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CLASSROOM TEACHERS' ARTIFICIAL INTELLIGENCE COMPETENCIES AND THE USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN MATHEMATICS TEACHING

Yasemin DERINGÖL, Elif ERBAŞ, Behiye AKÇAY

Abstract: Classroom teachers must realize instructional adaptations supported by artificial intelligence technologies in effective mathematics teaching practices. Based on this importance, the study aims to determine the artificial intelligence competencies of classroom teachers and the status of artificial intelligence technology-supported instruction in mathematics teaching practices. The study group consists of 320 teachers working in primary schools. The research was conducted using a mixed method, in which quantitative and qualitative research were conducted together. "Classroom Teacher Information Form" and "Teachers' Artificial Intelligence Competencies Scale" were used for the quantitative dimension, and "Semi-Structured Interview Form" which was finalized by taking expert opinion, was used for the qualitative dimension. The obtained data was analyzed using SPSS, LISREL, and MAXQDA. When the quantitative and qualitative results are evaluated together, the fact that the artificial intelligence competencies of the classroom teachers are at a medium level also coincides with the positive and negative ideas they put forward when using artificial intelligence in teaching mathematics in the qualitative data. Although the number of classroom teachers who received artificial intelligence training is low, the number of those who use artificial intelligence in their profession, especially in teaching mathematics, is higher. They have higher competencies in terms of scores, and at the same time, a compatible model (SEM) has been created.

Key Words: Artificial Intelligence, Artificial Intelligence Competencies, Mathematics, Primary School Mathematics Teaching.

1. Introduction

The rapid advancement of technology has brought about a significant transformation that has profoundly affected the world and has become an integral part of human life. Digitalization and the rise of artificial intelligence (AI) technologies have radically changed how individuals live and think. In parallel with this change, AI has been widely used in many fields, such as health, finance, engineering, and education. At the same time, advances in machine learning, natural language processing, and computer vision have enabled AI to be used more effectively in educational processes (Jiang et al., 2022).

The development of AI and ML techniques has not only transformed teaching processes but also reshaped the role of educators. In this context, the teaching profession has also been highly affected by the advancement of AI-based systems (Polat et al., 2024). Because it offers individualized learning opportunities, AI stands out as a critical element that increases the effectiveness of education and training processes (Chiu, 2023). In addition, technologies such as adaptive learning platforms, natural language processing (NLP)-based tutoring systems, and automated assessment tools are among the leading components of the use of AI in education (Luckin et al., 2016).

Today, AI has created many educational opportunities (Li et al., 2024). AI has much potential to improve students' academic performance and to enable teachers to provide personalized education to students (Adiguzel, Kaya, & Cansu, 2023). 2023). Global education systems lean towards a more

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personalized and student-centered approach (Bhutoria, 2022). Personalized education involves providing feedback for learning optimization after predicting students' performance and analyzing their learning profiles. AI-based systems, on the other hand, provide customized learning experiences, allowing students to learn according to their optimized needs (Holmes, Bialik, & Fadel, 2019).

According to the Diffusion of Innovation (DOI) Theory, the adoption of innovations involves a process in which individuals seek and process information to reduce uncertainty about its benefits and disadvantages. This process has five stages: information, persuasion, decision, implementation, and approval. DOI theory also categorizes adopters into five groups: innovators, early adopters, early majority, late majority, and laggards. Innovators are risk-takers who adopt new ideas, while early adopters are influential role models. The early majority cautiously adopt innovations and align them with practical realities, while the late majority are skeptical and require widespread adoption before acceptance.

On the other hand, laggards are resistant to change and prefer traditional methods (Rogers, 1995). According to this theory, it is crucial to determine the status of practitioners in this context. Teachers play an essential role in successfully implementing AI in schools as they act as intermediaries between schools' AI policies and students' needs (Felix, 2020). AI systems that analyze student performance and identify areas of deficiency enable teachers to provide more effective interventions (Zawacki-Richter et al., 2019). Furthermore, AI-powered chatbots and virtual tutors support the learning process by providing instant feedback to students (Woolf, 2020). As AI increasingly impacts education, it is essential to track teachers' perceptions and interactions with these technologies (Oved & Alt, 2025). Moreover, while AI-enabled tools can act like teachers by effectively and efficiently supporting certain aspects of children's learning, they cannot replace human characteristics that cannot be fully simulated or replicated, such as emotional support and social interaction (Chen & Lin, 2024). Undoubtedly, AI can facilitate specific tasks and provide valuable support, but it should not overshadow the unique qualities that only educational institutions possess.

AI applications have great potential to help generate meaningful content from datasets to enhance students' learning effectiveness. Integrating AI-supported tools in education has received widespread attention due to its potential to increase student engagement and encourage critical thinking (Wu & Ho, 2025). From designing study materials customized to the specific learning needs of a particular student to developing and evaluating customized study materials, from simulating and answering a student's questions about an instructor's possible teaching barriers to simulating and answering a student's questions, the application of data has penetrated deep enough into the education system to change its shape and structure significantly. In any case, it is recognized that the potential benefits may outweigh these concerns, making unethical use of ChatGPT challenging to control (Li et al., 2024).

Despite all its benefits, the use of AI in education has also raised important ethical and practical issues (Adiguzel, Kaya, & Cansu, 2023). Issues such as ethical dimensions of AI in education, data confidentiality, and student privacy are among the critical areas of debate (Selwyn, 2021). While AI offers promising opportunities for solving significant problems in education and society (Cowls et al., 2021), it also leads to reflections on its unintended consequences and risks (Nguyen et al., 2023). Studies have shown that as an innovation, the internet provides young people with greater ease in cheating and plagiarism. Academic cheating is not new; it has existed in educational institutions for centuries (Ghiațău et al., 2021). In educational institutions, teachers' difficulty identifying AI-generated content in evaluating students' original work poses a serious risk to academic ethics. Using AI-generated texts to cheat on assignments poses complex problems for educators because AI-generated material is challenging to detect, unlike more typical forms of cheating, such as plagiarism (Uyak et al., 2022). According to Hagendorff (2020), AI ethics often fails and falls short of ethical principles. Therefore, establishing regulations on AI ethics and developing ethical principles is a critical requirement to ensure this technology's reliable and fair use.

Furthermore, the legitimacy of AI-generated text and the fairness of grading are other issues that arise with using AI-generated material. Further research is needed on identifying AI-generated texts and aligning such content with academic standards. The ethical integration of AI into education and research requires a concerted effort to ensure that these technologies benefit society fairly and responsibly (Contreras & Jaimes, 2024). It is also observed that existing regulations and standards on

AI ethics are insufficient. In this context, the issue of how AI can be used more efficiently and safely in education should be increasingly studied in academic circles.

In the 21st century, it is essential to have a vision of the changes that need to occur in science and mathematics to become the informed and literate citizens we need and rise to world standards (NCTM, 2000). Fundamental disciplines such as mathematics are central in developing AI technologies as a resource and user. This relationship creates a bidirectional interaction between digital transformation and mathematics. AI algorithms provide innovative solutions to complex mathematical problems and enable students to develop mathematical thinking skills through personalized learning experiences. On the other hand, the fact that AI technologies are based on mathematical knowledge increases the importance of this discipline in education. It necessitates restructuring to meet the needs of the age (Kara, 2024). Recent research on mathematics and AI shows that AI-based learning tools significantly improve students' comprehension and problem-solving skills (Baker et al., 2019). One of the main benefits of AI in mathematics education is individualized learning (Opesemowo et al., 2024). AI tools, especially in abstract and challenging areas such as mathematics education, contribute to creating adaptive learning environments that consider students' learning differences. In mathematics education, AI offers new solutions with the potential for students to learn and teachers to teach (Opesemowo & Ndlovu, 2024). In this context, innovative applications such as AI-supported intelligent tutoring systems and game-based learning platforms enrich students' learning experiences in primary mathematics education and contribute to a deeper understanding of mathematical concepts. Integrating AI into mathematics education offers promising advances and potential pitfalls (Opesemowo & Ndlovu, 2024). It is critical to support teachers to ensure the informed use of technology tools and resources to access rich and meaningful mathematics (Association of Mathematics Teacher Educators [AMTE], 2022). In Turkey, as in the rest of the world, AI applications in elementary mathematics education are becoming increasingly important to improve students' mathematical skills and personalize their learning processes. AI has enabled students to develop and enhance mathematical and cognitive skills in learning (Mohamed et al., 2022). Building a solid mathematical foundation in education is vital for nurturing mathematical interests and competencies.

Technological tools are thought to help teachers improve their teaching strategies (NCTM, 2000). In this context, it is necessary to support teachers in using technology to improve their mathematical content knowledge and to enable the development of new methodologies in educational processes. Integrating AI into teaching processes enables teachers to provide more effective teaching by supporting them with digital tools. It allows students to encounter content appropriate to their learning pace (Uyak et al., 2023). Furthermore, Van Vaerenbergh and Pérez-Suay (2021) classified the AI systems used in mathematics education and examined the integration of existing technologies into educational practices. These studies provide important insights into how AI can be used effectively in elementary mathematics education. They also reveal that teachers' familiarity with AI technologies is one of the key factors influencing their level of adoption (Kurshumova, 2024).

2018, the OECD announced the "Future of Education and Skills 2030" project, bringing countries together to develop education policies. As a result of the International Summit on the Teaching Profession organized in this context, the report titled Redesigning Education, Developing Potential was published (OECD, 2024). The report highlights the importance of identifying the needs of a changing and transforming world. To respond to these needs, it is emphasized that the requirements of the new era should develop teaching methods and assessment strategies.

When we look at the studies conducted in the literature; studies on the use of artificial intelligence in mathematics (Eker, Halıcı Gurbuz, 2024; Heng & Tabunshchyk, 2021; Voskoglou & Salem, 2020; Zhang & Aslan, 2021) and studies on interviews with classroom teachers on (AI Acet et al., 2024; Akkol, & Balkan, 2024; Aksakal, Emre, & Özbek, 2024; Arı, 2024; Cojean et al., 2023; Erol, & Erol, 2024; Seyrek et al., 2024; Uyak et al., 2024). However, this research aims to examine the opinions and experiences of classroom teachers on the use of artificial intelligence in mathematics teaching on behalf of their competencies in using artificial intelligence and, at the same time, the integration of AI-supported teaching practices into educational processes to make a more in-depth examination. In this context, the questions related to the purpose of the research are as follows:

- How are the artificial intelligence competencies of classroom teachers?

- Do classroom teachers' artificial intelligence competencies differ according to gender?
- Do the artificial intelligence competencies of classroom teachers differ according to various variables (seniority, whether they receive artificial intelligence training, whether they use artificial intelligence in their profession)?
- Do the artificial intelligence competencies of classroom teachers differ according to their use in mathematics teaching?
- Is there a relationship between the "Practice and instruction (PI)" scale sub-dimension and the other dimensions and the overall scale?
- How is the fit of the structural model designed to test the direct and indirect effects of primary school teachers' artificial intelligence training and their use of artificial intelligence technologies in mathematics teaching on their artificial intelligence competencies?
- What are classroom teachers' opinions on using artificial intelligence technologies in mathematics teaching?

2. Method

2.1. Model of Research

This mixed-method research was conducted to obtain the opinions of classroom teachers about their artificial intelligence competencies and their use of artificial intelligence in mathematics teaching. Its approach is a convergent parallel mixed method. In the convergent parallel mixed method, the researcher analyzes qualitative and quantitative data by considering them as a combination, analyzes the data separately, and compares whether they confirm each other (Creswell, 2015). The quantitative part of the research consists of the scale applied to determine the artificial intelligence competencies of classroom teachers, and the qualitative part of the research consists of semi-structured interviews with teachers selected to use artificial intelligence in mathematics teaching. In data collection, survey design was preferred in the quantitative dimension, and case study design, one of the qualitative research designs, was chosen in the qualitative dimension.

2.2. Research Group

The criterion sampling method was applied from the purposive sampling method while determining the study group. Purposive sampling alternatively ensures that information on the subject is recorded in detail (Patton, 2014). In this context, the research group comprises primary school 1st-4th grade teachers working in Turkey's private and public primary schools. Teachers working in private and public primary schools in Turkey. In addition, primary school 1st-4th grade teachers who had used artificial intelligence technologies in mathematics teaching lessons were selected from this group for the interviews. Demographic information of the participants is given in Table 1.

Table 1. *Gender of primary school teachers*

Gender	***f***	***%***
Male	99	30.9
Female	221	69.1
Total		100.0

30.9 % of primary school teachers participating in the research are male (N: 99), and 69.1% (N: 221) are female. The perception and conclusion that most of the teachers who provide teaching services to younger students, such as preschool and classroom teaching, are women have been the subject of many studies (Smedley, 2007). In Turkey, teaching is perceived and chosen as a female profession. As seen in this research, most primary school teachers are female. For the semi-structured interview, 12 classroom teachers, 5 of whom were male and 7 of whom were female, were selected among the 12 classroom teachers who used artificial intelligence in mathematics teaching.

2.3. Data Collection Tools

This study used the Classroom Teacher Information Form, Teachers' Artificial Intelligence Competencies Scale" (TAICS), and Semi-structured Interview Form prepared by the researchers as

data collection tools.

Classroom Teacher Information Form: This form consists of demographic information about the teachers and some questions that were developed by the researchers and thought to contribute to the research. These questions are: "Have you received artificial intelligence training?" "Do you use artificial intelligence in your profession?" "Do you use artificial intelligence in mathematics teaching?"

Teachers' Artificial Intelligence Competencies Scale" (TAICS): In this study, the Teachers' Artificial Intelligence Competencies Scale" (TAICS) was used for the quantitative dimension. This scale, developed by Görgülü et al. (2025) with Chat GPT 4, consists of 5 dimensions and 33 items. "Basic Knowledge and Concepts (BKC)," "Practice and Instruction (PI)," "Ethics and Safety (ES)," "Communication and Assessment (CA)," and "Innovative and Openness to Learning (IOL)." A minimum of 33 and a maximum of 165 points are received. The reliability coefficient of the scale was .98, and in this study, the reliability coefficient was found to be .96.

Semi-Structured Interview Form: Literature on the subject was reviewed. Participant views were obtained using a semi-structured interview form. The reason for choosing the interview method is that it provides effective results in conveying the participants' experiences (King & Horrocks, 2010). The interview form was finalized by the researchers after receiving expert opinions and making the necessary corrections. To make a deeper evaluation within the scope of the research, online interviews were conducted with volunteer teachers who used artificial intelligence in mathematics teaching. Some examples of semi-structured interview questions prepared by the researchers are given below.

- What are the opinions of classroom teachers about the effectiveness of artificial intelligence technologies in mathematics teaching?
- What are the advantages and disadvantages that classroom teachers may experience regarding using artificial intelligence technologies in mathematics teaching?
- What are your expectations and suggestions for using artificial intelligence technologies in mathematics teaching?

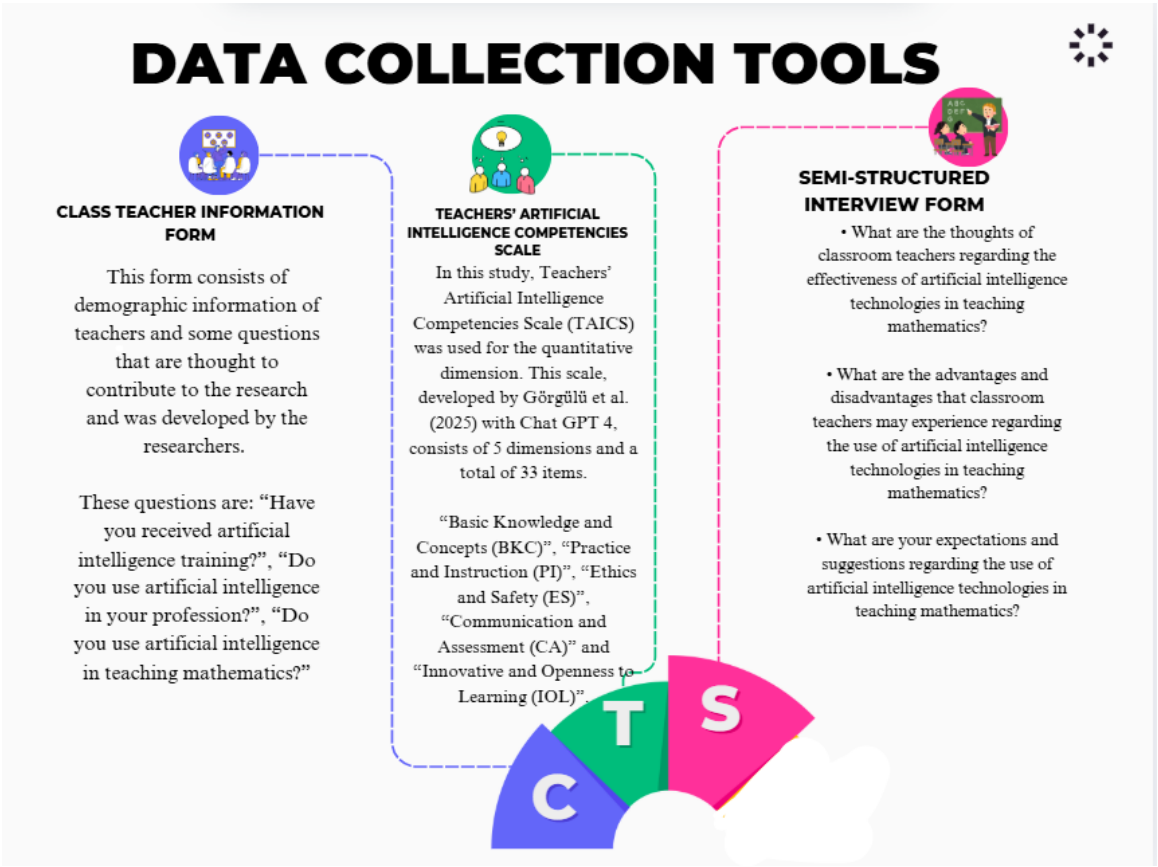

Figure 1. *Data Collection Tools*

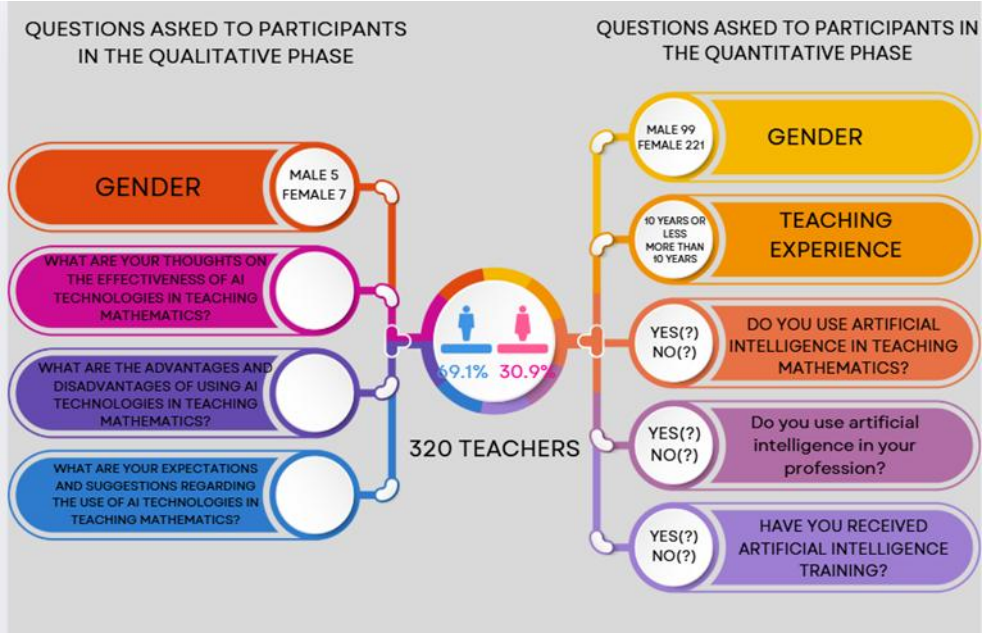

Figure 2. *Research Group and Applications*

2.4. Analysis of Data

In the quantitative part of the study, the Teachers' Artificial Intelligence Competencies Scale (TAICS) was applied to all classroom teachers. Data collection adhered to ethical principles, and voluntary participation was ensured. SPSS 25.0 was used for data analysis. Before analyzing the data, normality tests were conducted to assess whether assumptions were met. In addition, the values of the scale (Skewness: -.328; Kurtosis: -.507) were also examined, and it was seen that the scale showed a normal distribution. Since skewness and kurtosis values fell within the range of -1.5 and +1.5 (Tabachnick & Fidell, 2013), it was concluded that the data were standard and parametric tests, including Independent Samples t-test and Pearson Correlation Coefficient. Significant differences were examined in the tests, and since the magnitude of this difference did not provide complete information, the effect size was calculated to interpret it (Cohen, 1988). While evaluating the effect values, .010: Small, .059: Medium, and .138: Large values were considered (Cohen, 1988). Structural Equation Modeling (SEM) was applied to determine the effect of primary school teachers' artificial intelligence training and their use of artificial intelligence technologies in mathematics teaching on their intelligence competencies. The analyses were conducted using LISREL 9 software.

In the qualitative part of the study, the participants were interviewed for 25 to 30 minutes. Necessary information was provided to the participants before the research. The online interviews with the participants were recorded using a voice recording program with the participants' permission. The data analysis was obtained by directing the semi-structured interview question items in the research to the participants using the descriptive analysis technique. Themes and codes were determined using the MAXQDA 2020 program. In the descriptive analysis technique, the results of interviews and observations are presented to the reader after being organized. The data are classified and interpreted according to predetermined themes and codes (Yıldırım & Şimşek, 2021). For the interviews, permission was obtained from the participants who voluntarily participated in the research, and permission was obtained for audio recording. After the interviews, the researchers transcribed the voice recordings without any changes. While expressing the participants' opinions in the research, code names such as T1, T2..., and T12 were given.

3. Findings

The research findings are given during the research sub-problems. Accordingly, the finding of the first sub-problem is shown in Table 2.

Table 2. *Scores*

Scale	N	M	SD
ES	320	3.38	1.12
CA	320	3.01	1.09
IOL	320	3.37	1.04
BKC	320	2.97	.87
PI	320	2.99	1.02
TAICS	320	3.10	.95

The average score of the classroom teachers on the Teachers' Artificial Intelligence Competencies Scale (TAICS) was 3.10 (Table 2). To determine the levels based on the scores obtained from the scales, the scale's range width was calculated using the formula "range width/number of groups to be created" (4/5=0.80) (Tekin, 1993). The arithmetic means intervals of the scale are determined as follows: 1.00-1.79 'Very Low,' 1.80-2.59 'Low,' 2.60-3.39 'Moderate,' 3.40-4.19 'High,' 4.20-5.00 'Very High.' It is seen that the artificial intelligence competencies of classroom teachers are at a "moderate" level according to the sub-dimensions and scale mean scores (Table 2).

The findings related to the second sub-problem of the study are given in Table 3.

Table 3. *Independent Sample t-Test Results for Scores Teachers' Artificial Intelligence Competencies Scale" (TAICS) by gender*

Scale	Gender	N	Mean	S	t	p
ES	Female	221	3.35	1.16	-.747	.45
	Male	99	3.45	1.02		
CA	Female	221	2.90	1.11	-2.653	.00
	Male	99	3.25	1.03		
IOL	Female	221	3.29	1.05	-1.982	.04
	Male	99	3.54	1.02		
BKC	Female	221	2.88	.89	-2.617	.00
	Male	99	3.16	.80		
PI	Female	221	2.91	1.03	-2.254	.02
	Male	99	3.19	.97		
TAICS	Female	221	3.01	.97	-2.350	.01
	Male	99	3.28	.88		

To examine whether there is a significant difference in the scores obtained from the measurement tool based on the 'gender' variable. Independent Sample t-tests were conducted. "Communication and assessment (CA)" (t=-2.653, p< .01, d=.326), "Innovative and openness to learning (IOL)" (t=-1.982, p<.05, d=.241), "Basic knowledge and concepts (BKC)" (t=-2.617, p<.01, d=.330), "Practice and instruction (PI)" t=-2.254, p<.05, d=.279) and "Artificial Intelligence Competencies Scale" (TAICS) t=-2.350, p<.01, d=.291). Accordingly, it was observed that male classroom teachers had higher scores than female classroom teachers both in the sub-dimensions and in the total scale. In the "Ethics and safety (ES)" dimension (t=.747, p>.05), the difference was not statistically significant (Table 3). According to Cohen's d test, which was conducted to determine the level of substantial difference in line with these statistics, it was concluded that there was a "small" effect value in all dimensions and the total scale (Cohen, 1988).

Tables 4, 5, and 6 show the findings related to the third sub-problem of the study.

Table 4. *Independent Sample t-Test Results for Scores Teachers' Artificial Intelligence Competencies Scale" (TAICS) by Teaching Experience*

Scale	Teaching experience	N	Mean	S	t	p
ES	10 years or less	233	3.46	1.07	2.167	.03
	More than 10 years	87	3.16	1.20		
CA	10 years or less	233	3.11	1.08	2.642	.00

	More than 10 years	87	2.75	1.10		
IOL	10 years or less	233	3.42	1.04	1.494	.13
	More than 10 years	87	3.22	1.04		
BKC	10 years or less	233	3.03	.84	2.011	.04
	More than 10 years	87	2.81	.93		
PI	10 years or less	233	3.11	.98	3.519	.00
	More than 10 years	87	2.67	1.06		
TAICS	10 years or less	233	3.19	.93	2.835	.00
	More than 10 years	87	2.85	.97		

Independent Sample t-tests were conducted to examine whether there was a significant difference in the scores obtained from the measurement tool based on the '*Teaching Experience*' variable. "Ethics and safety (ES)" (t=2.167, p<.05, d=.263), "Communication and assessment (CA)" (t=2.642, p<.01, d=.330), "Basic knowledge and concepts (BKC)" (t=2.011, p<.05, d=.248), "Practice and instruction (PI)" (t=3.519, p<.01, d=.431) sub-dimensions and "Artificial Intelligence Competencies Scale" (TAICS) (t=2.835, p<.01, d=.357) mean scores were found to be statistically significant. Accordingly, it is seen that classroom teachers who have been teaching for 10 years or less have higher scores than those who have been teaching for more than 10 years. In the dimension of "Innovative and openness to learning (IOL)" (t=1.494, p>.05), the difference was not statistically significant (Table 4). Cohen's d test, conducted to determine the level of significant difference by these statistics, concluded that there was a "small" effect value in all dimensions and the total scale (Cohen, 1988).

Table 5. *Independent Sample t-Test Results for Scores Teachers' Artificial Intelligence Competencies Scale" (TAICS) by "Have you received artificial intelligence training?*

Scale	Ans.	N	Mean	S	t	p
ES	Yes	59	4.21	.68	6.752	.00
	No	261	3.19	1.11		
CA	Yes	59	3.99	.91	8.365	.00
	No	261	2.79	1.01		
IOL	Yes	59	4.30	.79	8.358	.00
	No	261	3.15	.98		
BKC	Yes	59	3.82	.73	9.363	.00
	No	261	2.77	.78		
PI	Yes	59	3.87	.77	7.902	.00
	No	261	2.80	.97		
TAICS	Yes	59	4.00	.72	8.978	.00
	No	261	2.89	.87		

Independent Sample t-tests were conducted to examine whether there was a significant difference in the scores obtained from the measurement tools based on the '*Have You Received Artificial Intelligence Training?*' question. "Ethics and safety (ES)" (t=6.752, p<.01, d=1.108), "Communication and assessment (CA)" (t=8.365, p<.01, d=1.248), "Innovative and openness to learning (IOL)" (t=8.358, p<.01, d=1.292), "Basic knowledge and concepts (BKC)" (t=9.363, p<.01, d=1.389), "Practice and instruction (PI)" (t=7.902, p<.01, d=1.221) sub-dimensions and "Artificial Intelligence Competencies Scale" (TAICS) (t=8.978, p<.01, d=1.390) scale mean scores were statistically significant. Accordingly, the scores of the classroom teachers who received artificial intelligence training in the dimensions and overall scale are higher than those who did not. According to Cohen's d test conducted to determine the level of significant difference in line with these statistics, it was concluded that there was a "large" effect value in all dimensions and the total scale (Cohen, 1988).

Table 6. *Independent Sample t-test Results for Teachers' Artificial Intelligence Competencies Scale" (TAICS) by Responses to the question "Do you use artificial intelligence in your profession?"*

Scale	Ans.	N	Mean	S	t	p
ES	Yes	208	3.80	.80	10.673	.00
	No	112	2.59	1.20		
CA	Yes	208	3.47	.87	12.467	.00
	No	112	2.15	.95		
IOL	Yes	208	3.77	.84	11.223	.00
	No	112	2.61	.96		
BKC	Yes	208	3.27	.77	9.593	.00
	No	112	2.40	.76		
PI	Yes	208	3.44	.78	13.407	.00
	No	112	2.15	.87		
TAICS	Yes	208	3.52	.71	13.490	.00
	No	112	2.31	.84		

To examine whether there is a significant difference in the scores obtained from the measurement tools based on the question '*Do you use Artificial Intelligence in your profession?*', Independent Sample t-tests were conducted. "Ethics and safety (ES)", (t=10.673, p<.01, d=1.186), "Communication and assessment (CA)" (t=12.467, p<.01, d=1.449), "Innovative and openness to learning (IOL)" (t=11.223, p<.01, d=1.286), "Basic knowledge and concepts (BKC)" (t=9.593, p<.01, d=1.137), "Practice and instruction (PI)" (t=13.407, p<.01, d=1.561) sub-dimensions and "Artificial Intelligence Competencies Scale" (TAICS) (t=13.490, p<.01, d=1.555), it is seen that the scores of classroom teachers who use artificial intelligence in their profession are higher compared to those who do not (Table 6). According to Cohen's d test, which was conducted to determine the level of significant difference in line with these statistics, it was concluded that there was a "large" effect value in all dimensions and the total scale (Cohen, 1988).

The findings related to the fourth sub-problem of the study are given in Table 7.

Table 7. *Independent Sample t-Test Results for Scores Teachers' Artificial Intelligence Competencies Scale" (TAICS) by "Do you use artificial intelligence in mathematics teaching?"*

Scale	Ans.	N	Mean	S	t	p
ES	Yes	161	3.90	.79	9.427	.00
	No	159	2.85	1.16		
CA	Yes	161	3.63	.83	12.250	.00
	No	159	2.38	.97		
IOL	Yes	161	3.94	.81	11.854	.00
	No	159	2.78	.93		
BKC	Yes	161	3.39	.75	9.786	.00
	No	159	2.54	.78		
PI	Yes	161	3.59	.74	12.900	.00
	No	159	2.39	.91		
TAICS	Yes	161	3.66	.68	13.168	.00
	No	159	2.53	.84		

To examine whether there is a significant difference in the scores obtained from the measurement tools based on the question '*Do you use Artificial Intelligence in Mathematics Teaching?*', Independent Sample t-tests were conducted. "Ethics and safety (ES)" (t=9.427, p<.01, d=1.058), "Communication and assessment (CA)" (t=12.250, p<.01, d=1.384), "Innovative and openness to learning (IOL)" (t=11.854, p<.01, d=1.330), "Basic knowledge and concepts (BKC)" (t=9.786, p<.01, d=1.110), "Practice and instruction (PI)" (t=12.900, p<.01, d=1.446) and "Artificial Intelligence Competencies Scale" (TAICS) (t=13.168, p<.01, d=1.478). Accordingly, the scores of classroom teachers who used artificial intelligence in mathematics teaching were higher than those who did not (Table 7). According to Cohen's d test conducted to determine the level of significant difference in line with these statistics, it was concluded that there was a "large" effect value in all dimensions and the total scale (Cohen, 1988).

The findings related to the fifth sub-problem of the research are given in Table 8.

Table 8. *Result of Pearson Correlation Test between "Practice and Instruction" Dimension and Scale Scores*

PI	N	r.	p
ES		.795	.00
CA		.900	.00
IOL	320	.827	.00
BKC		.771	.00
TAICS		.968	.00

As can be seen from Table 8, "Practice and instruction (PI)" and "Ethics and safety (ES)" (r=.795; p<.01), "Communication and assessment (CA)" (r=.900; *p*<.01), "Innovative and openness to learning (IOL)" (r=.827; *p*<.01), "Basic knowledge and concepts (BKC)" (r=.771; *p*<.01) and "Artificial Intelligence Competencies Scale" (TAICS) (r=.968; *p*<.01).

The findings related to the sixth sub-problem of the study are presented below.

To determine the effect of primary school teachers' artificial intelligence training and their use of artificial intelligence technologies in mathematics teaching on their artificial intelligence competencies, the conceptual model presented in Figure 1 was developed within the theoretical framework of the Technology Acceptance Model (TAM) and analyzed using Structural Equation Modeling (SEM). According to TAM, teachers' participation in artificial intelligence training and using artificial intelligence tools in instructional processes can enhance their intelligence competencies and awareness through perceived usefulness and ease of use; therefore, this model was adopted (Davis, 1989). Accordingly, the model tested the direct and indirect effects of teachers' artificial intelligence training and their use of artificial intelligence technologies in mathematics teaching on their intelligence competencies.

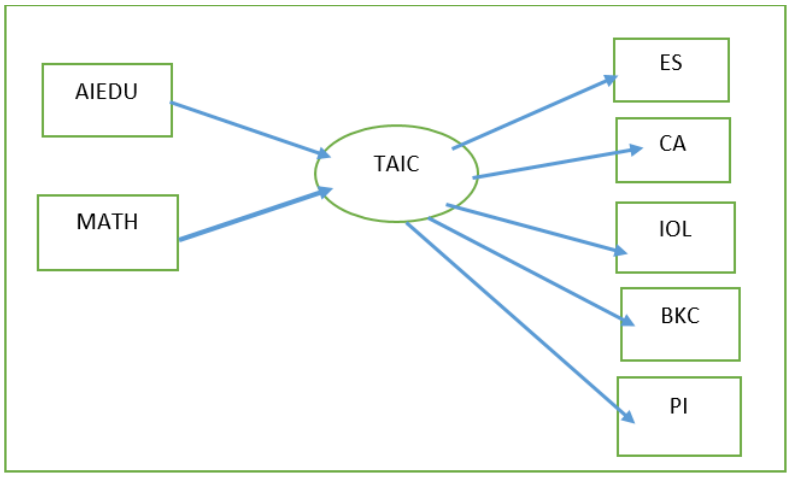

Figure 3. *Model Showing the Relationships Between Artificial Intelligence Training, Usage, and Competencies*

In the SEM analysis conducted, the model fit between primary school teachers' artificial intelligence training, their use of artificial intelligence tools in mathematics teaching, and the sub-dimensions of the Artificial Intelligence Nativity Scale were examined. According to the Structural Equation Modeling (SEM) analysis results, the model demonstrated a good fit based on fit indices such as SRMR, NFI, CFI, and IFI. The NNFI, RFI, GFI, and PGFI values were also calculated within the acceptable fit index thresholds. However, due to the influence of sample size (Hu & Bentler, 1999), the model's χ^2/df ratio and RMSEA value were not within the desired range. The literature suggests that, particularly in large samples, the χ^2 statistic is often significant, which may misleadingly indicate poor model fit (Kline, 2016). Similarly, the RMSEA index may yield higher values in small samples (Hu & Bentler, 1999; MacCallum, Browne & Sugawara, 1996). Accordingly, the high fit indices such as SRMR, NFI, CFI, and IFI indicate that the model exhibits an overall good fit. The NNFI, RFI, GFI,

and PGFI indices within acceptable levels further support the model's adequate fit. While the χ^2/df ratio and RMSEA values did not fall within the ideal range, they do not directly invalidate the model. Considering the other fit indices, it was concluded that the model sufficiently fits the data.

Table 9. *Fit Indices of the Conceptual Model* (Ilhan & Çetin, 2014, p. 31)

Index	Good Fit	Acceptable Fit	Research Findings	Results
X^2 / sd	The obtained value should be statistically insignificant, and the χ^2/df ratio should be less than 4.		99.96/13=7.6	-
RMSEA	$0 \leq RMSEA \leq .05$	$.05 < RMSEA \leq .08$	0.145	-
SRMR	$0 \leq SRMR \leq .05$	$.05 < SRMR \leq .10$	0.0330	Good fit
NFI	$.95 \leq NFI \leq 1.00$	$.90 \leq NFI < .95$	0.954	Good fit
NNFI	$.95 \leq NNFI \leq 1.00$	$.90 \leq NNFI < .95$	0.934	Acceptable fit
CFI	$.95 \leq CFI \leq 1.00$	$.90 \leq CFI < .95$	0.959	Good fit
IFI	$.95 \leq IFI \leq 1.00$	$.90 \leq IFI < .95$	0.959	Good fit
RFI	$.95 \leq RFI \leq 1.00$	$.90 \leq RFI < .95$	0.925	Acceptable fit
GFI	$.95 \leq GFI \leq 1.00$	$.90 \leq GFI < .95$	0.927	Acceptable fit
PGFI	$.95 \leq PGFI \leq 1.00$	$.50 \leq PGFI < .95$	0.590	Acceptable fit

The path diagram presented in Figure 4, which was developed within the scope of Structural Equation Modeling (SEM), reveals no red arrows. The absence of red arrows in the path diagram indicates that the t-values in the model are statistically significant and that the theoretical framework has validated the model. This is important as it demonstrates that the model supports the proposed structural relationships and adequately fits the data (Byrne, 2016).

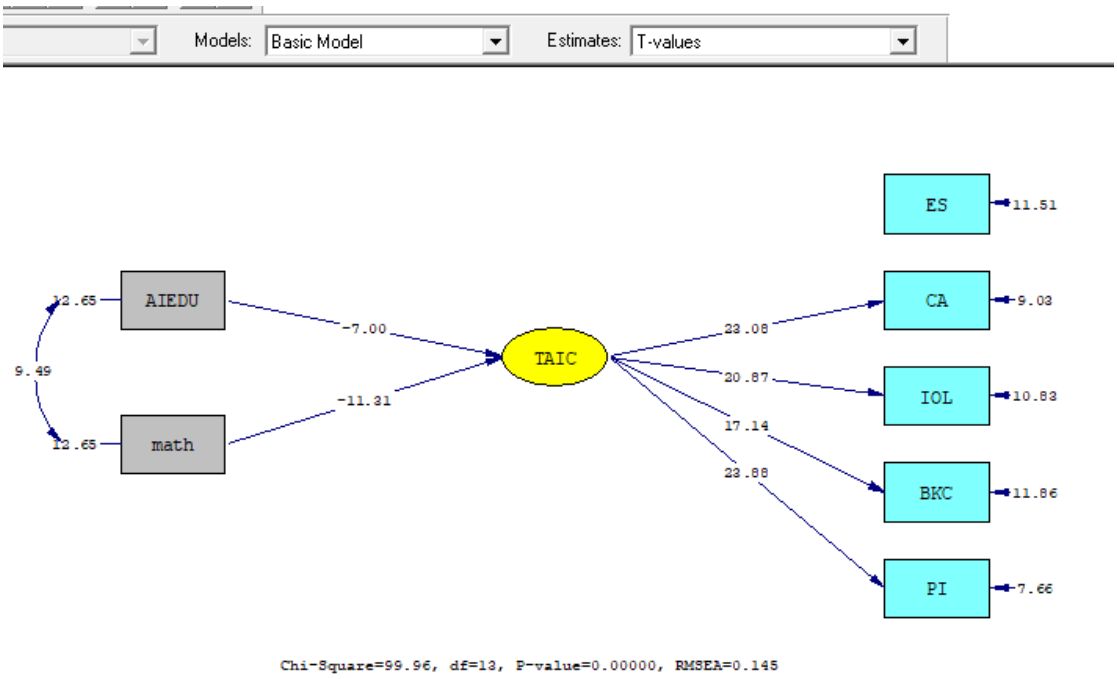

Figure 4. *Path Diagram of the Conceptual Model's t-Values*

When examining the path diagram of standardized coefficients in Figure 5, it is observed that all path coefficients fall within acceptable ranges and that the model functions in alignment with the theoretical framework. This supports the model's structural validity and confirms that the relationships between variables have been validated by theoretical expectations (Kline, 2016).

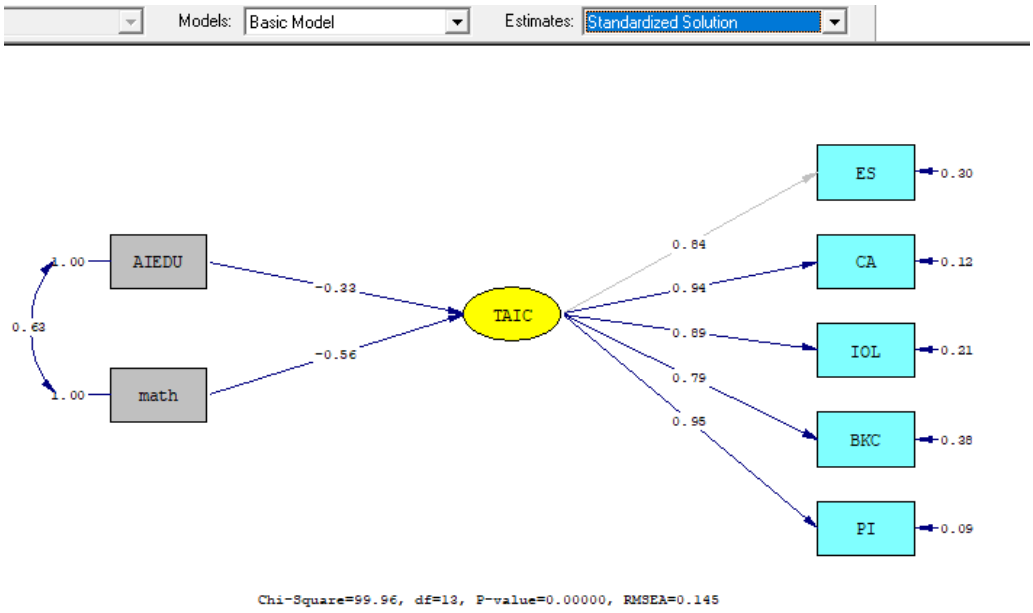

Figure 5. *Path Diagram of the Conceptual Model's Standardized Coefficients*

Qualitative findings for the seventh sub-problem of the research are given below.

The analysis of the responses of classroom teachers to the interview questions about the use of artificial intelligence technologies in mathematics teaching is as follows

The Use of Artificial Intelligence Technologies in Mathematics Teaching

Three main themes were reached regarding using artificial intelligence technologies in mathematics teaching. These themes are the effectiveness of artificial intelligence, advantages, and disadvantages. The themes are summarized in Figure 6.

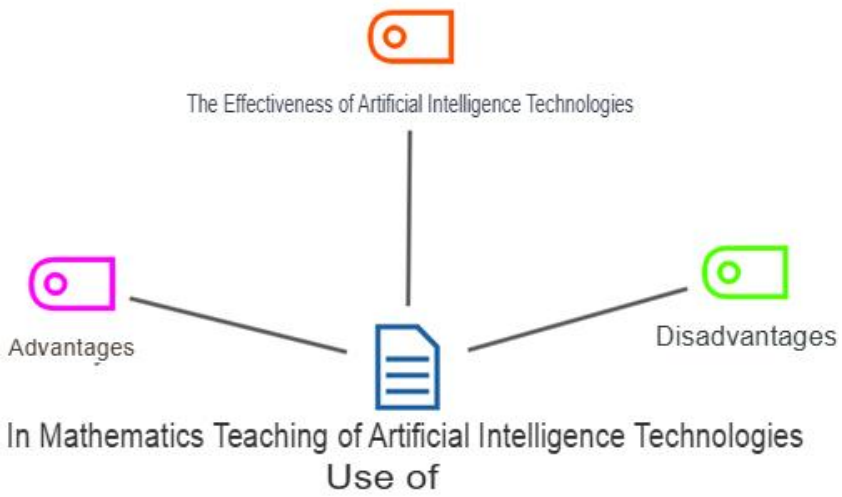

Figure 6. *Use of Artificial Intelligence Technologies in Mathematics Teaching*

The Effectiveness of Using Artificial Intelligence Technologies in Mathematics Teaching

As a result of the analysis, the codes related to the theme of the effectiveness of using artificial intelligence technologies in mathematics teaching are given in Figure 7.

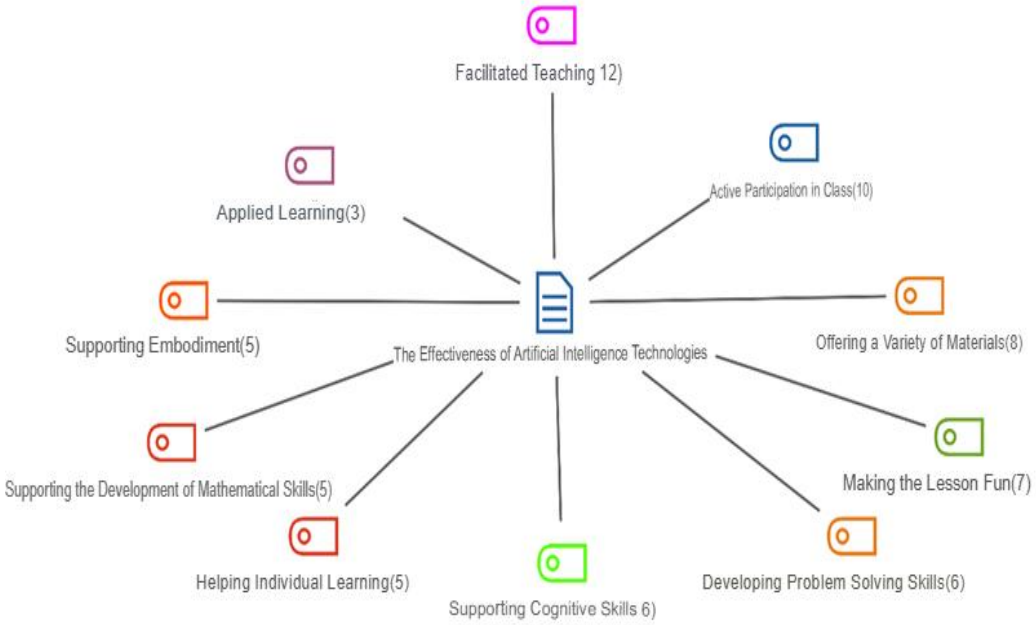

Figure 7: *Effectiveness of Using Artificial Intelligence Technologies in Mathematics Teaching*

When Figure 7 is examined, the codes of "facilitated teaching, active participation in the lesson, providing a variety of materials, making the lesson fun, developing problem-solving skills, supporting cognitive skills, helping individual learning, supporting mathematical skill development, supporting concretization, applied learning" are reached.

The most prominent teacher opinions regarding the related codes are given below. Regarding this issue, T1 *stated, "In the use of artificial intelligence technology in mathematics teaching, it supports students' mathematical skills significantly and makes the learning process both fun and easier." T2 stated, "In fact, artificial intelligence technologies are beneficial for individual education suitable for the student. It is an important source of support in terms of materials and can provide serious support in lesson planning"*. T7 stated, *"I think artificial intelligence has severe advantages. I have seen that artificial intelligence technologies have great benefits, especially in providing materials that can attract attention, especially in making the lesson fun and making students active in the lesson".* T9 stated*, "We now know that artificial intelligence technology tools are effective in making these subjects easier, especially when teaching some complex and difficult subjects in mathematics teaching, to make these subjects easier, that is, to customize them according to the level of the students, to organize them according to the individual, to benefit their learning."*

Advantages of Using Artificial Intelligence Technologies in Mathematics Teaching

As a result of the analysis, Figure 8 presents the codes related to the theme of the advantages of using artificial intelligence technologies in mathematics teaching.

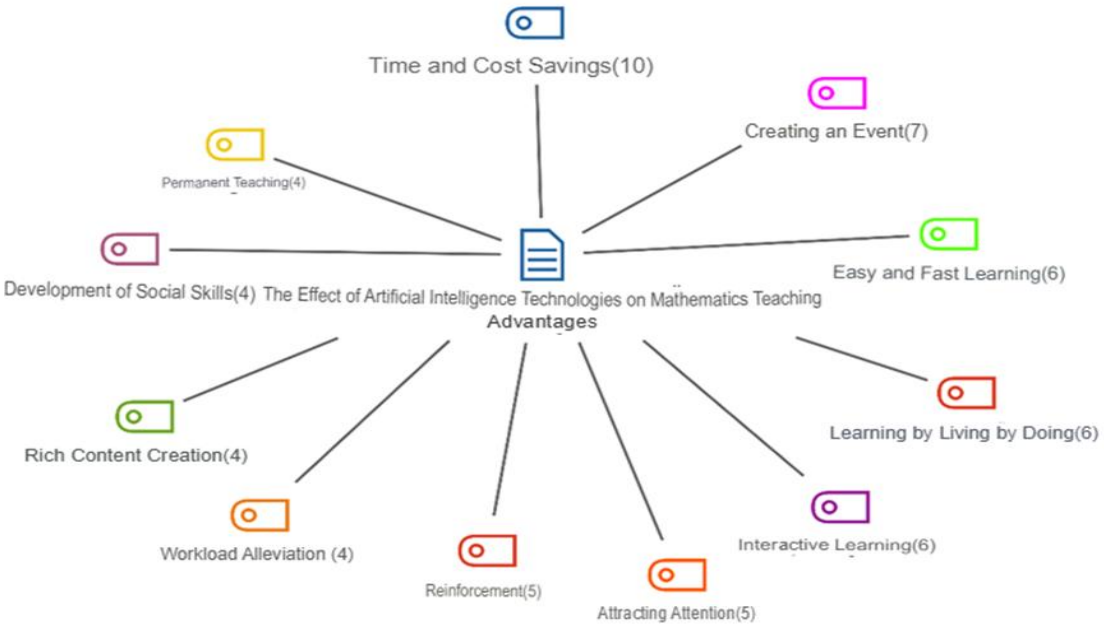

Figure 8: *Advantages of Using Artificial Intelligence Technologies in Mathematics Teaching*

When Figure 8 is examined, the codes of "time and cost saving, creating activities, easy and fast learning, learning by doing, interactive learning, attracting attention, reinforcement, lightening workload, creating rich content, development of social skills, permanent teaching" are reached.

The most prominent teacher opinions regarding the related codes are given below. *"Artificial Intelligence prevents a great loss of time and cost for the teacher. It even provides a multiple learning environment for students. It enables them to do activities not only by listening but also by seeing and sometimes by moving and hearing in a way that appeals to all sensory organs"*. T5 said, *"I would like to express that, especially in my mathematics lessons, it makes great contributions to my students' learning by doing and experiencing. In this sense, I think artificial intelligence applications provide convenience"*. T12 stated, *"I use artificial intelligence applications to reinforce my subjects with my studies. I use artificial intelligence while preparing my course content and creating activities. However, before that, after my studies, we provided a lot of repetition about the subject from the presentations made by the students with the artificial intelligence tool and the students' words, making our subject very remarkable. In addition, we also ensure permanence"*.

Disadvantages of Using Artificial Intelligence Technologies in Mathematics Teaching

As a result of the analysis, Figure 9 presents the codes related to the disadvantages of using artificial intelligence technologies in mathematics teaching.

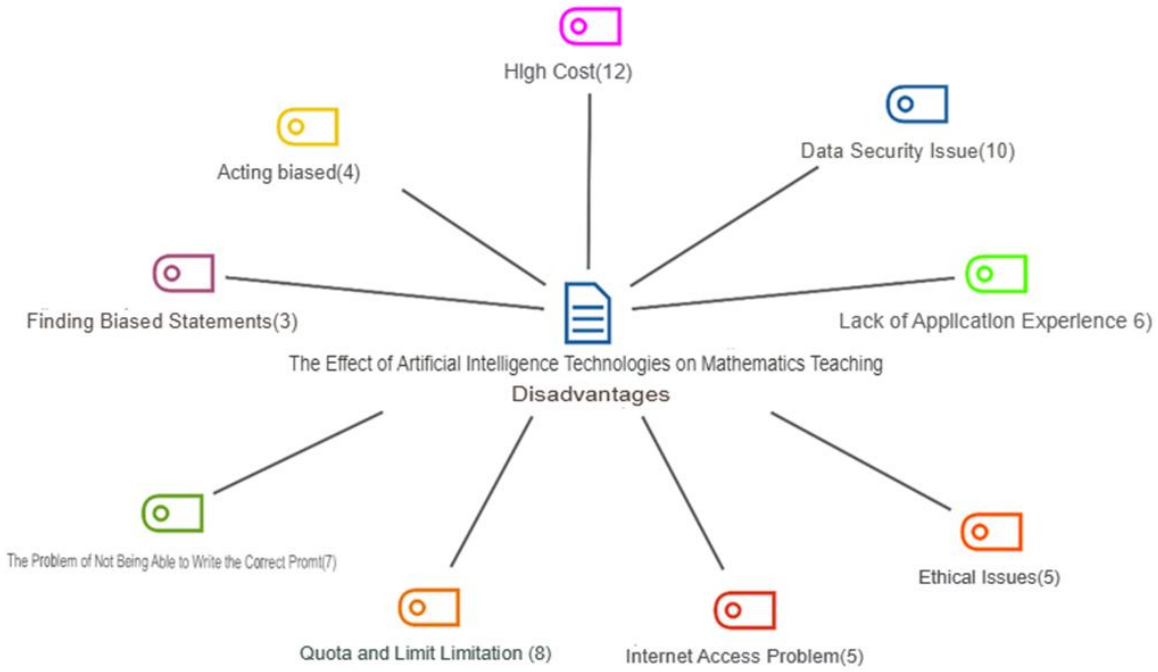

Figure 9. *Disadvantages of Using Artificial Intelligence Technologies in Mathematics Teaching*

When Figure 9 is analyzed, the codes "high cost, data security problem, inadequate application experience, ethical problems, internet access problem, quota and limit limitation, inability to write correct prompts, biased statements, and biased behavior" are found.

The most prominent teacher opinions regarding the related codes are given below. T2 stated, *"I want to apply artificial intelligence applications, especially in my mathematics lessons, but the fact that it has a very high cost limits us."* T4 stated, *"As a teacher, I attach great importance to internet security. Every teacher who uses artificial intelligence should know how to use the internet very well".* S6 stated, *"In artificial intelligence applications, not every application can be opened most of the time. It stops working after a certain limit and quota. This situation prevents me from using artificial intelligence as an auxiliary resource for lessons*". Conversely, T8 *said, "While there is internet infrastructure on our computers, it may not be available in the settlement where your student is located. You may not have internet infrastructure in your neighborhood or may not have a computer. When they do not have access in this regard, even when there are all kinds of technological opportunities, we may be unable to use artificial intelligence technologies in place and on time because there is no competence in education. After all, there is no competence in education".*

4.Discussion, Conclusion and Recommendations

Artificial intelligence (AI) education is increasingly considered necessary at the K-12 level. In order to better understand teachers' readiness for AI education and to effectively develop relevant teacher education programs, it is essential to determine the status of teachers on this issue (Yue, Jong, & Ng, 2024) and also to emphasize the importance of classroom teachers' use of AI in mathematics teaching; this research was carried out to determine the status of classroom teachers' competencies and the use of artificial intelligence technologies in the realization of educational activities for students in the mathematics teaching process. According to the quantitative findings obtained from the research, the artificial intelligence competence levels of classroom teachers were at the "medium" level. The scores of the classroom teachers were found to be above the scale average. This is a pleasing result for AI that will be used today and in the future. Akkol & Balkan (2024) conducted a study with 50 classroom teachers and found that a large proportion of classroom teachers (36%) had a moderate level of awareness of artificial intelligence (AI) technologies. Eker & Halıcı Gurbuz (2024) also found that mathematics teachers' perceptions of competence towards using artificial intelligence in mathematics lessons were positive. Çayak (2024) concluded that teachers' positive attitudes toward artificial

intelligence were at a high level, and their negative attitudes were at a low level. At the same time, teachers' artificial intelligence literacy levels were found to be at a medium level.

Based on the findings obtained from the quantitative data, the "Artificial Intelligence Skills Scale (TAICS)" was applied to determine the status of classroom teachers regarding the use of artificial intelligence technologies. In the study, while deciding the competencies of classroom teachers regarding the use of artificial intelligence technologies, it was examined whether there was a difference according to gender, professional seniority, receiving artificial intelligence training, using artificial intelligence in the profession, and using artificial intelligence in my mathematics teaching. Based on the findings, it was concluded that male classroom teachers were more competent than female classroom teachers in the gender variable of the scale for artificial intelligence competencies of classroom teachers. In both the sub-dimensions and the total scale, male classroom teachers scored higher than female teachers. Accordingly, male classroom teachers have more artificial intelligence competencies. This result has a negligible effect. No difference was found in the "Ethics and Safety" sub-dimension according to gender. In the study conducted by Acet et al. (2024) with 126 primary school teachers, it was stated that the attitudes of male teachers were higher than female teachers. A study conducted by Aksakal, Emre, & Özbek (2024) with classroom teachers determined that male classroom teachers had a more negative attitude towards artificial intelligence than female classroom teachers. All these results can be explained by the fact that male teachers are more open and curious about technology and are more proactive in using artificial intelligence in education (Edwards & Cheok, 2018; Tahiru, 2021).

When an evaluation is made according to the seniority of the classroom teachers, those teaching for 10 years or less have a negligible effect on artificial intelligence competencies by getting higher scores than those teaching for more than 10 years. There is no difference between the groups in the "Innovative and openness to learning" dimension. Although it is thought that the fact that senior teachers are more exposed to the technological changes they have encountered throughout their professional lives may positively affect their attitudes toward artificial Intelligence (Berry & Linoff, 2004), this result can be explained by the fact that young teachers with less experience are closer to technology and more open to innovations. In Seyrek et al.'s (2024) interviews with 28 primary school teachers, it is noteworthy that young teachers are more likely to use artificial intelligence and that many more initiatives related to artificial intelligence will become popular in educational studies in the future. In Acem et al.'s (2024) research with 190 teachers, attitudes towards artificial intelligence were higher in individuals with less professional experience and were younger in terms of age, as in the results of this research.

The study's classroom teachers were asked, "Have you received artificial intelligence training?" and a comparison was made with their scores. Accordingly, classroom teachers who received AI training were found to have higher AI competencies, which had a more significant effect than those who did not, as expected. In a study examining the AI literacy of 276 non-AI-trained university students, it was found that AI recognition, knowing AI, AI ethics, AI empowerment, and AI self-efficacy all had significant positive predictive effects on AI applications (Lu & Lin, 2025). A study examining the relationship between K-12 teachers' trust in AI, their knowledge about AI, and their digital competencies found a relationship between their knowledge about AI, their digital competencies, and their trust in AI (Lucas et al., 2024). This study also examines the relationship between trust in artificial intelligence (TAI), age, gender, teaching experience, and International Standard Classification of Education (ISCED) levels. The study used a comprehensive and valid instrument and a sample of 211 primary and secondary school teachers. The results show a significant positive relationship between all three variables and that knowledge of AI is a robust and important predictor of trust in artificial Intelligence (TAI). Without knowledge of AI, the significant relationship between digital competence and confidence in Artificial Intelligence (TAI) disappears. In another study, Saudi teachers emphasized the importance of training and support to effectively integrate AI tools into their pedagogical strategies (Alwaqdani, 2024). Likewise, it has been observed that self-efficacy perceptions of individuals trained in artificial intelligence increase with the development of their knowledge and skills towards this technology (Holmes, Bialik, & Fadel, 2019).

Scale evaluations were made with the answers to the question "Do you use artificial intelligence in your profession?" and classroom teachers who used artificial intelligence. At the same time, teaching were found to have higher artificial intelligence competencies with a more significant effect than those who did not-in a study conducted by Akkol and Balkan (2024) with 50 classroom teachers, 50% of the teachers stated that artificial intelligence tools contributed positively to classroom activities. It shows that 60% of classroom teachers are willing to integrate artificial intelligence technologies into educational processes. However, 20% of them are reluctant to this integration. This reluctance is generally related to inadequate educational policies and teachers' lack of sufficient knowledge and training on these technologies. Those who have experience with AI have more positive attitudes than those without AI experience (Sun & Zhou, 2024). Semi-structured interviews with 10 classroom teachers show that teachers generally evaluate AI tools positively but face challenges such as technology infrastructure, adaptation to educational processes, and teacher training. Başak, Yürekli, Başdan, & Uçuk (2024) conducted another interview with 15 classroom teachers and concluded that teachers evaluated artificial intelligence as a motivational tool that facilitates teaching processes, brings innovative solutions to the teaching profession, provides individualized learning opportunities, provides convenience in teacher work, and that they have thoughts such as the need to be careful about ethical issues when using artificial intelligence applications and that it may reduce social and cultural values (Sontay, Kazancı, & Karamustafaoğlu, 2024). The results of the study conducted by Cojean et al. (2023) also show that teachers perceive that the use of AI tools reduces the workload of teachers and their potential benefits without feeling the threat of a new change. The researchers found that classroom teachers perceived that AI mainly was used to improve students' skills, while teachers in secondary schools generally used AI to improve students' performance.

Finally, the classroom teachers were asked, "Do you use artificial intelligence in mathematics teaching?". When their answers were analyzed, teachers who use AI in mathematics teaching were found to have more AI competencies with a more significant effect than those who do not. AI-supported mathematics education helps individuals gain 21st-century skills and makes mathematics more accessible and personalized. In particular, in the light of PISA data, how countries that excel in mathematics integrate AI tools into their education systems and successful examples of AI-supported mathematics education on a global scale are discussed (Kara, 2024). The use of artificial intelligence in mathematics teaching will make it possible to improve the quality of learning, which will further increase students' academic competence. There are several advantages of using artificial intelligence in mathematics teaching. These include students' ability to look at everyday problems more critically and in different dimensions and to better understand the fundamental problems of geometry, mathematics, and statistics. Students also learn and develop interpersonal skills and better social interaction. It also allows effective learning to provide a better environment to enhance the acquisition of mathematical concepts (Mohamed et al., 2022). The study "The Possibility of Using Artificial Intelligence in Mathematics Education" by Park (2020) aims to investigate the applications and possibilities of bare science branches using artificial intelligence in mathematics education. As a result of the study, it was seen that artificial intelligence for mathematics education is mostly emphasized as supporting students' personalized mathematics learning, defining it as an auxiliary role to support mathematics teachers, and elevating technology not only in cognitive aspects but also in affective aspects. According to the study conducted by Uygun et al. (2024), as a result of teaching in an interactive learning environment with AI-assisted AR activities, including Chat Generative Pre-Trained Transformer (ChatGPT), Blender and MyWebAR applications, it was observed that conceptualization and geometric thinking levels of elementary mathematics teachers improved.

There is a highly significant positive relationship between the 'Practice and Instruction' sub-dimension and the mean scores of the Artificial Intelligence Competencies Scale (TAICS) scale and other dimensions. The fact that the dimension of the scale related to practice is associated with the other dimensions and the overall scale explains the use of AI in teaching.

Examining the conceptual model developed within the scope of the study indicates that teachers' participation in artificial intelligence (AI) training and their use of AI technologies in mathematics teaching significantly enhance their AI competencies. When evaluated within the Technology Acceptance Model (TAM) framework, this finding supports the notion that teachers' adoption of AI

tools is associated with perceived usefulness and ease of use (Davis, 1989). Similarly, studies in the literature suggest that teachers' participation in AI training and integrating these technologies into their lessons strengthen their AI awareness and perceptions of professional competency (Nazaretsky, Ariely, Çukurova, & Alexandros, 2022). Furthermore, it is emphasized that professional development programs are crucial for increasing teachers' confidence in AI-supported educational technologies (Nazaretsky et al., 2022). These results highlight the importance of professional development programs in fostering teachers' adoption of AI technologies in education and support the positive impact of AI training on their pedagogical practices.

Based on the findings obtained from qualitative data, classroom teachers stated that they experienced advantages in the process of using artificial intelligence technologies in mathematics teaching in terms of saving time and cost, creating activities, easy and fast learning, learning by doing, interactive learning, attracting attention, reinforcement, lightening workload, creating rich content, developing social skills and permanent teaching. However, some classroom teachers emphasized that the high cost of artificial intelligence technologies and inadequacies in application experience constitute a major problem during using artificial intelligence technologies in mathematics teaching. Classroom teachers experience difficulties in the use of artificial intelligence technologies. They stated that the problems in internet access and the quota and limit limitations in the application created negativities in the use of applications. Some teachers emphasized that data security problems may occur during using Artificial Intelligence. In addition, classroom teachers expressed their concerns about the ethical problems of artificial intelligence technologies. In addition, they stated that in artificial intelligence applications, writing the correct prompt and the data obtained should not be biased, and biased expressions should be encountered. Similar to these results, Sappaile et al. (2024) concluded that ethical issues such as data privacy and algorithmic bias in artificial intelligence should be handled carefully. Teng (2019) stated in his study that the high cost of artificial intelligence technology tools poses a problem. Nguyen et al. (2023) emphasized that using artificial intelligence applications in education brings ethical concerns and various issues which are of great importance. Garcia Castro et al. (2024) concluded that artificial intelligence technologies provide an excellent convenience for teachers and students in terms of saving time, just like the results of this research, and that teachers offer various content that facilitates personalized planning for individual students. According to some teachers, there are negative thoughts that artificial intelligence may decrease cultural values and weaken student communication (Sontay, Kazancı, & Karamustafaoğlu, 2024). Erol and Erol (2024), in their research with 16 primary school teachers, are concerned about the adverse effects of artificial intelligence tools on students. Whether artificial intelligence is a threat or an opportunity is controversial, as seen in this study. In another study conducted in this context, according to the data collected from 1443 participants, most of the participants believe that artificial intelligence will make life easier and increase productivity and, therefore, the development of artificial intelligence should be encouraged, while a significant number of participants are concerned that artificial intelligence will increase unemployment and lead to social inequalities as disadvantages (Bozkurt & Gursoy, 2023). Interviews with Saudi teachers revealed that while most participants acknowledged the potential of AI-enabled tools to save time and facilitate tasks in various aspects of teaching, they were also concerned about the effort required to learn and adapt AI-enabled tools (Alwaqdani, 2024). As can be seen, the benefits of AI, which are mentioned as advantages and disadvantages in most studies, also bring concerns (Jabali, Saeedi, & Alawneh, 2025).

In this study, classroom teachers emphasized that artificial intelligence technologies have advantages such as providing material diversity and active participation in using artificial intelligence technologies in mathematics teaching. They also stated that it helps facilitate mathematics teaching, makes the lesson fun, and contributes to developing students' problem-solving skills. Classroom teachers frequently emphasized that artificial intelligence technologies support students' cognitive skills, individual learning, and mathematical skill development. They also stated that they support the concretization of abstract expressions in mathematics teaching and practical teaching. Similar to these results, artificial intelligence is an effective tool in mathematics teaching. It improves students' comprehension of mathematics teaching and problem-solving skills and increases attitudes and achievement (Baker & Smith, 2019; Duralar, 2024). Darayseh (2023) concluded that teachers find AI easy to use and helpful in supporting teaching. AI-supported tools and systems enrich students'

learning experiences by providing more effective and efficient mathematics teaching methods (Richard et al., 2022). AI in mathematics teaching can provide more meaningful and lasting learning experiences by helping students develop complex problem-solving skills, think creatively, and strengthen their self-efficacy perceptions (Holmes, Bialik, & Fadel, 2019; Miao & Holmes, 2021). Individualized learning approaches based on artificial intelligence applications in education can increase students' mathematics achievement by 20% (Yang, 2022). Anh and Ngan (2021) conducted a study titled "Artificial Intelligence in Mathematics Education: An Empirical Study on the Use of Chatbots in Teaching and Learning Mathematics in Vietnamese High Schools." it was found that students concluded that the advantages of chatbot applications are more than the disadvantages, the results are more reliable than internet research, and teaching mathematics using chatbots on Facebook, messenger platform helps students to learn mathematics effectively. In terms of opportunities, Kuleto et al. (2022) concluded that artificial intelligence could be used in performing administrative tasks, identifying teachers' professional development needs, identifying difficulties in learning materials with students, identifying socio-emotional factors affecting students' knowledge acquisition, creating individual learning plans for students, selecting teaching materials for subject requirements, and objectively reviewing and evaluating homework, tests, written and other assignments. In his study, Al Darayseh (2023) emphasized that artificial intelligence applications provide ease of use for science teachers in the classroom and affect teacher perceptions and attitudes. Galindo-Dominquez et al. (2024) emphasized that Gender, age, education level, and experience are adequate in teachers' attitudes towards using digital competencies in artificial intelligence and that teachers are willing to use artificial intelligence and develop positive attitudes. Opesemowo and Ndlovu (2024) emphasized in their study that using artificial intelligence technologies in mathematics teaching provides problem-solving and reasoning skills and personalized learning opportunities. Hang's (2024) study stated that using artificial intelligence technologies in lessons effectively attracts student interest, active participation in the lesson, and digital literacy.

There are other studies similar to the findings obtained in the research. Kurshumova (2024) concluded that artificial intelligence technology is useful for teachers in making the educational process more effective and creative, promoting student learning, motivation, and self-confidence, and facilitating their work as educators. Pratama et al. (2023) concluded that artificial intelligence could change the role of educators, help personalize learning, and promote access to information. Chiu et al. (2023) concluded that artificial intelligence could provide adaptive teaching strategies, improve teachers' teaching skills, and support teachers' professional development. Regarding the contribution of artificial intelligence to the teaching profession, classroom teachers stated that artificial intelligence contributes to teaching processes, increases teachers' motivation, and brings an innovative perspective. This situation strengthens the role of artificial intelligence technologies in education. (Sontay, Kazancı, & Karamustafaoğlu, 2024). In a study conducted by Erol and Erol (2024) with 16 primary school teachers, they expressed the cognitive and socio-emotional contributions of artificial intelligence tools in educational environments and thought they facilitated their work. Akkol and Balkan (2024) conducted a study with 50 classroom teachers and found that 44% of the teachers gave feedback that artificial intelligence played a positive role in classroom activities. As a result, it is seen that using artificial intelligence tools in education facilitates teaching processes, just like the result of this research (Filgueiras, 2024; Ruiz-Rojas et al., 2023).

In the study by Pedro et al. (2019), artificial intelligence raises many ethical concerns regarding access to the education system, advice to individual students, personal data concentration, liability, business impact, data privacy, and ownership of data-feeding algorithms. AI regulation requires a public debate on ethics, accountability, transparency, and security. The paper concludes that AI has uses, possibilities, and risks in education for sustainable development. Based on their research, AlAfnan et al. (2023) found that ChatGPT skillfully rephrases generated responses in a way that cannot be detected by similarity detection software. To remain effective, similarity detection software providers must upgrade their software to prevent such events from going undetected.

Finally, when the quantitative and qualitative data are considered together, the fact that the classroom teachers' artificial intelligence competencies are moderate also coincides with the positive and negative ideas they put forward while using artificial intelligence in mathematics teaching in the

qualitative data. They do not consider themselves very competent in this regard. Although the number of classroom teachers who receive artificial intelligence training is low, the number of those who use artificial intelligence in their professions, especially in teaching mathematics, is higher and has higher proficiency scores. They have also created a harmonious model. These results are also related to the high number of positive opinions about the use of AI in mathematics teaching in the interviews. What they shared as disadvantages consisted of concerns about the use of AI in general, although they had difficulties using AI in mathematics teaching. In other words, the main themes emerging from these reviews are intended to guide future researchers in technological innovations and policy design and thus help implement AI-powered personalized education systems effectively. The rapid spread of artificial intelligence studies and the fact that this subject is constantly on the agenda and rapidly developing makes conducting regular and comprehensive studies in the field important. In this context, recommendations based on the results of the research are given below:

- Studies on artificial intelligence technologies can also be conducted in specific courses (Turkish, Life Sciences, Science, etc.).
- In-service training and courses should be organized to disseminate and develop the application studies of artificial intelligence technologies for classroom teachers.

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Authors

Yasemin DERİNGÖL, Istanbul University-Cerrahpaşa, Basic Education Department, Department of Classroom Education, Istanbul-Turkey, dyasemin@iuc.edu.tr

Elif ERBAŞ, Postgraduate student, Istanbul University-Cerrahpaşa, Hasan Ali Yücel Faculty of Education, Basic Education Department, Department of Classroom Education, Istanbul-Turkey, erbaselif@ogr.iuc.edu.tr

Behiye AKÇAY, Istanbul University-Cerrahpaşa, Hasan Ali Yücel Faculty of Education, Department of Science Education, behiye.akcay@iuc.edu.tr