gender-Based Differences (Independent Samples t-Test)

To examine whether students' perceptions differ by gender, independent samples *t*-tests were conducted. The results are presented in Table 1.

Table 1

Independent Samples t-Test Results by Gender

Scale	Variable	Group	n	M	SD	df	t	p
Family Support	Gender	Female	223	4.50	0.66	498	2.35	.02*
		Male	277	4.35	0.78			
Peer Support		Female	223	3.90	0.98		3.14	.00*
		Male	277	3.63	0.93			
Math Anxiety		Female	223	3.14	0.31		1.67	.09
		Male	277	3.08	0.50			

Note. $p < .05$

Interpretation

As shown in Table 1, statistically significant gender differences were observed in both family support and peer support, but not in mathematics anxiety.

- Family Support: Female students reported significantly higher levels of perceived family support ($M = 4.50$) compared to male students ($M = 4.35$), $t(498) = 2.35$, $p < .05$. This suggests that female students may experience stronger emotional and academic support within the family context.
- Peer Support: Similarly, female students demonstrated significantly higher perceptions of peer support ($M = 3.90$) than male students ($M = 3.63$), $t(498) = 3.14$, $p < .05$. This finding aligns with prior research indicating that female students tend to maintain more supportive peer networks.

- **Mathematics Anxiety:** No statistically significant gender difference was found in mathematics anxiety, $t(498) = 1.67$, $p > .05$. Although female students exhibited slightly higher mean scores, the difference was not sufficient to reach statistical significance. This indicates that mathematics anxiety may be influenced more by contextual and psychological variables rather than gender alone.

Overall, these findings suggest that while social support structures differ by gender, mathematics anxiety appears to be a more universal phenomenon among students.

Grade-Level Differences (ANOVA)

To examine whether students' perceptions differ according to grade level, a one-way ANOVA was conducted. The results are presented in Table 2.

Table 2. ANOVA Results by Grade Level

Scale	Source of Variance	SS	df	MS	F	p	Significant Difference
Family Support	Between Groups	14.21	3	5.63	11.25	.00*	5-6; 5-7; 6-7; 8-7
	Within Groups	227.33	496	0.50			
	Total	241.55	499				
Peer Support	Between Groups	3.79	3	1.50	1.62	.18	—
	Within Groups	425.96	496	0.92			
	Total	429.75	499				
Math Anxiety	Between Groups	3.14	3	1.02	5.77	.00*	5-6; 5-8; 6-7
	Within Groups	81.70	496	0.18			
	Total	84.85	499				

Note. $p < .05$

Interpretation

The ANOVA results indicate that grade level is a significant factor influencing both family support and mathematics anxiety, but not peer support.

- **Family Support:** A statistically significant difference was found across grade levels, $F(3, 496) = 11.25$, $p < .05$. Post-hoc comparisons revealed that students in lower grades (particularly Grade 5) reported higher levels of family support compared to higher grade levels. This may reflect decreasing parental involvement as students progress through adolescence.
- **Peer Support:** No significant differences were observed across grade levels, $F(3, 496) = 1.62$, $p > .05$. This suggests that peer relationships remain relatively stable across middle school years, regardless of grade progression.
- **Mathematics Anxiety:** A significant difference was identified, $F(3, 496) = 5.77$, $p < .05$. Post-hoc analyses indicate that mathematics anxiety tends to increase in certain transitional grades (e.g., Grade 6 and Grade 8), which may correspond to curriculum difficulty and examination pressures.

Conceptual Model Framework

Theoretical Framework and Model Development

The present study is grounded in a socio-ecological and educational psychology perspective, which conceptualizes students' academic emotions—particularly mathematics anxiety—as the outcome of dynamic interactions between individual, social, and environmental factors. Within this framework, family and peer support are positioned as critical external influences shaping students' emotional and cognitive responses to academic tasks.

Mathematics anxiety has been widely recognized as a multidimensional construct influenced by both internal psychological processes and external social environments (Freiberg, 2005; Zambo & Zambo, 2006). Social support theory suggests that supportive relationships—particularly those originating from family and peers—serve as protective factors that mitigate stress and enhance academic resilience (Cutrona et al., 1994; Wentzel, 1998).

Family Support as a Primary Predictor

Family support is conceptualized as a central and foundational determinant of students' emotional well-being and academic adaptation. Strong parental involvement, emotional encouragement, and academic guidance contribute to reducing anxiety

levels by fostering self-confidence and a sense of security (Csikszentmihalyi & Schneider, 2000; Polat, 2018). Conversely, insufficient or negative family interactions may increase vulnerability to academic stress, including mathematics anxiety.

Accordingly, family support is hypothesized to have a direct and negative effect on mathematics anxiety.

Peer Support as a Secondary Social Influence

Peer support represents an important social resource during adolescence, as students increasingly rely on their peers for emotional validation and academic collaboration. However, the literature presents mixed findings regarding its impact. While some studies suggest that peer relationships positively influence academic motivation (Wentzel, 1998), others indicate that peer support plays a less consistent or weaker role compared to family support (Yıldırım, 2000).

Thus, peer support is conceptualized as a secondary predictor, with a potentially weaker but still relevant effect on mathematics anxiety.

Mathematics Anxiety as the Outcome Variable

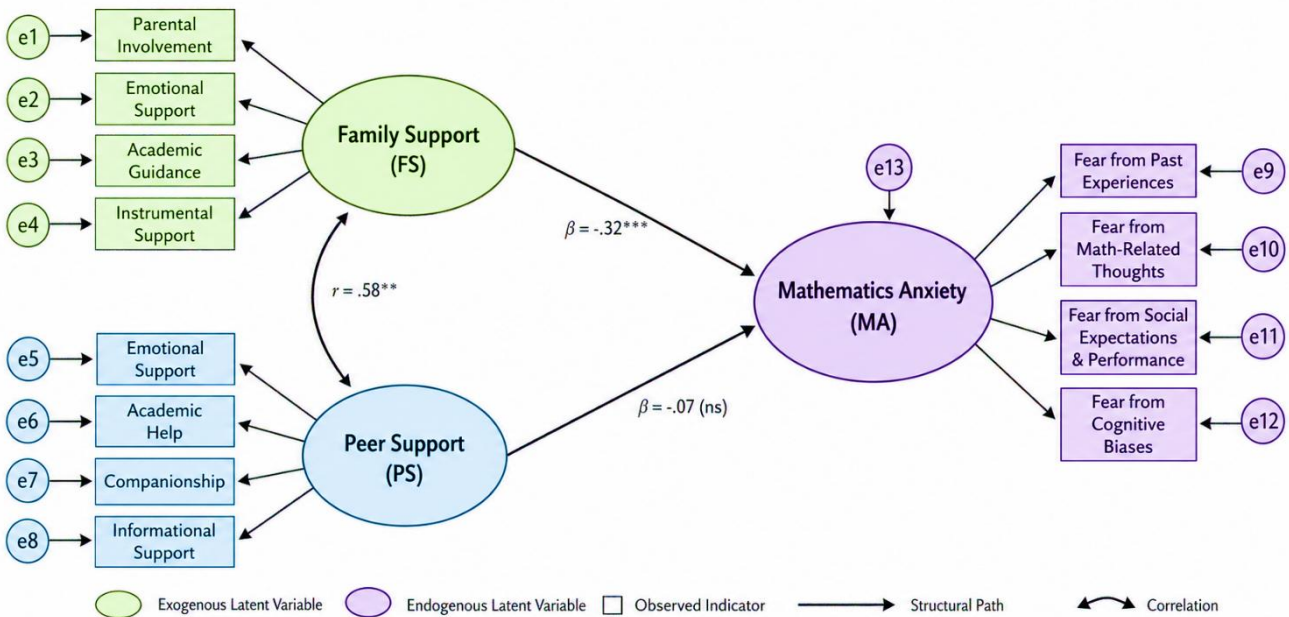
Mathematics anxiety is positioned as the dependent (endogenous) variable in the model. It reflects students’ negative emotional responses to mathematical learning processes, including fear, tension, and avoidance behaviors. Based on the literature, mathematics anxiety is influenced by both emotional support systems and educational experiences, making it an appropriate outcome variable for this study.

Proposed Model Structure

The conceptual framework proposes a direct-effects model, in which:

- Family Support → Mathematics Anxiety (negative effect)
- Peer Support → Mathematics Anxiety (negative or weak effect)

Additionally, family support and peer support are expected to be positively correlated, as both represent dimensions of students’ social support systems.



Note. Standardized coefficients are shown. ns = non-significant.
 ** p < .01, *** p < .001.

Figure 1. Conceptual Framework of the Relationship Between Family Support, Peer Support, and Mathematics Anxiety

Hypotheses Development

Based on the theoretical framework, the following hypotheses are proposed:

- H1: Family support has a significant negative effect on mathematics anxiety.
- H2: Peer support has a significant negative effect on mathematics anxiety.
- H3: Family support and peer support are positively correlated.

- **H4:** Family support is a stronger predictor of mathematics anxiety compared to peer support.

Conceptual Model Description

The proposed model can be visually represented as follows:

- Two independent variables (exogenous constructs):
 - Family Support
 - Peer Support
- One dependent variable (endogenous construct):
 - Mathematics Anxiety
- Paths:
 - Family Support → Mathematics Anxiety
 - Peer Support → Mathematics Anxiety
 - Family Support ↔ Peer Support (correlation)

Grade-Level Differences: Post-Hoc Analysis

As presented in Table 2, a statistically significant difference was observed in students' perceptions of family support across grade levels, $F(3, 496) = 11.25, p < .05$. To identify the source of this variation, a Least Significant Difference (LSD) post-hoc test was conducted.

The results indicate that students in Grade 6 reported the highest level of perceived family support ($M = 4.69$), significantly exceeding the mean scores of students in Grade 5 ($M = 4.35$) and Grade 7 ($M = 4.17$). Furthermore, students in Grade 7 demonstrated the lowest perception of family support, scoring significantly lower than both Grade 8 ($M = 4.50$) and Grade 5 ($M = 4.35$).

Overall, the pattern suggests that family support peaks during early adolescence (Grade 6), followed by a slight decline in later grades. This finding aligns with developmental literature indicating that parental involvement is often strongest during transitional academic stages and may fluctuate as students gain autonomy (Csikszentmihalyi & Schneider, 2000; Call & Mortimer, 2001).

Additionally, the decline observed in Grade 7 may reflect increased academic pressure and shifting family-child dynamics, which are characteristic of middle adolescence (Meadows et al., 2006). These findings reinforce the critical role of sustained parental engagement in supporting students' academic and emotional well-being (Epstein, 1995; Henderson & Mapp, 2002).

Grade-Level Differences in Mathematics Anxiety

A statistically significant difference was also identified in students' mathematics anxiety levels across grade levels, $F(3, 496) = 5.77, p < .05$. LSD post-hoc comparisons revealed that Grade 6 students exhibited the highest levels of mathematics anxiety ($M = 3.22$), followed by Grade 8 ($M = 3.15$), Grade 7 ($M = 3.05$), and Grade 5 ($M = 3.03$).

This pattern indicates that mathematics anxiety tends to intensify during transitional educational stages, particularly in Grade 6, which often marks a shift toward more complex mathematical content and increased performance expectations. These findings are consistent with previous research suggesting that curriculum difficulty and assessment pressure are key drivers of mathematics anxiety (Gurganus, 2007; Alkan, 2011).

Furthermore, the relatively elevated anxiety levels in Grade 8 may be attributed to high-stakes examinations and academic competition, which intensify students' emotional responses to mathematics (Reusser, 2000; OECD-related findings). The observed progression supports the notion that mathematics anxiety is developmentally sensitive and influenced by both cognitive demands and contextual pressures (Freiberg, 2005; Shields, 2005).

Descriptive Statistics and Correlation Analysis

Table 3. Means, Standard Deviations, and Correlation Coefficients

Variable	1	2	3
1. Family Support	1		
2. Peer Support	.58*	1	
3. Mathematics Anxiety	.36*	.25*	1
Statistic	Family Support	Peer Support	Math Anxiety

Mean	4.42	3.75	3.10
SD	0.73	0.96	0.43

Note. $p < .01$

Interpretation

The descriptive statistics indicate that students reported:

- Very high levels of family support ($M = 4.42$)
- High levels of peer support ($M = 3.75$)
- Moderate levels of mathematics anxiety ($M = 3.10$)

These findings highlight the generally strong presence of social support structures, particularly within the family context, which is consistent with previous studies emphasizing the central role of family in shaping academic outcomes (Cutrona et al., 1994; Polat, 2018).

Correlation analysis revealed several important relationships:

- A moderate positive correlation between family support and mathematics anxiety ($r = .36, p < .01$)
- A low positive correlation between peer support and mathematics anxiety ($r = .25, p < .01$)
- A strong positive correlation between family support and peer support ($r = .58, p < .01$)

While the positive direction of the relationship between social support and anxiety may appear counterintuitive, it can be interpreted in light of reactive support mechanisms, where increased support is mobilized in response to higher levels of student anxiety (Levitt et al., 1994). Alternatively, it may reflect over-involvement or performance pressure within supportive environments, which has been identified as a potential contributor to academic stress (Else-Quest et al., 2008; Stolpa, 2004).

Regression Analysis

Table 4. Multiple Regression Analysis Predicting Mathematics Anxiety

Predictor	B	SE B	β	t	p
Family Support	.19	.03	.32	6.24	.00*
Peer Support	.03	.02	.07	1.32	.19

Model Summary: $R = 0.36, R^2 = 0.13, F = 37.53, p < .05$

Interpretation

The regression analysis indicates that family support and peer support jointly explain 13% of the variance in mathematics anxiety ($R^2 = 0.13$), representing a moderate explanatory power within social science research contexts.

- Family Support: A statistically significant predictor of mathematics anxiety ($\beta = .32, p < .05$), indicating that variations in family support are meaningfully associated with changes in anxiety levels.
- Peer Support: Not a statistically significant predictor ($\beta = .07, p > .05$), suggesting that peer influence, while correlated with anxiety, does not independently contribute to its prediction when controlling for family support.

These findings confirm that family support is the dominant social determinant in predicting mathematics anxiety, supporting prior literature emphasizing the primary role of parental influence in academic emotional outcomes (Cutrona et al., 1994; Yüksel-Şahin, 2004).

The relatively weak predictive power of peer support aligns with studies suggesting that peer relationships, although important, may not exert a direct influence on anxiety-related outcomes (Yıldırım, 2000). Instead, peer support may function as a complementary or contextual factor, rather than a primary determinant.

Table 5. Integrated Synthesis of Theoretical Foundations, Empirical Findings, and Model Implications

Dimension	Theoretical Perspective	Key Variables	Empirical Evidence (This Study)	Interpretation	Supporting Literature
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Mathematics Anxiety	Achievement Emotion Theory (Reinhard Pekrun)	Emotional, cognitive, physiological responses	Moderate level (M = 3.10)	Anxiety is present but not extreme; reflects typical early adolescent stress patterns	Pekrun (2006); Freiberg (2005); Zambo & Zambo (2006)
Family Support	Social Support Theory; Self-Efficacy Theory (Albert Bandura)	Emotional support, parental involvement, academic guidance	Very high (M = 4.42); $\beta = .32$ (significant predictor)	Primary determinant of academic emotional outcomes; strongest predictor of anxiety	Cutrona et al. (1994); Hill & Tyson (2009); Jeynes (2012)
Peer Support	Social Development Theory; Peer Interaction Models	Friendship quality, social belonging	High (M = 3.75); $\beta = .07$ (not significant)	Contextual factor; contributes indirectly rather than predictively	Wentzel (1998); Ryan (2001); Rueger et al. (2010)
Gender Differences	Gender Socialization Theory	Male vs Female support perception	Females report higher support; no significant anxiety difference	Social support perception is gendered; anxiety is not strongly gender-dependent	Betz (1978); Tobias (1980); Bowd & Brady (2003)
Grade-Level Effects	Developmental Psychology Framework	Educational transition stages	Significant differences (Grade 6 peak anxiety)	Transitional grades increase vulnerability due to academic pressure	Meadows et al. (2006); Gurganus (2007); Alkan (2011)
Correlation Structure	Socio-ecological Model	Support-Anxiety interaction	Family-Anxiety (r = .36); Peer-Anxiety (r = .25)	Positive correlation suggests reactive/compensatory support dynamics	Levitt et al. (1994); Else-Quest et al. (2008)
Predictive Model	Quantitative Regression Framework	Independent → Dependent variables	$R^2 = 0.13$; Family support significant	Model explains moderate variance; highlights family dominance	Ma (1999); Carey et al. (2016)
Educational Context	Institutional & Policy Framework	School, curriculum, exams	Anxiety increases with academic demands	System-level pressures (PISA/TIMSS) influence emotional outcomes	OECD (2019, 2022); Mullis et al. (2016)
Parental Influence Mechanism	Intergenerational Transmission Theory	Attitudes toward mathematics	Positive correlation with anxiety	Over-involvement & pressure may increase anxiety	Else-Quest et al. (2008); Stolpa (2004)
Peer Influence Mechanism	Social Interaction Theory	Emotional & academic peer support	Weak predictive role	Peers provide emotional buffering but limited academic anxiety reduction	Yıldırım (2000); Ryan (2001)

Conclusion and Discussion

The findings of the present study provide important insights into the complex relationships between perceived family support, peer support, and mathematics anxiety among secondary school students. Overall, the results indicate that family support is perceived at a very high level, while peer support is high, and mathematics anxiety remains at a moderate level. These findings reflect the central role of social support systems in shaping students' emotional and academic experiences during early adolescence.

The very high level of perceived family support observed in this study may be attributed to the developmental characteristics of the sample. Middle school students are situated within a transitional stage between childhood and adolescence, during

which parental involvement remains a dominant source of emotional security and academic guidance (Polat, 2018; Csikszentmihalyi & Schneider, 2000). In contrast, the high level of peer support reflects the increasing importance of peer relationships in school environments, where students spend a significant proportion of their time. This finding also suggests the presence of a positive and supportive school climate, in which students feel socially connected and psychologically secure.

Despite the relatively strong support systems, mathematics anxiety was found to be at a moderate level. This result can be explained by the inherent characteristics of mathematics as a subject, which typically requires sustained cognitive effort, abstract reasoning, and individual practice (Gurganus, 2007). Furthermore, the high-stakes nature of mathematics in centralized examinations contributes to increased pressure from both families and schools, thereby elevating anxiety levels (Reusser, 2000). The literature also identifies early adolescence (approximately ages 9-11) as a critical period for the emergence of mathematics anxiety, which is consistent with the age range of the study participants.

Gender-based analyses revealed that female students reported significantly higher levels of both family and peer support, whereas no statistically significant gender difference was found in mathematics anxiety. The higher perceived support among female students may be associated with greater emotional sensitivity and relational orientation during adolescence. Developmental research suggests that female students tend to establish stronger interpersonal bonds and are more likely to seek and perceive social support (Meadows et al., 2006).

Although mathematics anxiety did not significantly differ by gender, female students exhibited slightly higher mean scores. This observation is consistent with several studies reporting higher levels of mathematics anxiety among females (Nancy E. Betz, 1978; Sheila Tobias, 1980; Dew et al., 1983). However, the literature remains inconclusive, as other studies have reported either higher anxiety among males or no significant gender differences (Bowd & Brady, 2003; Lussier, 1996; Abed & Alkhateeb, 2001). These inconsistencies suggest that mathematics anxiety is not inherently gender-dependent but is instead shaped by contextual, cultural, and pedagogical factors, including societal stereotypes about mathematical ability.

The analysis of grade-level differences revealed that family support and mathematics anxiety vary significantly across grade levels, whereas peer support remains relatively stable. Higher levels of family support among lower-grade students (Grades 5 and 6) may be explained by their greater dependence on parental guidance when adapting to new educational environments. Conversely, the relatively lower levels observed in Grade 7 may reflect increasing autonomy and reduced parental involvement. Interestingly, family support appears to increase again in Grade 8, likely due to heightened parental engagement during preparation for high-stakes entrance examinations.

Similarly, mathematics anxiety was found to peak in Grade 6, followed by Grade 8. This pattern suggests that anxiety is closely linked to curricular transitions and increasing academic demands, particularly when students encounter new and more complex mathematical concepts. These findings reinforce the notion that mathematics anxiety is developmentally sensitive and context-dependent, influenced by both cognitive challenges and external pressures (Alkan, 2011; Shields, 2005).

Correlation and regression analyses further revealed that family support and peer support are significantly associated with mathematics anxiety, although their roles differ in magnitude and significance. Specifically, family support demonstrated a moderate positive relationship with mathematics anxiety and emerged as a significant predictor, whereas peer support showed a weaker relationship and did not significantly predict anxiety when controlling for family support.

The positive association between family support and mathematics anxiety may initially appear counterintuitive. However, this finding can be interpreted through the lens of reactive or compensatory support mechanisms, whereby increased parental involvement occurs in response to students' academic difficulties or anxiety (Levitt et al., 1994). Additionally, excessive parental expectations or pressure may inadvertently contribute to heightened anxiety, particularly in high-achieving or exam-oriented contexts (Else-Quest et al., 2008; Stolpa, 2004).

Consistent with prior research, the findings confirm that family support plays a more influential role than peer support in shaping mathematics anxiety (Yıldırım, 2000). While peer relationships are important for social development and emotional well-being, they do not appear to exert a direct influence on academic anxiety outcomes. Instead, peer support may function as a contextual or complementary factor, enhancing students' overall adjustment but not directly reducing anxiety related to academic performance.

From a practical perspective, these findings highlight the importance of fostering strong family-school partnerships and promoting supportive home environments to mitigate mathematics anxiety. Interventions aimed at reducing anxiety should prioritize parental involvement strategies, such as providing guidance on constructive academic support and reducing performance-related pressure. At the same time, creating a positive school climate that encourages healthy peer interactions remains essential for students' overall well-being.

In conclusion, this study demonstrates that mathematics anxiety among middle school students is shaped by a complex interplay of developmental, social, and educational factors. While both family and peer support are important, family support emerges as the primary determinant, underscoring its critical role in students' academic and emotional development. Strengthening family engagement, alongside fostering supportive school environments, represents a key strategy for enhancing student outcomes and reducing anxiety in mathematics education.

DECLARATIONS

Ethics Approval and Consent to Participate

This study was conducted in accordance with internationally recognized ethical standards for research involving human participants, including the principles outlined in the Declaration of Helsinki.

Prior to data collection, formal permission was obtained from the relevant school administrations and the Ministry of National Education. Given that the participants were minors (secondary school students), informed consent was obtained from parents or legal guardians, and participation was strictly voluntary.

All participants were informed about the purpose of the study, their right to withdraw at any time without penalty, and the confidentiality of their responses. No identifying personal data were collected, and all responses were anonymized prior to analysis.

The study protocol adhered to institutional and national ethical guidelines for educational research. No procedures involving physical or psychological harm were applied.

Consent for Publication

Not applicable. The study does not include any individual person's identifiable data, images, or personal information.

Availability of Data and Materials

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request. Data sharing is subject to ethical considerations and institutional regulations regarding the protection of participant confidentiality.

Conflict of Interest

The author(s) declare that there are no competing interests or conflicts of interest that could have influenced the results or interpretation of this study.

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Ethical Statement

This study was conducted with full ethical approval from relevant educational authorities. Participation was voluntary, informed consent was obtained from parents/guardians, and all data were anonymized. The research complies with international ethical standards.

AI Use Statement

The authors declare that no generative artificial intelligence tools were used in the data collection, analysis, or interpretation stages of this research. AI tools were used only for language editing and formatting purposes, without affecting the scientific integrity of the study.

REFERENCES:

1. Abed, A., & Alkhateeb, H. (2001). Mathematics anxiety among eighth-grade students of the United Arab Emirates. *Psychological Reports, 89*(1), 65–66.
2. Alkan, V. (2011). Etkili matematik öğretiminin gerçekleştirilmesindeki engellerden biri: Kaygı ve nedenleri. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi, 29*, 89–107.
3. Arastaman, G. (2011). *Öğrenci yılmazlığına etki eden faktörlere ilişkin görüşler* (Doctoral dissertation, Ankara University).
4. Ashcraft, M. H., & Krause, J. A. (2007). Working memory, math performance, and math anxiety. *Psychonomic Bulletin & Review, 14*(2), 243–248.
5. Ashcraft, M. H., & Moore, A. M. (2009). Mathematics anxiety and the affective drop in performance. *Journal of Psychoeducational Assessment, 27*(3), 197–205.
6. Aslan, G. (2017). Öğrencilerin temel eğitimden ortaöğretime geçiş (TEOG) sınav başarılarının belirleyicileri: Okul dışı değişkenlere ilişkin bir analiz. *Eğitim ve Bilim, 42*(190), 211–236. <https://doi.org/10.15390/EB.2017.6847>
7. Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman.
8. Baştürk, S. (2012). Sınıf öğretmenlerinin öğrencilerin matematik dersindeki başarı ya da başarısızlığına atfettikleri nedenler. *Mehmet Akif Ersoy Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 4*(7), 105–118.

9. Betz, N. E. (1978). Prevalence, distribution, and correlates of math anxiety in college students. *Journal of Counseling Psychology, 25*(5), 441–448.
10. Bowd, A. D., & Brady, P. H. (2003). Gender differences in mathematics anxiety among preservice teachers. *Alberta Journal of Educational Research, 49*(1), 24–36.
11. Brewster, C., & Railsback, J. (2003). *Building trust with schools and diverse families*. Northwest Regional Educational Laboratory.
12. Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2012). *Bilimsel araştırma yöntemleri* (11th ed.). Pegem Akademi.
13. Call, K. T., & Mortimer, J. T. (2001). *Arenas of comfort in adolescence*. Lawrence Erlbaum.
14. Carey, E., Hill, F., Devine, A., & Szűcs, D. (2016). The chicken or the egg? The direction of the relationship between math anxiety and math performance. *Frontiers in Psychology, 6*, 1987.
15. Christensen, L. B., Johnson, R. B., & Turner, L. A. (2015). *Research methods, design, and analysis*. Am Publishing.
16. Comer, J. P., Haynes, N. M., Joyner, E. T., & Ben-Avie, M. (Eds.). (1996). *Rallying the whole village*. Teachers College Press.
17. Crosnoe, R. (2000). Friendships in childhood and adolescence. *Social Psychology Quarterly, 63*, 377–391.
18. Csikszentmihalyi, M., & Schneider, B. (2000). *Becoming adult*. Basic Books.
19. Cutrona, C. E., Cole, V., Colangelo, N., Assouline, S. G., & Russell, D. W. (1994). Perceived parental support and academic achievement. *Journal of Personality and Social Psychology, 66*(2), 369–378. <https://doi.org/10.1037/0022-3514.66.2.369>
20. Dew, K. M. H., Galassi, J. P., & Galassi, M. D. (1983). Mathematics anxiety: Some basic issues. *Journal of Counseling Psychology, 30*, 443–446.
21. Else-Quest, N. M., Hyde, J. S., & Hejmadi, A. (2008). Mother and child emotions during math homework. *Mathematical Thinking and Learning, 10*(1), 5–35.
22. Epstein, J. L. (1995). School/family/community partnerships. *Phi Delta Kappan, 76*(9), 701–712.
23. Fan, X., & Chen, M. (2001). Parental involvement and students' academic achievement. *Educational Psychology Review, 13*(1), 1–22.
24. Freiberg, M. (2005). Math anxiety in education. *Academic Exchange Quarterly, 9*(3), 7–11.
25. Fulkerson, K. F. (1984). Cognitions and performance in math-anxious students. *Journal of Counseling Psychology, 31*(3), 376–382.
26. Goddard, R. D., Tschannen-Moran, M., & Hoy, W. K. (2001). Teacher trust and student outcomes. *Elementary School Journal, 102*, 3–17.
27. Gurganus, S. P. (2007). *Math instruction for students with learning problems*. Pearson.
28. Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education, 21*(1), 33–46.
29. Hendel, D. (1980). Affective correlates of math anxiety. *Psychology of Women Quarterly, 5*(2), 219–230.
30. Henderson, A. T., & Mapp, K. L. (2002). *A new wave of evidence*. Southwest Educational Development Laboratory.
31. Hill, N. E., & Tyson, D. F. (2009). Parental involvement in middle school. *Developmental Psychology, 45*(3), 740–763.
32. Jeynes, W. H. (2012). A meta-analysis on parental involvement. *Urban Education, 47*(4), 706–742.
33. Katipoğlu, M., & Öncü, B. (2015). Students' perceptions of mathematics difficulty. *International Journal of Social Sciences and Education Research, 1*(4), 1357–1370.
34. Keçeci, T. (2011). Strategies to overcome math anxiety. In *International Conference on Education*.
35. Keklikçi, H. (2011). *Matematik korkuları üzerine bir araştırma* (Master's thesis).
36. Lazarus, M. (1974). Mathophobia: Personal perspectives. *National Elementary Principal, 53*(2), 16–22.
37. Levitt, M. J., Guacci-Franco, N., & Levitt, J. L. (1994). Social support and achievement. *Journal of Applied Developmental Psychology, 15*(2), 207–222.
38. Lussier, G. (1996). Predictors of math anxiety. *Psychological Reports, 79*(3), 827–833.
39. Ma, X. (1999). A meta-analysis of the relationship between anxiety and achievement in mathematics. *Journal for Research in Mathematics Education, 30*(5), 520–540.
40. Malecki, C. K., & Demaray, M. K. (2002). Measuring perceived social support. *Psychology in the Schools, 39*(1), 1–18.
41. Malecki, C. K., & Demaray, M. K. (2006). Social support as a buffer. *School Psychology Quarterly, 21*(4), 375–395.
42. McLoughlin, L. (2002). *Özel gereksinimli öğrencilerin ölçümlemesi* (4th ed.). Gündüz Eğitim.
43. Meadows, S. O., Brown, J. S., & Elder, G. H. (2006). Stress and support trajectories. *Journal of Youth and Adolescence, 35*, 89–99.
44. Milli Eğitim Bakanlığı. (2016a). *PISA 2015 Ulusal ön raporu*. MEB.
45. Milli Eğitim Bakanlığı. (2016b). *TIMSS 2015 ulusal raporu*. MEB.
46. Mullis, I. V. S., et al. (2016). *TIMSS 2015 international results*.

47. OECD. (2019). *PISA 2018 results*. OECD Publishing.
48. OECD. (2022). *PISA 2022 results*. OECD Publishing.
49. Özer, Y., & Aml, D. (2011). Structural equation modeling of achievement factors. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 41, 313-324.
50. Pekrum, R. (2006). The control-value theory of achievement emotions. *Educational Psychology Review*, 18(4), 315-341.
51. Pekrum, R., et al. (2011). Academic emotions and student engagement. *Contemporary Educational Psychology*, 36(1), 36-48.
52. Polat, Ş. (2018). School alienation and burnout. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 31(1), 257-277.
53. Ramirez, G., et al. (2018). Math anxiety: Past research, promising interventions. *Journal of Educational Psychology*, 110(3), 311-325.
54. Reusser, K. (2000). Success and failure in school mathematics. *European Child & Adolescent Psychiatry*, 9(2), 18-25.
55. Rueger, S. Y., et al. (2010). A meta-analytic review of perceived social support. *Psychological Bulletin*, 136(4), 637-660.
56. Ryan, A. M. (2001). The peer group as a context for development. *Educational Psychologist*, 36(2), 113-124.
57. Şenol, A., Dündar, S., Kaya, İ., Gündüz, N., & Temel, H. (2015). Teachers' views on math anxiety. *Journal of Theory & Practice in Education*, 11(2), 653-672.
58. Shields, D. J. (2005). Reducing math anxiety. *Academic Exchange Quarterly*, 9(3), 326-330.
59. Şimşek, Ö. F. (2007). *Yapısal eşitlik modellemesine giriş*. Ekinoks.
60. Stolpa, J. M. (2004). Math and writing anxieties. *Phi Kappa Phi Forum*, 84(3), 3-5.
61. Tobias, S. (1980). Math anxiety: What you can do. *Today's Education*, 69(3), 26-29.
62. Vinson, B. M. (2001). Mathematics anxiety in preservice teachers. *Early Childhood Education Journal*, 29(2), 89-94.
63. Wentzel, K. R. (1998). Social relationships and motivation. *Journal of Educational Psychology*, 90(2), 202-209.
64. Whyte, J. M. (2009). *Maths anxiety: The what, where, and how* (Master's thesis).
65. Yıldırım, İ. (2000). Predictors of academic achievement. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 18, 167-176.
66. Yüksel-Şahin, F. (2004). Math anxiety levels in students. *Eğitim Bilimleri ve Uygulama*, 3(5), 57-74.
67. Zambo, D., & Zambo, R. (2006). Assessing students' feelings about mathematics. *Mathematics Teaching in the Middle School*, 12(1), 14-17.