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The Impact of Innovative Technological Practices for Gifted Children's Education on Support Classroom Teachers' Attitudes and Opinions towards Technology Use

Özel Yetenekli Çocukların Eğitimi için Yenilikçi Teknolojik Uygulamaların Destek Eğitim Odası Öğretmenlerinin Teknoloji Kullanımına Yönelik Tutum ve Görüşlerine Etkisi

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ABSTRACT: The aim of this study is to determine how innovative practices aimed at meeting the educational needs of gifted children, taught during activities, influence the attitudes and opinions of resource room teachers towards the use of technology in education. This study, conducted with 30 teachers working in the Southeastern and Eastern Anatolia Regions, employed a mixed-methods approach and included various activities such as animations, augmented reality, educational games, and STEAM. Data were collected through the attitude scale and diaries towards the use of technology in education. The results indicate that teachers' attitudes towards technology use did not differ by gender and that innovative applications were beneficial for all teachers. However, deficiencies were observed in teachers' ability to adapt to technologies related to coding, engineering, and STEAM. To address these deficiencies and keep technological knowledge and skills up to date, it is recommended to organize regular professional development programs and seminars.

Keywords: Gifted children, innovative practices, resource room teachers, technology use in education.

ÖZ: Bu çalışmanın amacı, özel yetenekli çocukların eğitim ihtiyaçlarına yönelik hazırlanan yenilikçi uygulamaların öğretildiği etkinliklerin, destek eğitim odası öğretmenlerinin eğitimde teknoloji kullanımına yönelik tutum ve görüşlerini nasıl etkilediğini belirlemektir. Güneydoğu ve Doğu Anadolu Bölgesi'nde görev yapan 30 öğretmenle gerçekleştirilen bu çalışmada karma yöntem kullanılmış, animasyon, artırılmış gerçeklik, eğitsel oyun ve STEAM gibi çeşitli etkinlikler düzenlenmiştir. Veriler, eğitimde teknoloji kullanımına yönelik tutum ölçeği ve günlükler aracılığıyla toplanmıştır. Sonuçlar, öğretmenlerin teknoloji kullanımına yönelik tutumlarının cinsiyete göre farklılaşmadığını ve yenilikçi uygulamaların tüm öğretmenler için faydalı olduğunu göstermektedir. Ancak öğretmenlerin kodlama, mühendislik ve STEAM alanlarındaki teknolojilere uyum sağlama konusunda eksiklikler yaşadığı gözlemlenmiştir. Bu eksikliklerin giderilmesi ve teknolojik bilgi ile becerilerin güncel tutulabilmesi için düzenli mesleki gelişim programları ve seminerlerin yapılması önerilmektedir.

Anahtar kelimeler: Özel yetenekli çocuklar, yenilikçi uygulamalar, destek eğitim odası öğretmenleri, eğitimde teknoloji kullanımı.

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In the 21st century, the close relationship between education and digital technology has also brought about efforts to transform educational systems. This transformation aims to keep up with the rapid changes brought about by the digital age and to equip students with today's skills (Ersoy & Gurgen, 2021; Kiroglu & Guven, 2024). The integration of technology into education not only enriches learning experiences but also has the potential to provide students with a more effective and interactive learning environment (Erdogmus & Cagiltay, 2009; Kucuk et al., 2024; Zengin et al., 2024).

The way technology use is shaped by gender and its implications in the field of education remain subjects of uncertainty and debate. Differences in technology use and attitudes observed between men and women are linked to social and biological factors. Specifically, demographic characteristics such as gender, ethnicity, religion, social, and economic status are noted to influence individuals' attitudes towards technology and their usage patterns (Anandhita & Ariansyah, 2018; Oldeweme et al., 2021; Rahiem, 2020; Wilhelm, 2018). However, some studies question the extent of these differences. Gokbulut and Coklar (2018) found no significant differences in technology use levels among teachers based on gender. On the other hand, Oktay and Cakir (2012) discovered that woman teachers had higher attitudes towards technology compared to their man counterparts. Menzi et al. (2012) reported that, according to their study on teacher candidates' technology use competencies, man teacher candidates had higher technology usage competencies compared to woman candidates. Gunes and Buluc (2017) demonstrated that man teachers were more effective in using educational technologies and software in their classes, as well as in acquiring knowledge about new technologies, compared to woman teachers. Sayginer (2016) also found that man teacher candidates had higher computer competency levels than woman candidates. Additionally, according to an Organisation for Economic Co-operation and Development (OECD) report, Turkey is among the countries where the largest gender differences in information processing skills are observed (OECD, 2013). These results highlight that the gender variable plays a significant role in technology use and education, yet the diversity of results across different studies underscores the need to understand these dynamics. Including the gender variable in the analysis is a critical step in identifying gender-based differences in technology use in education and in designing more effective educational policies. Gender analysis plays an important role in determining the necessary support and resources for teachers to use technology more effectively in education. Therefore, a comprehensive analysis of the gender variable is essential for enhancing the effective use of technology in education and supporting gender equality.

The widespread use of technology in education increases the opportunity to provide more specific and effective solutions to the learning needs of student groups. Therefore, the proliferation of information technologies in education adds particular value to the education of gifted children (Caliskan, 2017; Ozmen & Komurlu, 2011). While information technologies can effectively enhance the learning environments of typical students (Isman, 2002; Ocak & Kus-Serin, 2024), they are also highly effective in the education of gifted individuals (Gunduzoglu, 2023; Diffily, 2002). These technologies play a significant role in better meeting the individual needs of these students and maximizing their potential. According to Ozmen and Komurlu (2011),

information technologies enable gifted individuals to more easily demonstrate their abilities and facilitate better integration with learning environments. Additionally, these technologies are effective in reducing peer pressure, providing students with opportunities to demonstrate and develop their creativity and mathematical abilities, and promoting collaboration by increasing communication and interaction. Thus, gifted children can experience a more effective learning experience by using information technologies (British Educational Communication and Technology Agency [BECTA], 2001). Gifted children generally require more personalized and in-depth learning experiences beyond standard educational methods. Activities can enhance teaching effectiveness by considering these individual differences and can be tailored to the students' interests, abilities, and learning styles. Activities aimed at developing skills such as problem-solving, creative thinking, and critical analysis can help gifted children better unlock their potential.

Advanced countries' education systems focus particularly on the education of gifted children and have developed various educational models. For example, in Germany, there is no uniform education system nationwide, and in some states, separate classes for gifted children cannot be opened in state schools. However, it is possible for private schools to open separate classes or schools for gifted children. In New Zealand, a flexible and school-centered education model has been adopted for gifted individuals. The Ministry of Education's website in New Zealand provides information and support services for gifted children (TGNA Commission, 2012). In South Korea, with a law enacted in 2002, the education of gifted children has been standardized, and teacher training has become an important part of this process. In Canada, education for gifted individuals is provided within the formal education system, and particularly in the province of Ontario, differentiated educational opportunities are offered to students. In Russia, the Sozvezdie School, established in 1992, offers a special program for the education of gifted individuals. In the UK, various opportunities such as early school entry, grade skipping, and individual mentoring are provided to gifted children (TGNA Commission, 2012).

According to the definition made by the Ministry of National Education (MoNE) in 2013, gifted individuals are individuals who demonstrate performance at a higher level than their peers in terms of general or special talents. However, education programs in Turkey are generally prepared considering the learning capacities of typical students. This creates an educational environment that does not adequately meet the needs of gifted children (Levent & Bakioglu, 2013). In this context, there is a need for the design of programs and education tailored to gifted children and for strategies and recommendations to meet the educational needs of these students in existing educational environments (Levent, 2014). Considering the increasing demand for differentiated programs adapted to the education system in our country, concrete steps need to be taken in this field (Sak et al., 2015). The importance of support education room services is increasingly recognized to meet this demand. The support education room is designed to provide additional support education in areas where full-time inclusive/integration education students and gifted children need in accordance with their individual needs (MoNE, 2018). The implementation of support education rooms brings many benefits. Providing support opportunities tailored to the individual needs of the student helps the student complete topics that are ahead of their peers. Also, providing individual

attention and support contributes to finding solutions to the student's behavioral problems. Thus, the student overcomes behavioral problems and is accepted and valued by the class, school, and community. Receiving education in a support education room for students with disabilities prevents disruptions in the operation of education in the general education classroom and enables normally developing students to benefit from educational opportunities to the fullest. The participation of individuals with special needs in the support education practice ensures that they show positive academic and behavioral development (Asik, 2023; Kale & Demir, 2017; Opengin, 2018; Semiz, 2018).

Due to geographical location, social and cultural characteristics, especially in the Southeastern and Eastern Anatolia regions, the awareness level regarding the education of gifted children is low, and the educational opportunities for these students are limited. It is important for support education room teachers working in these regions to provide education that is suitable for the potential of gifted children (Nar, 2017). Teachers working in support education rooms in our country encounter various difficulties in providing students with unique and effective education. In a study by Al Khateeb and Hadidi (2009), it is stated that there is a lack of technology and resources in support education rooms, while Aydin (2015) emphasized that teachers experience inadequacy in materials, space, and equipment, and suitable materials for students' needs cannot be obtained. Similarly, Guven (2021) also concluded that the physical conditions of support education rooms are inadequate. In this context, increasing the proficiency of these teachers in technology usage and developing their awareness of innovative practices in science are crucial to provide more effective and innovative education to their students.

The continuous updating of students' and teachers' skills and competencies enhances the importance of technology in the field of education (Gulcu et al., 2013). In this context, it has been determined that class and subject teachers working in support education rooms generally lack sufficient professional knowledge and experience, leading to difficulties in the education of students with special needs (Fazlioglu & Dogan, 2013; Kartopu, 2013; Pektas, 2008). However, existing studies have primarily focused on identifying these issues and have not sufficiently addressed solutions. Additionally, these studies often overlook practical strategies for implementing innovative educational practices and how teachers can effectively use technology. The most significant contribution of this study is the organization of concrete activities aimed at directly providing teachers with innovative practices for addressing the educational needs of gifted children. By focusing on STEAM (Science, Technology, Engineering, Arts, Mathematics) areas and offering activities related to robotics and coding, this study aims to help teachers deliver more effective education to their students. This approach seeks to equip teachers with practical knowledge on how to use technology effectively and to enhance the quality of education for students. This study aims to determine how activities teaching innovative practices prepared for the educational needs of gifted children, within the scope of the TUBITAK 4005 “Journey to Innovative Practices of Science with Support Education Room Teachers” project, affect teachers' attitudes and opinions towards the use of technology in education. In line with this aim, the following questions were addressed throughout the study:

- Do teachers' attitudes towards the use of technology in education differ depending on gender? Is there a significant difference in attitudes towards technology use in education between woman and men teachers?

In the context of the "Journey to Innovative Practices of Science with Support Education Room Teachers" project, what feedback have teachers provided regarding the skills they have acquired, their technological learning experiences, and their strengths and weaknesses in using technology? Understanding the impact of activities organized for support education room teachers on their attitudes and opinions towards technology usage can be a valuable opportunity to enhance the quality of education provided by teachers. Increasing teachers' exposure to innovative technologies such as robotics and augmented reality and enhancing their skills in transferring these technologies to students can contribute to the more effective use of educational technology potential and maximizing the potential of gifted children.

Method

This study constitutes a part of the "Journey to Innovative Practices of Science with Support Education Room Teachers" project. Mixed methods were chosen for this study due to various reasons such as allowing the combination of numbers and words, facilitating the integration of reasoning methods (induction and deduction), enabling the answering of questions that cannot be addressed by a single research method, and allowing for the elaboration and enrichment of study results.

As a research method, mixed methods involve the collection and analysis of both quantitative and qualitative data at various stages of the study process, guided by philosophical assumptions. Mixed methods focus on compiling, analyzing, and integrating quantitative and qualitative data within a single study or a series of studies. As noted by Creswell and Plano-Clark (2007), the integration of quantitative and qualitative data is the most significant premise to better understand the research problem compared to methods that collect only one type of data. Mixed methods are particularly suitable for studies where a single type of data is insufficient, where the results need to be generalized during the study, where the results need to be clarified, and where an additional method is used. It is necessary to make some stages of the research more meaningful and understandable.

In the study, an explanatory design, which is one of the mixed methods designs, was used. There are four basic points to consider in selecting the most appropriate design type for mixed methods studies. These are the level of interaction between stages, the relational priority of stages, the timing of stages, and the integration of stages. The explanatory design is a mixed methods design where the researcher conducts a quantitative stage initially and then begins to search for specific outcomes in the second stage. The second qualitative stage is applied to further explain the relevant results, and the focus of the design is on explaining these results. The general aim of the explanatory design is to use the qualitative stage to explain relationships and trends within quantitative data (Creswell et al., 2003). In this design, first, the teachers' attitudes towards the use of technology in education were determined through quantitative data, and numerical data were collected using an attitude scale. In the second phase, qualitative data were collected to gain a deeper understanding of the teachers' perspectives, and content analysis was conducted on the journals. Thus, the

general trends and results obtained from the quantitative data were explained in more detail and contextually through the qualitative data, providing a deeper understanding of the teachers' attitudes and experiences regarding technology use.

Ethical Procedures

Ethical approval for this study was obtained with decision number 6 dated 23.12.2021 from the Ethics Committee of Social and Humanities Research at Firat University. Written consent was obtained from the participating teachers, and they were provided with information about the process, purpose, and outcomes of the study to ensure their understanding. The identities and personal information of the teachers were kept confidential. Researchers were vigilant to minimize any biases during the data collection and analysis processes.

Participants

The study was conducted with 30 support education room teachers (16 woman, 14 man) working in the Southeastern and Eastern Anatolia Regions, and to ensure the confidentiality of the teachers, pseudonyms were used instead of their real names. Criterion sampling, one of the purposive sampling types, was used in determining the study group. Purposive sampling involves selecting rich situations in terms of information related to the purpose of the study to conduct in-depth research. In criterion sampling, which is one of the types of purposive sampling, the sample is composed of individuals, events, objects, or situations with characteristics identified for the problem (Yildirim & Simsek, 2011). The following criteria were considered in selecting teachers:

- Teachers working in state schools,
- Teachers serving in support education rooms in the Southeastern and Eastern Anatolia Regions or considering this duty,
- Equal or balanced number of man and woman teachers,
- Teachers with postgraduate education,
- Teachers willing to develop and conduct research.

Data Collection Tools

The “Attitude Scale towards the Use of Technology in Education”, developed by Ozturk (2006), consists of 39 attitude statements, with 15 being positive and 24 negative, using a 5-point Likert scale. The scale consists of three dimensions. The first dimension, “the reflection of technology use in education on teaching processes”, includes 16 items. The second dimension, “self-development in technology use in education”, comprises 14 items. The third dimension, “technology use in education and classroom management”, contains 9 items. The positive items on the scale are scored from 5 to 1 with options “Strongly Agree = 5”, “Agree = 4”, “Undecided = 3”, “Disagree = 2”, and “Strongly Disagree = 1”, while the negative items are scored inversely from 1 to 5. The Cronbach's Alpha reliability coefficient of the scale was found to be 0.90. The scale was administered to participant teachers as a pre-test and post-test.

As part of the study, teachers were asked to keep a journal to share their opinions, and experiences based on the activities and observations conducted during the study. Two guiding questions were asked to encourage teachers to express their opinions, and experiences clearly and openly. The questions included in the journal are listed below:

- What achievements do you think you have obtained from the activities you participated in during the day? Please mark (Learning and innovation skills: Creativity and innovation, critical thinking, problem-solving, communication, collaboration; Information, media, and technology skills: Information literacy, media literacy, information and communication technology literacy; Life and career skills: Flexibility and adaptability, entrepreneurship and self-direction, social and intercultural skills, productivity, leadership).
- What did you learn technologically in the project? What are your technological strengths and weaknesses?

The journals collected from teachers at the end of the same day contain information about the gains they obtained from the activities they participated in during the day and what they learned technologically, as well as their strengths and weaknesses in technological terms.

Research Process

The TUBITAK 4005 "Journey to Innovative Practices of Science with Support Education Room Teachers" project was conducted in Elazig province between October 23th and 25th, 2021. A total of 23 different activities were organized within the scope of the study, and these activities were introduced to the teachers by expert academics. The activities held during the study included various methods such as animation and simulation, augmented reality, computational thinking, digital games, educational games, mobile practices, gamification, sports and arts, discussion (seminar, panel vb.), and STEAM (Science, Technology, Engineering, Arts, Mathematics). These activities aimed to provide teachers with a broad perspective on innovative practices, developments in the STEAM field, and methods to support students' special abilities. The activities conducted during the study are presented in Table 1.

Table 1

Activities Conducted During the Study

Days	Activity Names
1st day (October 23, 2021)	Project opening
	Pre-test implementation
	Characteristics of gifted children and educational needs of gifted children
	STEAM theory and practices
	Introduction to robotics through Milo Science
	Fastest race car
	Evaluation of the day-1
2nd day (October 24,	Solar-powered car

2021)	Earthquake simulator
	Designing my dreams with a 3D pen
	My dream car
	Researcher teachers building a theme park I
	Researcher teachers building a theme park II
	Evaluation of the day-2
3rd day (October 25, 2021)	Augmented reality activity with Aurasma
	Augmented reality activity with Quiver Education app
	Smart projects with Arduino
	Creating interactive exams with Kahoot! app
	Creating interactive exams with Powtoon app
	My propeller paper car
	Post-test implementation
	Evaluation of the day-3
	Closing and document submission

Table 1 summarizes the activities and daily schedule from October 23-25, 2021. According to the table, on the first day, a total of seven activities were conducted, including STEAM theories, an introduction to robotics, building the fastest race car, and the day's evaluation. On the second day, seven activities were held, featuring amusement park construction, an earthquake simulator, a solar-powered car, and 3D design. The third day included nine activities, such as augmented reality practices, robotic programming, and effective presentation creation. In total, 23 different activities were conducted throughout the course.

Photographs of the activities conducted during the study process are presented in Figures 1, 2, and 3.

Figure 1

Photograph of the Introduction to Robotics through Milo Science Activity

Figure 2

Photograph of the Earthquake Simulator Activity

Figure 3

Photograph of the Building an Amusement Park II Activity

Researchers play significant roles in the successful execution of the study. They planned and designed the activities at the beginning of the study. When designing the activities, special emphasis was placed on creating an effective and innovative teaching process tailored to the educational needs of gifted children. Each activity was meticulously planned with consideration of these children's characteristics and educational requirements. The design of the activities prioritized active teacher participation and hands-on learning methods, ensuring that teachers had the opportunity to directly apply the knowledge they gained. Additionally, it was decided to administer pre-tests at the beginning and post-tests at the end of the activities to assess the development of teachers' knowledge and skills. Organizational tasks such as organizing the activities and providing materials and resources were carried out by the researchers. The process of data collection and analysis was also conducted by the researchers. Additionally, researchers provided education and guidance to the teachers during the

activities and maintained continuous communication with them throughout the study process.

Data Analysis

SPSS 23 software package was used for the analysis of quantitative data collected during the study. To determine whether there were any gender-based differences in teachers' attitudes towards technology use before and after the study, and to assess the normality of the data distribution, skewness and kurtosis coefficients were examined to see if they fell between -1 and +1. Additionally, due to the small size of the study group, the Shapiro-Wilk test was employed for analysis (Buyukozturk, 2017; Cevahir, 2020). The presence and impact of outliers in the data were assessed, and their effects on the analysis were considered and managed appropriately. Additionally, the adequacy of the sample sizes for both groups (woman and man) and the equality of group sizes were checked. The independence of data within each group was also examined to ensure that individual responses did not influence each other. Following a detailed examination of these parameters, the Mann-Whitney U test was employed for analyzing the scale data. This test is used to determine whether two different groups have similar distributions regarding the variable under investigation. Particularly in experimental studies with a small number of subjects, this test is frequently preferred for data that do not meet the normality assumption.

In the study, content analysis was used for the analysis of qualitative data. Content analysis involves breaking down data into smaller units and categorizing these units. In this process, the researchers used the terms content analysis and coding synonymously, providing an objective, structured, and quantitative explanation of symbolic behaviors, which ensured the attainment of repeatable and valid results (Cartwright, 1953). The journals were reviewed several times by the researchers, and codes were created based on the identified concepts. After compiling and examining these codes, themes were developed by considering the commonalities and similarities among the codes. For example, based on the teachers' responses to the question “What technological skills did you acquire in the project?”, conceptual codes such as “learning and applying technological practices, reinforcing knowledge through practical application” and “understanding the mechanisms of robots and learning the fundamental principles of mechanical systems” were identified. The common points among the codes were analyzed to create final themes, and the general trends of the data were determined through these themes. This process was carried out independently by two researchers, and a comparative review was conducted to ensure consistency in the obtained results. During this process, the following important concepts were considered to evaluate the validity and reliability of the journals:

- Researchers assured teachers of the confidentiality of their journals, directed them to express their opinions, and experiences clearly and openly with explicit and clear questions, and ensured that the contents were analyzed without disclosing their personal information.
- Teachers were encouraged to use clear and understandable language in their journals to increase the transferability of the data. They were provided with guidance and questions to provide information under specific topics or headings in their journals, and the data were described in detail and presented impartially.

- Data consistency was evaluated using the Miles-Huberman formula, aiming for an agreement of 80% or higher among coders (Miles & Huberman, 1994; Patton, 2002). The obtained agreement value was calculated as 85%.
- For the validity and reliability of the study, the data were verified by an expert group, aiming to enhance the validity and reliability of the study (Cepni, 2011; Denzin & Lincoln, 1994). Additionally, direct quotations have been included to support validity.

Results

In this section, the results obtained from the journals kept by the teachers to share their own opinions, and experiences based on their attitudes towards technology use in education, as well as the conducted activities and observations, are presented.

Teachers' Attitudes towards Technology Use in Education

The results of the Mann-Whitney U test comparing teachers' attitudes towards technology use in education before and after the application, based on gender, are presented in Table 2.

Table 2

Mann-Whitney U Test Results for Attitudes towards Technology Use in Education by Gender

Variables	Gender	Number of People (N)	Rank Mean	Sum of Ranks	U	p
Attitude towards Technology Use in Education Scale_Pre	Woman	16	14.66	234.50	98.50	.57
	Men	14	16.46	230.50		
Attitude towards Technology Use in Education Scale_Post	Woman	16	13.47	215.50	79.50	.16
	Man	14	17.82	249.50		

Upon examining Table 2, the U statistic for the “Attitude towards Technology Use in Education Scale_Pre” between women and men is 98.50, with a p-value of 0.57. Thus, no statistically significant difference was found between genders in this measurement ($p > 0.05$). In the case of the “Attitude towards Technology Use in Education Scale_Post”, the U statistic between women and men is 79.50, with a p-value of 0.16. Similarly, no statistically significant difference was found between genders in this measurement as well ($p > 0.05$). Consequently, when the data is examined based on gender, no statistically significant difference in attitudes towards technology use is observed between women and men.

Teachers' Journals

In this section, the questions in teachers' journals, the responses to these questions, the themes and codes generated, the frequencies of these responses and codes, and some students' opinions are presented.

Various skills gained by teachers during the course of the study through the conducted activities are provided in Table 3.

Table 3

Activities and Gained Skills

Days	Activities	Skills		
		Learning and Innovation Skills (creativity and innovation, critical thinking, problem-solving, communication, collaboration)	Information, Media, and Technology Skills (information literacy, media literacy, information and communication technology literacy)	Life and Career Skills (flexibility and adaptability, entrepreneurship and self-direction, social and intercultural skills, productivity, leadership)
1st day	Characteristics of gifted children and their educational needs	9	6	15
	STEAM theory and practices	13	10	15
	Introduction to robotics through Milo Science	8	5	17
	The fastest racing car	12	8	15
2nd day	Solar-powered car	14	6	12
	Designing my dreams with a 3D pen	13	12	14
	My dream car	10	5	13
	Earthquake simulator	7	7	12
	Researcher teachers building a theme park I	14	10	13
	Researcher teachers building a theme park II	12	9	12
3rd day	Augmented reality activity with Aurasma	19	16	24
	Augmented reality activity with Quiver Education app	20	16	21
	Smart projects with Arduino	20	16	24

	Preparing interactive exams with Kahoot! app	20	18	21
	Preparing interactive exams with Powtoon app	22	20	18
	My paper fan-powered car	17	12	14

Table 3 shows that the skills gained by teachers from the activities increased as the study progressed. Especially the activities on the 3rd day (Augmented reality activity with Aurasma, augmented reality activity with Quiver Education app, smart projects with Arduino, preparing interactive exams with Kahoot! app, preparing interactive exams with Powtoon app, my paper fan-powered car) have provided teachers with a wide range of skills. Additionally, it is observed that teachers made progress, particularly in the "life and career skills" domain as a result of these activities.

The frequencies of the responses given by teachers to the question "What did you learn technologically in the project?" are presented in Table 4.

Table 4

Responses of Teachers Regarding their Technological Learning Experiences

Days	Themes	Codes	f
1st day	Technological development and application skills	Learning and using technological practices, reinforcing knowledge by practical application	10
		Understanding the working mechanism of robots and learning the basic principles of mechanical systems	4
		Learning the importance of technology for life, understanding the role of technology at individual and societal levels	2
		Using algorithms in vehicle construction with Legos and making connections with daily life	1
		Learning basic technology concepts and acquiring basic knowledge in information technology, hardware, and software	1
		Learning how new technological designs can be made with creative thinking skills	1
		Realizing the convenience of robotics and coding in many areas of life, understanding the universal importance of these skills	1
		Recognizing the efficiency of learning by doing rather than theoretical knowledge in technological practices	1
2nd day	STEAM education and technological skills	Developing skills related to the use of 3D pens	9
		Learning about renewable energy concepts using solar panels and simple motors	9
		Acquiring the ability to use WeDo 2.0 program	5
		Learning design and coding practices using Lego	3
		Gaining the ability to use the Green Screen practice	3
		Understanding the STEAM concept and learning process within	3

		this scope	
3rd day	Variety and use of technological concepts in STEAM education	Understanding the features and usage areas of practices like Aurasma, Kahoot!, Powtoon	12
		Grasping the basic coding principles used in robotic systems	2
		Understanding the principles and operation of 3D technological devices	1
		Learning the design processes of STEAM activities	1

In Table 4, responses of teachers regarding their technological learning experiences during the three-day projectare provided. On the first day, teachers learned basic technology concepts, including the working mechanisms of robots, their fundamental principles, and the use of algorithms in Lego vehicle construction. They also had the opportunity to understand the individual and societal role of technology in life. On the second day, they focused on various topics such as 3D pen usage, renewable energy concepts with solar panels and simple motors, the WeDo 2.0 program, Lego design, and the Green Screen application. On the third day, their focus shifted to features of practices like Aurasma, Kahoot!, Powtoon, coding principles used in robotic systems, usage of 3D technological devices, and STEAM activity design processes. Some of the responses to the question are provided below:

> Teacher Efe: I learned that by closely following technology, many projects can be produced, and it's essential to keep up with the rapid developments in technology.
>
> Teacher Idil: I was not knowledgeable about online practices like Canva, Kahoot!, Powtoon, etc. I gained awareness about them. I will use them in my lessons to both raise awareness among my students and make the lessons enjoyable and productive.

The frequencies of responses given by teachers to the question “What are your strengths in terms of technology?” are provided in Table 5.

Table 5

“Responses Regarding “Creative Technology Skills and Openness to Development” Theme

Days	Responses	f
1st day	Ability to creatively combine mechanical knowledge to generate innovative solutions	1
	Capability to quickly and easily adapt to new programs and technological developments	1
2nd day	Possessing creative thinking skills in a technological context	1
	Being open to technological advancements	1
	Applying critical thinking skills in a technological context	1
3rd day	Having an openness to learning in a technological context, being curious, and having a willingness for continuous development	5
	Possessing innovative thinking skills and a sense of responsibility while using technology	2
	Ability to quickly grasp and learn technological information	1

Table 5 summarizes the responses of teachers under the theme of "creative technology skills and openness to development". On the first day, teachers highlighted their abilities to creatively combine mechanical knowledge to generate innovative solutions and to quickly adapt to new programs; both responses came from a single teacher. On the second day, teachers emphasized their creative thinking skills in a technological context, openness to technological advancements, and application of critical thinking skills; each of these three responses came from different teachers. On the third day, teachers focused on openness to learning in a technological context, curiosity, and willingness for continuous development; these responses were provided by five teachers. Additionally, two teachers discussed innovative thinking skills and a sense of responsibility while using technology. The ability to quickly grasp technological information was mentioned by only one teacher. In the evaluation of the 30 teachers, the majority of responses did not align with the examined skill, and only a limited number of teachers' responses were consistent with this theme. Therefore, the views of the other teachers were not considered under this theme. Some of the responses to the question are provided below:

> Teacher Ali: I believe I am fast in grasping and learning technological information.
>
> Teacher Sevda: I realized that I am open to learning in a technological context and can adapt quickly.

The frequencies of the responses given by teachers to the question "What are your shortcomings in terms of technology?" are provided in Table 6.

Table 6

Responses Regarding "Deficiencies in Technological Skills and Development Needs" Theme

Days	Responses	f
1st day	Not having sufficient skills in coding	1
	Not having adequate interest and knowledge in engineering discipline where new designs generally attract attention	1
	Feeling inadequate in integrating technology into the curriculum successfully	1
	Feeling deficient in STEAM subjects	1
2nd day	Feeling deficient in engineering and design disciplines	2
	Feeling deficient in coding	1
	Having a lack of understanding of technological concepts	1
3rd day	Being inadequate in keeping up with technology trends	1
	Feeling deficient in coding skills	1

Table 6 summarizes the teachers' responses to the theme of "deficiencies in technological skills and development needs" by day and number of teachers. On the first day, it is observed that teachers highlighted various technological skill deficiencies. Four teachers indicated their lack of proficiency in coding, lack of interest and knowledge in engineering disciplines related to new designs, difficulties in successfully integrating technology into the curriculum, and inadequacies in STEAM subjects. Each

response came from a different teacher. On the second day, deficiencies in engineering and design disciplines and coding skills were emphasized. On this day, two teachers mentioned deficiencies in engineering and design disciplines, while one teacher noted inadequacies in coding and technological concept understanding. On the third day, teachers pointed out deficiencies in keeping technology up-to-date and in coding skills. On this day, one teacher mentioned issues with staying current with technology and another with coding skills. Given that many responses did not align with the examined skill and only a limited number of teachers' responses were consistent with this theme, the views of the other teachers were not considered within this theme in the evaluation of 30 teachers. Some of the responses to the question are provided below:

> Teacher Merve: I believe I have a lack of understanding of concepts and a knowledge gap in the fields of science and engineering.
>
> Teacher Selim: I think I have many deficiencies. I especially realized the need to closely follow technology.

Discussion and Conclusion

The aim of this study was to determine how innovative practices designed for the educational needs of gifted children, taught in activities within the scope of the TUBITAK 4005 “Journey to Innovative Practices of Science with Support Education Room Teachers” project, affected teachers' attitudes and opinions towards the use of technology in education.

Research on technology use indicates that there are differences in technology use and attitudes between men and women. These differences are associated with demographic characteristics such as gender, ethnicity, religion, social, and economic status (Anandhita & Ariansyah., 2018; Oldeweme et al., 2021; Rahiem, 2020; Wilhelm, 2018). These demographic factors influence individuals' attitudes towards technology. There are various approaches in the literature regarding how technology use changes according to gender (Ardies et al., 2015; Plumm, 2008; Teo et al., 2016). In particular, signs of differences in technology use between genders still exist in education (Tasci et al., 2023). However, the results of the Mann-Whitney U test analysis conducted in this study indicate that there was no statistically significant difference between man and woman teachers' attitudes towards technology before and after the implementation (Table 2). This result suggests that innovative practices supporting the use of technology in education may be beneficial for all teachers regardless of gender. This result is consistent with many studies in the literature (Ardic, 2021; Dursun et al., 2017; Qazi et al., 2022), highlighting that technology use is influenced not only by gender but also by demographic, social, and cultural factors. Therefore, these factors are critical in effective technology use in education.

The continuous updating of skills and competencies for both students and teachers enhances the role of technology in education (Gulcu et al., 2013). The results of this study indicate that the educational activities provided to teachers help to improve their learning and innovation skills, media and technology knowledge, as well as life and career skills. The literature suggests that innovative practices equip teachers with problem-solving, creativity, and collaboration skills, and also enhance life and career skills (Sayin, 2020; Avci et al., 2019). Technological tools offer significant opportunities for students, such as reducing peer pressure, increasing creativity, and

improving mathematical skills. Additionally, interaction with technology enhances communication and supports collaboration and teamwork skills. Gifted children can achieve more effective learning experiences through the use of information technology (BECTA, 2001). Therefore, the role of technology in education is a critical factor that enriches and develops the educational processes for both students and teachers. Throughout the study, the activities provided to teachers have developed their learning and innovation skills, media and technology knowledge, as well as life and career skills. Particularly, activities conducted on the third day offered a broad range of skills and showed a notable development in "life and career skills" (Table 3). STEAM theories and practices, robotics, augmented reality, coding, and interactive exam preparation were observed to significantly contribute to the professional development of teachers. Teachers acquired various new information and skills in STEAM education and technological development, including robotics, 3D technology, coding, augmented reality, solar energy, and media literacy. Notably, in the later days of the study, an increased interest in technological concepts, practices, and STEAM education among teachers was observed (Table 4). Furthermore, teachers emphasized skills such as creative technological thinking, openness to technological advancements, critical thinking, and openness to continuous learning, showing development in these areas (Table 5). These results suggest that innovative educational activities can enrich teachers' technological learning experiences and contribute to the continuous updating of their technological skills and competencies.

Evaluations conducted throughout the study revealed that teachers felt inadequate in keeping up with current technology, particularly in coding, engineering, design, and STEAM subjects (Table 6). These inadequacies manifest as gaps in teachers' abilities to integrate technology into the curriculum and in their knowledge and skills regarding fundamental technology concepts. This situation is supported by several studies, which highlight that support staff and subject teachers often lack sufficient professional knowledge and experience, leading to challenges in educating students with special needs (Fazlioglu & Dogan, 2013; Kartopu, 2013; Pektas, 2008). These gaps in teachers' competencies can hinder their ability to provide effective and high-quality education, potentially negatively impacting students' learning processes. Therefore, it is essential to continuously update technological skills and competencies, invest in teachers' professional development, and provide more comprehensive and ongoing support for technology education. Innovative educational activities and programs play a critical role in enhancing teachers' professional knowledge and experience, ensuring effective use of technology, and providing students with more effective learning experiences.

Implications

Based on the results of this study, the following recommendations can be made for teachers and gifted children:

- It is recommended to prepare specialized educational materials and resources to enable teachers to enhance their skills and competencies in using technology in education.
- Regular professional development programs, training sessions, and seminars should be conducted to allow teachers to keep their technological knowledge

and skills current and address deficiencies in areas such as coding, engineering, and design.

- Interactive and hands-on learning opportunities should be provided to students.
- Personalized educational programs should be developed for gifted children, tailored to their individual interests and abilities.

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All sections of the article have been collectively written by the authors. Introduction, method, results, discussion and conclusion sections have been collaboratively composed.

Conflicts of Interest

The authors or the article do not have any financial, commercial, legal, or professional relationship with any person or organization, therefore, there is no conflict of interest.

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