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Primary School Teachers' Attitudes Toward Mathematics Teaching, Mathematics Anxiety, and Beliefs About Their Ability to Use Technology

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Abstract

This study examines primary school teachers' mathematics teaching anxiety, mathematics anxiety, and beliefs about their technology use skills according to field of graduation, daily internet use duration, and professional seniority. The study adopted a quantitative correlational survey design and included 300 primary school teachers. The data were analyzed using descriptive statistics, independent-samples t-tests, one-way ANOVA, and Scheffé post hoc tests. The findings showed that teachers' mathematics teaching anxiety and mathematics anxiety did not differ significantly according to field of graduation, daily internet use duration, or professional seniority. However, teachers' beliefs about their technology use skills differed significantly across all three variables. Primary school teaching graduates reported stronger beliefs about their technology use skills than graduates of other teaching programs. Teachers who used the internet for longer periods each day reported stronger technology-related skill beliefs. Moreover, teachers with more than 16 years of professional seniority reported lower technology-related skill beliefs than teachers in the 0–8-year and 8–16-year seniority groups. These results indicate the need for practice-oriented professional development that strengthens pedagogically meaningful technology integration and supports experienced teachers' technology use skills.

Keywords: Anxiety, mathematics, primary school teachers, teaching, technology use skills.

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1. INTRODUCTION

Education seeks not only to provide individuals with basic skills but also to prepare them to contribute to society through analytical thinking, entrepreneurship, critical perspectives, and problem-solving skills (Ministry of National Education [MoNE], 2018). In this context, mathematics is one of the most fundamental subjects because it aims to equip individuals with the knowledge and skills required for the future and to foster problem solving and the modes of thinking associated with problem-solving approaches (Yıldırım et al., 2006). Mathematics teaching stands out as an instructional process that enables individuals to understand mathematical concepts, develop problem-solving skills, and use this knowledge effectively in daily life (Altun, 2008). Whereas computational and procedural skills once occupied the foreground in mathematics teaching, skills such as problem solving, reasoning, estimation, and pattern recognition now receive greater emphasis (Toluk & Olkun, 2009). Kanbir (2009) states that although mathematics plays an important role in every aspect of life, many people still distance themselves from this field because of its perceived difficulty and emphasizes that one of the major problems in mathematics is the anxiety students experience.

Mathematics anxiety is defined as an irrational sense of worry that emerges while working with numbers in daily or academic contexts, solving mathematical problems, or engaging with mathematics more generally, as well as a self-esteem-damaging reaction to situations related to mathematics (Deniz & Üldaş, 2008). Peker and Şentürk (2012) state that mathematics anxiety is a process that continues from primary school to university. Blazer (2011) emphasizes that students who experience mathematics anxiety take fewer mathematics courses and receive lower grades in these courses, and therefore learn less mathematics than their peers with lower levels of anxiety. Students with high mathematics anxiety appear to have difficulty understanding the topics taught in class, and the fact that this situation results in failure appears to be a natural consequence of anxiety (Bakkaloğlu & Toptaş, 2019). Yenihayat (2007) states that the effects of mathematics anxiety lead to low academic achievement in the short term and to avoidance of mathematics courses and a decline in self-efficacy beliefs in the long term. Üldaş (2005) further states that the consequences of mathematics anxiety are also important in terms of career choice and future planning.

Technology directly influences the processes of teaching, learning, and educational planning today and plays an important role in education (Erdoğan & Mutluoğlu, 2016). Twenty-first-century students are described as digital natives, and their command of technology is considered to be quite high (Schrum & Levin, 2009). For this reason, integrating technology into educational processes is regarded as a necessity. In mathematics teaching, the use of technology should not be viewed separately from traditional paper-and-pencil methods and should instead be considered a complementary element (Drijvers et al., 2010).

Mishra and Koehler (2006) emphasize that the use of technology in education should not remain limited to technical knowledge and that teachers should also possess adequate knowledge of mathematics and mathematics teaching. However, some scholars argue that technology use in education has not yet been grounded in a sufficiently strong theoretical foundation (Buckingham, 2013). Even so, technology-supported instruction is reported to provide substantial support for teachers, especially in mathematics lessons involving abstract concepts (Topçu, 2020). In addition, technology-based instruction can help reduce students' mathematics anxiety, increase their self-confidence, and improve their academic achievement (Alakoç, 2003).

Educational processes become more effective and efficient when lessons are supported by technology and when appropriate learning environments are created for this purpose (Adıgüzel & Yüksel, 2012; Laurens et al., 2018; Turan-Güntepe, 2020). In this regard, mathematics stands out as one of the most important subjects to be integrated with technology during instruction (Akkoç & Yeşildere-İmre, 2015). Research also supports this view and highlights the need for effective technology use in mathematics classrooms (National Council of Teachers of Mathematics [NCTM], 2000).

The rapid integration of technology into everyday life has led to significant changes in both the development of new generations of children and the education system (Metin, 2018). Traditional approaches to education have evolved into a multidimensional and multichannel model with the introduction of new technological tools (Oğuz et al., 2004). Technology refers to the set of solutions that scientific knowledge offers to facilitate, improve, and support human life (Kalelioğlu, 2015). Technological devices such as smartphones, tablets, and navigation systems, which have become an integral part of daily life, are also widely used in education (Babacan & Şaşmaz Ören, 2017). Educational technologies are regarded as tools that support the learning process and aim to help students acquire desired behaviors (Sönmez, 2015). These technologies enrich learning environments and improve the quality of instruction (Kuzgun & Özdinç, 2017).

Integrating technology into educational processes from an early age is regarded as a major necessity for enabling individuals to adapt to society (Olkun & Toluk Uçar, 2012). Research shows that when technology is used effectively in education, students develop more positive attitudes toward mathematics and a positive classroom climate emerges (Higgins et al., 2012; Ruthven & Hennessy, 2002). Given the convenience that technology provides in human life, the use of technology in educational processes clearly appears to be inevitable (Aydın, 2005). Technology makes its presence felt not only in education but also in every aspect of daily life. People live in constant interaction with technology at home, in the workplace, and at school (Daşdemir et al., 2012).

Teachers' successful integration of technology into their classrooms has become one of the most important issues in teacher education (Lee & Lee, 2014). Educational standards and curricula emphasize the impact of technology on learning and draw particular attention to the necessity of technology integration in mathematics education (MoNE, 2018). In this study, the main problem and sub-problems were formulated as follows in order to examine the relationship among primary school teachers' attitudes toward mathematics teaching, mathematics anxiety levels, and beliefs about their technology use skills.

- Do primary school teachers' beliefs about their ability to use technology differ according to professional seniority, type of degree program completed, and daily duration of technology use?

- Do primary school teachers' mathematics anxiety levels differ according to professional seniority, type of degree program completed, and daily duration of technology use?
- Do primary school teachers' attitudes toward mathematics teaching differ according to professional seniority, type of degree program completed, and daily duration of technology use?

2.METHOD

2.1. Research Model

This study employed the correlational survey model, one of the quantitative research methods, to examine the relationship among primary school teachers' attitudes toward mathematics teaching, mathematics anxiety levels, and beliefs about their ability to use technology. The correlational survey model refers to research models that aim to determine the presence or degree of covariation between two or more variables (Karasar, 2016). In this context, the model allowed the study to investigate primary school teachers' attitudes toward mathematics teaching, mathematics anxiety levels, and beliefs about their ability to use technology.

2.2. Study Sample

The population of the study consisted of primary school teachers working in the Central Anatolia Region. The study collected data from primary school teachers by using the convenience sampling method. The sample consisted of 300 primary school teachers who voluntarily responded to the questionnaires distributed online during the 2024–2025 academic year. Ethical approval for the study was obtained from the Social and Human Sciences Scientific Research and Publication Ethics Committee of the related university (No. 20251121).

2.3. Data Collection Process

Within the scope of the study, four different measurement instruments were used simultaneously to determine the relationship among primary school teachers' attitudes toward mathematics teaching, mathematics anxiety levels, and beliefs about their ability to use technology. These instruments were the Personal Information Form, the Basic Competencies of Teachers in Technology Use Scale, the Mathematics Anxiety Scale for Teachers (M-MAS), and the Mathematics Teaching Anxiety Scale for Primary School Teachers.

The Personal Information Form included four closed-ended questions designed to determine the department from which the teachers graduated, their daily internet use duration, and their professional seniority. All data related to the study were collected through secure online platforms in order to avoid putting participants' health at risk.

2.4. Data Collection Tools

The Mathematics Anxiety Scale for Teachers (M-MAS), developed by Yıldırım and Gürbüz (2017) to determine teachers' mathematics anxiety levels, is a five-point Likert-type scale consisting of 33 items and 5 factors. In this scale, teachers evaluate the statements on a continuum ranging from strongly disagree to strongly agree. Eleven items are positively worded, whereas 22 items are negatively worded. Based on the validity and reliability studies conducted by the researchers, the Cronbach's alpha internal consistency coefficient for the overall scale was .90.

The Mathematics Teaching Anxiety Scale for Primary School Teachers, developed by Sarı (2014) to determine teachers' mathematics teaching anxiety, is a five-point Likert-type scale consisting of 23 items and 3 factors. In this scale, teachers evaluate the statements on a continuum ranging from never to always. All items are negatively worded. The researcher conducted the validity and reliability studies of the scale and calculated the Cronbach's alpha internal consistency coefficient as .89.

The Basic Competencies of Teachers in Technology Use Scale, developed by Tuti and Çolak Seymen (2023) to determine teachers' basic competencies in technology use, is a five-point Likert-type scale consisting of 28 items and 3 factors. In this scale, teachers evaluate the statements on a continuum ranging from strongly disagree to strongly agree. All scale items are positively worded. The researchers conducted the validity and reliability studies of the scale and calculated the Cronbach's alpha internal consistency coefficient as .96.

2.5. Data Analysis

The analysis of the data obtained from the scales administered to teachers used descriptive statistics, parametric tests, and correlational statistics. An examination of the study data showed that the Kolmogorov–Smirnov values indicated normal distribution for the Basic Competencies of Teachers in Technology Use Scale and the Mathematics Anxiety Scale for Teachers, whereas the Mathematics Teaching Anxiety Scale for Primary School Teachers did not show normal distribution. Based on these results, the Skewness and Kurtosis values were examined and found to range from -.712 to 1.318. In light of the views of Tabachnick and Fidell (2013), who accept values between -1.5 and +1.5, the study data were accepted as normally distributed. Within this scope, an independent-samples t test, one of the parametric tests, was used to examine the department from which the teachers graduated in order to determine differences in teachers' technology competencies and their mathematics and mathematics teaching anxiety levels. A one-way ANOVA was also conducted to examine professional seniority and daily internet use duration, both of which consisted of more than two groups.

3. RESULTS

The findings obtained in this study, which aimed to determine primary school teachers' mathematics teaching anxiety, mathematics anxiety levels, and beliefs about their technology use skills, are presented below.

3.1. Findings on Teachers' Mathematics Teaching Anxiety Levels

The following section presents the findings on teachers' mathematics teaching anxiety levels in relation to field of graduation, daily internet use duration, and professional seniority.

Table 1. *Independent-samples t-test results for teachers' mathematics teaching anxiety levels by field of graduation*

Field of graduation	N	M	SD	df	t	p	Cohen's d
Primary school teaching	260	55.61	15.69	298	-.294	.769	0.049
Other teaching programs	40	56.40	15.94				

As shown in Table 1, teachers' mathematics teaching anxiety did not differ significantly by field of graduation. The mean score of graduates from other teaching programs on the Mathematics Teaching Anxiety Scale (M = 56.40) was higher than that of primary school teachers (M = 55.61). However, this difference was not statistically significant (t = -.294, p > .05, Cohen's d = 0.049). These results indicate that mathematics teaching anxiety levels do not differ significantly according to field of graduation.

Table 2. *One-way ANOVA results for teachers' mathematics teaching anxiety levels by daily internet use duration*

	Sum of Squares	df	Mean Square	F	p	Eta-squared
Between Groups	813.155	2	406.577	1.6550	.193	0.011
Within Groups	72961.325	297	245.661			
Total	73774.480	299				

As shown in Table 2, teachers' mathematics teaching anxiety levels did not differ significantly according to daily internet use duration ($F_{(2, 297)}$ = 1.655, p > .05, eta-squared = 0.011). This finding indicates that teachers' mathematics teaching anxiety levels do not vary significantly according to their daily internet use duration.

Table 3. *One-way ANOVA results for teachers' mathematics teaching anxiety levels by professional seniority*

	Sum of Squares	df	Mean Square	F	p	Eta-squared
Between Groups	193.453	2	96.726	.390	.677	0.002
Within Groups	73581.027	297	247.748			
Total	73774.480	299				

As shown in Table 3, teachers' mathematics teaching anxiety levels did not differ significantly according to professional seniority ($F_{(2, 297)}$ = 0.390, p > .05, eta-squared = 0.002). This finding indicates that teachers' mathematics teaching anxiety levels do not vary significantly according to their professional seniority.

3.2. Findings on Teachers' Mathematics Anxiety Levels

Findings regarding teachers' mathematics anxiety levels by field of graduation, daily internet use duration, and professional seniority are presented below.

Table 4. Independent-samples t-test results for teachers' mathematics anxiety levels by field of graduation

Field of graduation	N	M	SD	df	t	p	Cohen's d
Primary school teaching	260	75.61	17.95	298	-1.770	.078	0.281
Other teaching programs	40	81.15	21.30				

As shown in Table 4, teachers' mathematics anxiety did not differ significantly by field of graduation. The mean score of graduates from other teaching programs on the Mathematics

Anxiety Scale (M = 81.15) was higher than that of primary school teachers (M = 75.61). However, this difference was not statistically significant (t = -1.770, p > .05, Cohen's d = 0.281).

Table 5. *One-way ANOVA results for teachers' mathematics anxiety levels by daily internet use duration*

	Sum of Squares	df	Mean Square	F	p	Eta-squared
Between Groups	454.402	2	227.201	.663	.516	0.004
Within Groups	101763.848	297	342.639			
Total	102218.250	299				

As shown in Table 5, teachers' mathematics anxiety levels did not differ significantly according to daily internet use duration ($F_{(2, 297)}$ = 0.663, p > .05, eta-squared = 0.004). This finding indicates that teachers' mathematics anxiety levels do not vary significantly according to their daily internet use duration.

Table 6. *One-way ANOVA results for teachers' mathematics anxiety levels by professional seniority*

	Sum of Squares	df	Mean Square	F	p	Eta-squared
Between Groups	575.560	2	287.780	.841	.432	0.005
Within Groups	101642.690	297	342.231			
Total	102218.250	299				

As shown in Table 6, teachers' mathematics anxiety levels did not differ significantly according to professional seniority ($F_{(2, 297)}$ = 0.841, p > .05, eta-squared = 0.005). This finding indicates that teachers' mathematics anxiety levels do not vary significantly according to their professional seniority.

3.3. Findings on Teachers' Beliefs About Their Technology Use Skills

Presented below are the findings on teachers' beliefs about their technology use skills with respect to field of graduation, daily internet use duration, and professional seniority.

Table 7. *Independent-samples t-test results for teachers' beliefs about their technology use skills by field of graduation*

Field of graduation	N	M	SD	df	t	p	Cohen's d
Primary school teaching	260	111.65	17.01	298	2.873	.004	0.469
Other teaching programs	40	103.22	18.83				

As shown in Table 7, teachers' beliefs about their technology use skills differed significantly by field of graduation. The mean score of primary school teachers on the relevant scale (M = 111.65) was higher than that of graduates from other teaching programs (M = 103.22). This difference was statistically significant (t = 2.873, p < .05, Cohen's d = 0.469).

Table 8. *One-way ANOVA results for teachers' beliefs about their technology use skills by daily internet use duration*

	Sum of Squares	df	Mean Square	F	p	Eta-squared
Between Groups	4734.011	2	2367.005	8.123	.001	0.051
Within Groups	86546.776	297	291.403			
Total	91280.787	299				

As shown in Table 8, teachers' beliefs about their technology use skills differed significantly according to daily internet use duration ($F_{(2, 297)}$ = 8.123, p = .001, eta-squared =

0.051). This finding indicates that teachers' beliefs about their technology use skills vary significantly according to their daily internet use duration. To determine the source of the significant difference, the Scheffé post hoc test was conducted. The results are presented in Table 9.

Table 9. *Scheffé test results for teachers' beliefs about their technology use skills by daily internet use duration*

(I) Daily internet use duration	(J) Daily internet use duration	Mean Difference (I-J)	Standard Error	p	Source of Difference
1) 1-8 hours	2)8-15 hours	-5.92150*	2.34243	.042	1<2,3
	3)15+ hours	-9.93217*	2.49693	.001	
2) 8-15 hours	1)1-8 hours	5.92150*	2.34243	.042	2>1
	3)15+ hours	-4.01067	2.43952	.260	
3) 15+ hours	1)1-8 hours	9.93217*	2.49693	.001	3>1
	2)8-15 hours	4.01067	2.43952	.260	

As shown in Table 9, teachers who used the internet for 1-8 hours per day had significantly lower scores for beliefs about their technology use skills than those who used the internet for 8-15 hours (Mean Difference = -5.921, $p = .042$) and those who used it for 15+ hours (Mean Difference = -9.932, $p = .001$). On the other hand, the difference between teachers who used the internet for 8-15 hours and those who used it for 15+ hours was not significant (Mean Difference = -4.010, $p = .260$). These results indicate a positive relationship between teachers' daily internet use duration and their scores for beliefs about their technology use skills. In other words, as daily internet use duration increases, scores for beliefs about their technology use skills also increase.

Table 10. *One-way ANOVA results for teachers' beliefs about their technology use skills by professional seniority*

	Sum of Squares	df	Mean Square	F	p	Eta-squared
Between Groups	9339.793	2	4669.897	16.926	<.001	0.102
Within Groups	81940.993	297	275.896			
Total	91280.787	299				

As shown in Table 10, teachers' beliefs about their technology use skills differed significantly according to professional seniority ($F_{(2, 297)} = 16.926$, $p < .001$, eta-squared = 0.102). This finding indicates that teachers' beliefs about their technology use skills vary significantly according to their professional seniority. To determine the source of the significant difference, the Scheffé post hoc test was conducted. The results are presented in Table 11.

Table 11. *Scheffé test results for teachers' beliefs about their technology use skills by professional seniority*

(I) Professional seniority	(J) Professional seniority	Mean Difference (I-J)	Standard Error	p	Source of Difference
1) 0-8 years	2)8-16 years	-.98736	2.69747	.935	1>3
	3)16+ years	11.33386*	2.12727	<.001	
2) 8-16 years	1)0-8 years	.98736	2.69747	.935	2>3
	3)16+ years	12.32123*	2.80362	<.001	
3) 16+ years	1)0-8 years	-11.33386*	2.12727	<.001	3<1,2
	2)8-16 years	-12.32123*	2.80362	<.001	

As shown in Table 11, teachers with more than 16 years of professional seniority had significantly lower scores for beliefs about their technology use skills than teachers with 0-8 years of seniority (Mean Difference = 11.333, $p < .001$) and those with 8-16 years of seniority (Mean Difference = 12.321, $p < .001$). On the other hand, the difference between teachers with 0-8 years of seniority and those with 8-16 years of seniority was not significant (Mean Difference = -.987, $p = .935$). These results indicate a positive relationship between teachers' professional seniority and their scores for beliefs about their technology use skills. In other words, as professional seniority increases, beliefs about their technology use skills also become stronger.

4. DISCUSSION, CONCLUSION AND SUGGESTIONS

The absence of a significant difference in mathematics teaching anxiety and mathematics anxiety across undergraduate programs should be interpreted cautiously. Although this finding supports Doruk and Kaplan (2013), it does not necessarily mean that undergraduate preparation is irrelevant to anxiety. Rather, the result may suggest that variation within programs is greater than variation between programs, particularly when teachers’ individual experiences, perceived competence, and professional support are taken into account. Ceylan’s (2019) finding that preservice primary school teachers reported low anxiety levels may reflect differences in sample characteristics or in the balance between theoretical coursework and practical teaching experiences. A more nuanced interpretation, therefore, is that the quality, intensity, and applicability of mathematics-related preparation may matter more than program category itself.

Daily internet use duration also did not produce a significant difference in either teachers’ mathematics teaching anxiety or mathematics anxiety levels. This result supports Yıldırım’s (2013) argument that internet or technology use does not directly determine anxiety. In contrast, Alakoç (2003) emphasized that technology-supported instruction may reduce mathematics anxiety and enhance self-confidence. Taken together, these findings suggest that the pedagogical purpose and quality of internet use may be more influential than the amount of time spent online. For this reason, practical training that helps teachers use the internet effectively for lesson preparation, material development, and instructional support appears to be important.

Professional seniority likewise did not differentiate teachers’ mathematics teaching anxiety or mathematics anxiety in a statistically significant manner. Although Ceylan (2019) and Yıldırım (2013) suggested that increasing experience may contribute to lower anxiety, the present finding indicates that years of service alone may not be sufficient to explain anxiety levels. It is possible that the quality of professional experience, rather than its duration, plays a more decisive role in shaping teachers’ confidence and anxiety in mathematics-related instruction. In addition, shared curricular demands, classroom challenges, and school-based expectations may lead teachers at different career stages to experience similar levels of anxiety. This result points to the importance of sustained professional support, including mentoring, anxiety management, and practice-based instructional training, particularly for teachers who need stronger support in developing confidence in mathematics teaching.

A different pattern appeared in relation to technology use skills. Primary school teachers demonstrated higher technology use skills than graduates of other teacher education programs. This result is consistent with Drijvers et al. (2010), who reported that technology integration contributes positively to the instructional process. In contrast, Buckingham (2013) criticized the use of technology in education on the grounds that it does not rest on a sufficiently strong theoretical foundation. Within this framework, the present finding may reflect not only access to technology but also teachers' personal motivation and prior experiences with technological tools. Expanding in-service training that addresses technology integration from a pedagogical perspective may therefore be important.

As daily internet use increased, teachers' technology use skills also increased. This result is in line with Eyyam and Yaratan (2014), who stated that technology use positively influences teachers' classroom practices. However, Buckingham (2013) noted that intensive internet use may also lead to negative consequences such as distraction. What seems to matter here is not merely the duration of internet use but whether such use is regular and oriented toward instructional purposes. Guidance and practice-based support programs may help teachers use the internet more efficiently and in ways that better serve pedagogical goals. This interpretation gains further support from the finding that teachers who used the internet for 1 to 8 hours had significantly lower technology skill scores than those who used it for 8 to 15 hours and those who used it for more than 15 hours. Laurens et al. (2018) emphasized that technology integration develops through regular use and experience. Taken together, these findings suggest that regular internet use for instructional purposes may contribute to the development of technology-related skills. Seminars and practice-oriented training designed to help teachers establish planned and sustainable technology use habits may therefore be beneficial.

Professional seniority also produced a meaningful difference in technology use skills. Teachers with 16 or more years of experience scored lower than those with 0 to 8 years and 8 to 16 years of experience. This finding corresponds with the view of Schrum and Levin (2009), who emphasized that younger teachers may adopt technology more quickly and show greater affinity for digital tools. On this basis, needs-based and practice-oriented in-service training programs appear especially important for supporting the technology use skills of teachers with longer professional experience.

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