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ORIGINAL ARTICLE

The Effect of Digital Material Applications on Preservice Teachers' Self-Efficacy towards Educational Technology Standards

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Volunteer pre-service teachers were included in the study.

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"No conflict of interest is present in the conduction or the reporting of this study."

ABSTRACT

This study aims to explore the transformation processes of pre-service teachers in terms of knowledge, skills, and attitudes gained through digital material applications and to evaluate their effects on self-efficacy towards educational technology standards. A one-group pretest-posttest quasi-experimental design was used for the quantitative part, and a phenomenology design was applied for the qualitative part. The study involved 74 first-year pre-service teachers from the English Language Teaching program at a state university during the spring semester of 2023-2024 who were taking the Instructional Technology Course. Data were collected using the Self-Efficacy Scale for Educational Technology Standards (ETSSE) and a Written Opinion Form on Digital Material Applications. In the analysis of the data, a t-test was used for quantitative data and content analysis was used for qualitative data. The findings show that digital material applications significantly enhance pre-service teachers' self-efficacy towards educational technology standards. Participants reported improvements in knowledge, skills, and attitudes, particularly in strengthening pedagogical and technological skills, creative thinking, and professional self-confidence. These results reveal that digital tools contribute significantly to the professional development of pre-service teachers and support effective technology integration in educational processes. The study highlights the importance of continuous training and support in developing digital competencies for teaching. Encouraging the effective use of digital tools can further enhance teaching practices, enrich learning experiences, and build pre-service teachers' confidence in integrating technology into their professional roles.

Keywords: Digital Material Applications, Self-efficacy towards Educational Technology Standards, Technology Integration.

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INTRODUCTION

The use of digital technologies and Web 2.0 tools in education has the potential to transform learning and teaching processes. Today, the integration of these tools into educational environments requires individuals not only to use technology as a tool but also to employ these tools consciously and effectively for pedagogical purposes (Berg, 2011; Collis & Moonen, 2008). In particular, pre-service teachers' adoption of technology as a tool to support teaching processes, rather than as a goal, plays a critical role in both improving their professional competences and increasing students' digital literacy (Starkey, 2019). In this context, it is seen that some studies have focused on pre-service teachers' ability to use this technology and their competencies. Collis and Moonen (2008) emphasize that pedagogical practices supported by new technologies that can lead to innovation, or not sufficiently known and valued by educators and are perceived as difficult to implement in practice. On the other hand, according to Berg (2011), lecturers lack awareness of the opportunities that Web 2.0 tools offer in terms of student engagement. The fact that lecturers, teachers or pre-service teachers are not adequately equipped on how to use these tools, have difficulties in incorporating modern technology into teaching practices and gaining an in-depth understanding to align specific technology applications with learning objectives are among the significant challenges (Karakuş & Er, 2021; Wang & Lu 2021). In this context, some studies have focused on developing the skills necessary for pre-service teachers to use technology in educational activities (Cengiz, 2014; Ersoy et al., 2016; Gürsoy & OrhanGöksün, 2019). Because the increasing importance of digital technologies and the internet in education systems and the consequent change in school, teacher and learner profiles and teaching processes have made it inevitable for teacher training programs to adapt to this change (Starkey, 2019).

Studies in the literature emphasize that pre-service teachers' technology use skills are insufficient (Aksoğan & Bulut Özek, 2020; Emre et al., 2020), that these skills are not adequately supported in undergraduate education (Aydoğmuş & Karadağ, 2020), and that teachers' digital competencies are not at the desired level, especially in terms of digital pedagogical competencies (Köksal & Canlı, 2024; Polat & Göktaş, 2023). Research on pre-service teachers' technology use self-efficacy in Turkey reveal varying results. While some studies reveal that teachers and pre-service teachers generally have high self-efficacy levels regarding educational technology standards and self-efficacy (Ozan & Taşgın, 2017; Şimşek & Yazar, 2017), some studies reveal that pre-service teachers are confident in using basic technologies such as search engines and preparing simple teaching materials but have difficulty in more complex educational technologies (Erdemir et al., 2009). Factors such as grade level, program of study and computer ownership significantly affect pre-service teachers' self-efficacy (Ozan & Taşgın, 2017), and self-efficacy towards educational technology standards is related to attitudes towards technology use and material development competencies (Şimşek & Yazar, 2017). These studies emphasize the importance of technology education and integration in teacher education programs to increase self-efficacy in educational technology standards. In this context, investigating the effect of digital material applications on pre-service teachers' self-efficacy towards educational technology standards will contribute to both the literature and the development process of teacher education programs towards technology integration. Because educational technology standards provide a comprehensive framework that requires individuals to use digital technologies pedagogically effectively in the context of knowledge, skills, and attitudes (ISTE, 2024). Self-efficacy towards these standards has a critical importance for pre-service teachers both in their professional development processes and in their future teaching practice.

In this context, this study aims to understand the transformation processes of pre-service teachers in terms of

knowledge, skills, and attitudes gained through digital material applications and to evaluate the effect of these processes on their self-efficacy towards educational technology standards. Accordingly, the following questions were sought to be answered in the study:

1. Is there a significant difference in pre-test and post-test scores of pre-service teachers' self-efficacy towards educational technology standards?

2. Is there a significant difference in the pre-test and post-test scores of pre-service teachers regarding the sub-dimensions of the self-efficacy scale for educational technology standards?

3. What are the opinions of pre-service teachers about the competences that digital material applications provide for knowledge, skills and attitudes?

It is thought that the results of this study will make an important contribution in terms of supporting the digital material integration processes of teacher training programs, increasing candidates' self-efficacy related to technology and providing guidance for more effective technology use in education.

METHOD

Research Design

In this study, mixed-method approach was employed combining quantitative and qualitative analyses were used together. Mixed method research is a type of research in which a researcher or a team of researchers combines elements of qualitative and quantitative research approaches to achieve breadth and depth (Johnson et al., 2007). For the quantitative dimension of the study, a quasi-experimental design with pre-test and post-test control groups was used. The quasi-experimental process in which the effect of digital material applications (X) on the level of self-efficacy regarding educational technology standards (dependent variable) on first-year pre-service teachers in the English language teaching program is examined is presented in Table 1.

Table 1. *Experimental Design of the Study*

Group	Pre-test	Operation	Final Test
G	O1	X	O2
English Language Teaching	Self-efficacy Scale for Educational Technology Standards (Dependent Variable)	8 Weeks Training (Digital Material Design) (Intervention)	Self-efficacy Scale for Educational Technology Standards (Dependent Variable) Written Opinion Form Regarding Digital Material Applications

For the qualitative part of the research, a phenomenological design was employed to explore the views of pre- service teachers on digital material applications. Phenomenology design focuses on phenomena that individuals are aware of but do not fully understand in-depth or in detail. In addition, phenomenological research aims to uncover what a phenomenon (event, concept, experience, perception, etc.) means in the lives of individuals (Yıldırım & Şimşek, 2016). In the study, as a requirement of phenomenological studies, the common meaning of pre-service teachers' experiences related to digital material applications was examined and discussed (Creswell, 2014).

Participants

The study group for this research was determined using convenience sampling, which is one of the purposive sampling methods, as the researcher conducts this course and has easy access to the participants. The study group of the research consists of 74 pre-service teachers studying in the first year of the Department of English Language Teaching at the Faculty of Education of a state university in the Spring Term of the 2023-2024 academic year and taking the Instructional Technologies Course. Table 2 provides information about the study group of the research.

Table 2. *Study Group of the Research*

	Groups	Female N	Male N	Total N	%
English Language Teaching	1	18	4	22	29.7
	2	21	7	28	37.8
	3	21	3	24	32.4
Total		60	14	74	100

As shown in Table 2, the study group consists of a total of 74 pre-service teachers. There are 22 pre-service teachers (18 female, 4 male) in group 1, 28 pre-service teachers (21 female, 7 male) in group 2, and 24 pre-service teachers (21 female, 3 male) in group 3.

While selecting the participants, all students were informed about the research, and it was explained how they could apply the skills gained through the digital material applications within the scope of the research both in their student life and in their professional careers in the future. Seventy-four pre-service teachers who volunteered accepted to participate in the study, and the remaining 26 pre-service teachers were not included in the study group.

Instruments

In order to assess the self-efficacy of pre-service teachers towards educational technology standards, "Self-Efficacy Scale for Educational Technology Standards (ETSES)" developed by Şimşek and Yazar (2017) was used. The scale is a five-point Likert-type scale and the following score coding as Strongly Agree=5, Agree=4, Undecided=3, Disagree=2 and Strongly Disagree=1. The scale was developed based on the International Society for Technology in Education (ISTE) standards. The scale consists of five sub- dimensions and 40 items. The first factor includes items 1-9, the second factor is items 10-19, the third factor is items 20-24, the fourth factor is items 25-31, and the fifth factor is items 32-40. The fit indices of the original scale were analyzed in detail. The indices are named as $\chi 2$, $\chi 2/df$, GFI, AGFI, RMSEA, RMR, SRMR, NFI, CFI, RFI, RMR, IFI. Confirmatory Factor Analysis (CFA) values of the original scale are $\chi 2$ (732, N = 394) = 2362.77, $p < .000$, RMSEA=.069, S-RMR= .059, NFI =.95, NNFI= .97, CFI= .97, IFI= .97]. In terms of validity and reliability, the scale was deemed appropriate for use in this study.

Secondly, the 'Written Opinion Form on Digital Material Applications' created by the researchers was used to determine the opinions of pre-service teachers about digital material applications. While preparing the form, the researchers firstly reviewed the literature and examined the studies, and in this direction, they created the draft form by writing three open- ended questions to answer the research questions. The researchers received the opinions of two field experts about the draft form and no changes were required. In addition, to determine the approximate answer time of the questions and to test the comprehensibility of the questions, the form was applied on a student who was outside the scope of the research, and no changes were made to the form since no problems were experienced. In the research,

pre-service teachers were asked which competencies digital material applications provide in terms of knowledge, skills, and attitudes.

Procedure

This study was conducted by the researcher in the Instructional Technologies Course for first-year students of the Department of English Language Teaching, Faculty of Education, Department of Foreign Languages Education, Faculty of Education of a state university in Ankara, in the Spring Term of the 2023-2024 academic year. While planning the activities, two experts from the Department of Curriculum and Instruction were consulted. The course is credited as 2 hours in the program. In the scope of the research, Self-Efficacy Scale for Instructional Technology Standards was administered to the study group before the experimental process. The content and scope of the course followed the normal process. Starting from the fourth week during the last 20 minutes of each session, a Web 2.0 tool was introduced every week. The usage of each tool was explained, and sample course materials were examined. The pre-service teachers who voluntarily participated in the study were assigned weekly homework and asked to prepare examples using the relevant web tool for their fields outside of class hours. These assignments were uploaded to the Padlet application created by the researcher and shared with the candidates. The researcher also provided individual support via e-mail and gave necessary feedback. When selecting these Web 2.0 tools, the most important factors that influenced the selection were their usability in the educational process, ease of use, availability free of charge, and their relevance in English language teaching given the background of the pre-service teachers. After the eight-week process was completed, the Self-Efficacy Scale for Educational Technology Standards was applied again. Additionally, to collect qualitative data, the "Written Opinion Form on Digital Teaching Materials" prepared by the researcher was distributed to the pre-service teachers and they were given time to complete the form. The researcher administered the forms. Details of the implementation process of the research, organized by week, are provided in Table 3.

Table 3. *Implementation Process of Digital Materials*

Weeks	Web Tools	Events
		Pre-test application of self-efficacy scale for educational technology standards
1	Padlet	Create a virtual classroom using Padlet and create content with examples of how it can be used in the field of English
2	Canva	Preparing a presentation for the field of English using Canva, uploading the link to Padlet created by the researcher
3	Emaze	Preparing a presentation for the field of English using Emaze, uploading the link to Padlet created by the researcher
4	Powtoon	Preparing a 2-minute educational video introducing himself/herself as a prospective teacher using Powtoon, uploading the link to Padlet created by the researcher
5	Venngage	Preparing an infographic on the necessity of using teaching materials using Venngage, uploading the link to Padlet created by the researcher
6	Wordwall	Creating an activity for the field of English using Wordwall, uploading the link to the Padlet created by the researcher
7	Kahoot	Creating an activity consisting of 5 questions for the field of English using Kahoot, uploading the link to Padlet created by the researcher
8	Plickers	Creating an activity consisting of 3 questions for the field of English using Plickers, uploading the link to the Padlet created by the researcher
		Post-test application of self-efficacy scale for educational technology standards Application of written opinion form on digital teaching materials

Data Analysis

The SPSS data analysis program was used for the statistical analyses of the quantitative data obtained with the Self-Efficacy Scale for Educational Technology Standards. The scale used in the research was administered twice before the digital material applications (pre-test) and after the applications (post-test). The scores obtained from the dependent variables were tested for normal distribution. Then, parametric tests were used when the normality assumption was met, and nonparametric tests were used when the normality assumption was not met. In this case, before examining the differences between the pre-test and post-test scores of pre-service teachers' levels of self-efficacy towards educational technology standards, it was checked whether the distribution of the pre-test and post-test scores obtained from all the groups was in accordance with the assumption of normal distribution. For this purpose, the differences between the pre-test and post-test scores were calculated and the normal distribution analysis was performed on these difference scores. The results of the Kolmogorov Smirnov (K-S) test were examined to determine whether the differences of the pre-test and post-test scores were normally distributed, and the skewness and kurtosis values were calculated in terms of Z scores. The K-S test was used because the size of the study groups was larger than 50 (n>50). The Z statistics, obtained by dividing the skewness and kurtosis coefficients by their standard errors, were considered significant at a 1.96 level (Büyüköztürk, 2024). The normality test results for the Self-Efficacy Scale for Educational Technology Standards and its sub- dimensions are presented in Table 4.

Table 4. *Normality Test Results of the Differences of the Self-Efficacy Scale for Educational Technology Standards Pre-Test and Post-Test Score*

Sub Dimensions	N	K-S	Z skewness	Z kurtosis
1. Facilitating Student Learning and Encouraging Creativity	74	,032*	,751	1,229
2. Designing and Developing Learning Environments and Assessment Activities Suitable for the Digital Age	74	,001*	,895	1,125
3. Pioneering the Working and Learning Approach of the Digital Age	74	,004*	,364	,596
4. Modelling Digital Citizenship	74	,067	,569	,111
5. Participation in Professional Development and Leadership Activities	74	,200	,697	1,369
Self-efficacy towards Educational Technology Standards (Total)	74	,087	1,000	1,589

*p<,05

When the normality test results for the sub-dimensions of "facilitating students' learning and encouraging creativity", "designing and developing learning environments and assessment activities suitable for the digital age" and "leading the working and learning understanding of the digital age" are examined in the table, it is observed that the skewness and kurtosis values are within acceptable limits for normal distribution (Z<1,96). However, according to the Kolmogorov-Smirnov test, it was determined that the scores were not normally distributed (KS=p<,05). On the other hand, the results of the analysis indicate that the distribution of the pre-test and post-test score differences of the "being a model in digital citizenship" and "participating in professional development and leadership activities" sub-dimensions of the scale and the total scale follows a normal distribution (KS=p>,05; Z<1,96).

Since the sub-dimensions of "facilitating students' learning and encouraging creativity", "designing and developing learning environments and assessment activities suitable for the digital age", and "leading the working and learning understanding of the digital age" did not meet the assumption of normal distribution, the Wilcoxon signed-ranks test was

used for nonparametric related measurements when analysing the difference between the pre-test and post-test. To determine whether the arithmetic averages of the pre-test and post-test scores obtained from the sub-dimensions of "being a model in digital citizenship", "participating in professional development and leadership activities" and the total scale show statistically significant differences, t-test for related samples was used. These sub-themes were subsequently grouped under main themes. In the final stage of the content analysis, the findings were explained by identifying the relationships between the themes in the light of the data.

In order to determine the reliability of the coding, the coding list prepared by the researcher for each question was also used by another researcher to perform the coding process. In qualitative research, the accuracy of the results and their alignment with the overall framework of the study are related to validity, while the absence of bias and errors, along with the ability to replicate the results by other researchers, are indicators of reliability (Yin, 2009; McMillan, 2004).

To enhance the validity and reliability of the research, the following measures were taken:

To increase the validity of the research, the statements were written down after the interview, and during the interview, the participants were assured that their opinions would be solely used for this research and their identities would be kept confidential. Efforts were made to ensure that they expressed their opinions correctly and sincerely, so that the data obtained reflected the real situation.

During content analysis, the data were reviewed multiple times by the researchers. the sub-themes created, the relationships between the themes and the connections between the main themes were all checked to ensure coherence.

The training activities, data collection process, and data analysis steps applied in the study were explained in detail.

To enhance the reliability of the research, the findings of the content analysis were conveyed without commentary. The research process was presented in detail. The obtained data and coding are kept by the researchers for re-examination.

RESULTS AND DISCUSSION

The Effect of Digital Material Applications on Self-Efficacy Level towards Educational Technology Standards

The results of the paired samples t-test and Cohen's d, calculated for effect size, comparing pre-test and post-test scores of pre-service teachers' self-efficacy towards educational technology standards, are presented in Table 5.

Table 5. *Paired Samples T-test Results of Pre-Service Teachers' Self-Efficacy Towards Educational Technology Standards Pre-Test-Post-Test Scores*

Measurement	N	X	SS	sd	t	p	D
Pre-test	74	3,22	,37	73	16,592	,000*	,40
Final test	74	4,34	,43				

*p<.05

As seen in the table, it was determined that the difference between the mean scores [t(73) = 16.592, p <.05] of pre-service teachers' self-efficacy scores towards educational technology standards after digital material applications was statistically significant in favor of the post-test. In addition, when the arithmetic averages of the pre-test and post-test scores of the scale were analyzed, it was observed that the mean of the post-test scores (M=4,34) was higher than the

mean of the pre-test scores (X =3,22). However, this significance in self-efficacy scores alone is not sufficient .For this reason, the effect size was calculated with Cohen's d formula (Cohen, 1988) to determine the practical significance. The calculated effect size was found to be 0.40. Considering all these results, it can be said that digital material applications have a moderate effect on pre-service teachers' self- efficacy towards educational technology standards.

The Effect of Digital Material Applications on the Level of Self-Efficacy Scale for Educational Technology Standards Sub-Dimensions

The results of the analyses examining the significant difference between the pre-test and post-test scores of the sub-dimensions of the scale of measuring pre-service teachers' self-efficacy towards educational technology standards are presented in Table 6.

Table 6. *Paired Samples t-test and Wilcoxon Signed-Ranks Test Results of the Pre-Test-Post-Test Scores Related to the Sub-Dimensions of the Self-Efficacy Scale for Educational Technology Standards*

Sub Dimensions (Wilcoxon Signed Ranks Test)	*Pre-test - Post-test*	*n*	*Rank Mean*	*Row Total*	*z*	*P*
Facilitating Student Learning and Encouraging Creativity	Negative Sequence	1	2,00	2,00	7,368	,000*
	Positive Sequence	71	36,99	2626,00		
	Equal	2				
Designing and Developing Learning Environments and Assessment Activities Suitable for the Digital Age	Negative Sequence	2	1,50	3,00	7,462	,000*
	Positive Sequence	72	38,50	2772,00		
	Equal	0				
Pioneering the Working and Learning Approach of the Digital Age	Negative Sequence	4	11,00	44,00	7,083	,000*
	Positive Sequence	67	37,49	2512,00		
	Equal	3				
Sub Dimensions (Paired Samples T-test)	*Measurement*	*n*	X	*SS*	*t*	*P*
Modelling Digital Citizenship	Pre-test	74	3,22	,64	9,206	,000*
	Final test	74	4,14	,54		
Participation in Professional Development and Leadership Activities	Pre-test	74	3,36	,57	12,631	,000*
	Final test	74	4,42	,41		

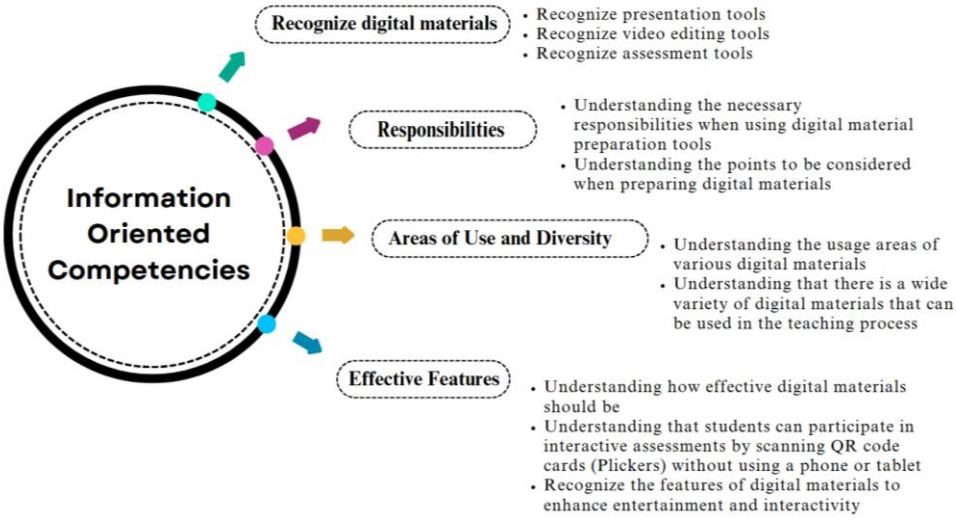
*p<.05

As can be seen in the table, the difference between the rank means of the scores related to 'facilitating students' learning and encouraging creativity' [z = 7.368, p < .05], 'designing and developing learning environments and assessment activities suitable for the digital age' [z = 7.462, p < .05], and 'pioneering the working and learning understanding of the digital age' [z = 7.083, p < .05] sub-dimensions was statistically significant in favor of the post-test. In addition, the pre-test and post-test mean scores of pre-service teachers regarding the sub-dimensions of 'being a model in digital citizenship' (t(73) = 9.206, p < .05, M(post-test) = 4.14 > M(pre-test) = 3.22) and 'participating in professional development and leadership activities' differed significantly (t(73) = 12.631, p < .05), with post-test mean scores higher than pre-test mean scores (M(post-test) = 4.14 > M(pre-test) = 3.22). According to these findings, it can be concluded that digital material applications are effective in improving the features examined in all sub-dimensions of pre-service teachers' self-efficacy towards educational technology standards.

Competences Gained by Digital Material Applications for Knowledge

In the third question of the research, candidates were asked for their opinions about the competencies gained through the digital material applications in the course, specifically regarding knowledge, skills, and attitude. The responses were analyzed within the framework of competencies for knowledge, competencies for skills, and competencies for attitude. Accordingly, the competencies gained in terms of knowledge are presented in Figure 1 below.

Figure 1. *Competences Gained by Digital Material Applications for Knowledge*



The opinions of the pre-service teachers regarding the competencies gained by the digital material applications in the course for knowledge were analyzed in four sub-themes: "recognition of digital materials", "responsibilities", "usage areas and diversity", "effective features". In the sub-theme of "recognizing digital materials", pre-service teachers mentioned that they learned presentation, video editing and online assessment tools that they could prepare on digital platforms that they did not know before thanks to the digital applications made in the course. S17 stated that he had not used any application or tool other than power point before and that he learned new tools thanks to these applications with the following sentences: *"The applications we made within the scope of this course introduced me to technology, which is a necessity of today. I learned many digital tool preparation programs that I can use in teaching, and I got information about how to use them. I had not used any application or tool other than power point before. However, thanks to these applications, I discovered new options. I recognized digital tools that I was not aware of their existence."*

S12's view, "*The digital material applications we made in this course helped me learn different tools that I can use in my future teaching life during my presentation*," emphasizes the impact of familiarizing with digital materials on a pre-service teacher's professional development. By exploring digital tools, the student discovered not only specific tools but also their potential in the teaching process. This view highlights the student teacher's realization of how digital tools contribute to teaching practices and enable the preparation of more effective presentations. Since presentation skills are critical for the teaching profession, the student gained an awareness of how to prepare more interactive, dynamic, and engaging presentations in future lessons by using these tools. This process shows that digital materials allow pre-service teachers to expand their teaching resources and better prepare for their professional careers. Furthermore, recognizing

digital materials was not just an acquisition of knowledge; it also helped the teacher develop awareness about how to transform course content and interact with students.

Similarly, S14's view, *"...When we become teachers, we had the opportunity to meet new applications that we can use while making presentations, organizing videos, and making evaluations*," reflects the comprehensive learning experience pre-service teachers had in becoming familiar with digital materials. Here, the student was introduced to tools not only for making presentations but also for organizing videos and conducting assessments. This statement highlights the versatility of digital tools in the teaching process. The student realized that these tools could be used at various stages of the lesson, each serving different functions effectively. Since presentations, videos, and assessments are essential for diversifying teaching methods and engaging students, these new tools enhance the student teacher's ability to integrate technology into education comprehensively. Additionally, the process of getting to know digital materials boosts the pre-service teacher's confidence in the digital world and helps develop more creative teaching methods in the future. Recognizing these tools facilitates the adoption of innovative methods as part of the digital transformation in education.

S35's statement, "*I learned digital material preparation programs that I can use when I become a teacher. I got to know the applications that I can use to prepare various presentations, videos, and evaluation tools that both facilitate the acquisition of knowledge and measure the acquired knowledge*," and S38's statement, "*In this process, I met various digital material preparation tools. For instance, I got to know that there is a program like Powtoon, where I can edit animated videos*," show that pre-service teachers not only gained technical knowledge through exposure to digital tools but also learned how to use these tools pedagogically. This process allows students to understand the role of digital materials in education and use them more effectively in future teaching. Additionally, familiarizing with digital materials highlights a process through which pre-service teachers acquire skills that can transform and enrich their teaching practices.

When the opinions of pre-service teachers under the sub-theme of "responsibility" are analyzed, it is seen that participants S6, S28, S60 and S62 stated that they learned what kind of responsibilities they have and what they should pay attention to while preparing and using materials, thanks to the digital material applications in this course. S6's opinion *"...I learned what my responsibilities are while preparing and using digital material preparation tools...."* shows that pre-service teachers comprehend their responsibilities in the process of preparing digital materials and develop materials more consciously by recognizing these responsibilities. While getting acquainted with digital tools, the student go beyond gaining only technical knowledge and come to understand what kind of ethical and pedagogical responsibilities they should uphold while preparing the materials. Such responsibilities may include content accuracy, considering the diverse learning needs of students and ensuring the accessibility of materials. In addition, using the interactive features of digital materials correctly is an important responsibility for teachers to contribute to the educational process of their students. S6's statement reveals that considering such responsibilities while preparing digital materials is a necessary step for pre-service teachers to develop their teaching skills. This process enables pre-service teachers to think not only about the tools but also about how they can integrate these tools into the students' learning process in the most efficient way. S28's opinion *"I have learned that there are many digital materials that I can use in my teaching profession. At the same time, I have learned what to pay attention to while preparing these materials. Even now, when I am a student, I have learned information that I should pay attention to while preparing presentations. I can say that I get a lot of efficiency from these applications."* shows that pre-service teachers comprehend not only the functionality of digital materials but also the important points to consider while preparing them. This suggests that the student has realized that using digital tools entails more than technical knowledge; it also carries the responsibility of how to use these tools in a pedagogically correct way. These responsibilities may include taking into account the environment in which students live, cultural

differences and learning needs. As the student acquired the information to be considered when preparing digital materials, she gained the ability to prepare her presentations in a more effective, goal-oriented and student-centered way. This view implies that the pre-service teacher learns to use digital tools not only as resources, but also as a tool that empowers them to guide their teaching process more carefully and responsibly. Thus, the pre-service teacher will develop a more effective teaching practice by balancing ethical, pedagogical and practical responsibilities when using digital materials in their future professional life. These two views provide very valuable statements in terms of pre-service teachers recognizing their responsibilities in the process of preparing digital materials, becoming aware of these responsibilities and evaluating them from a pedagogical perspective. They demonstrate that when using digital tools, they should not only use their technical competences but also act responsibly to meet the needs of their students. This process enables pre-service teachers to more consciously embrace and effectively implement the digital transformation in education.

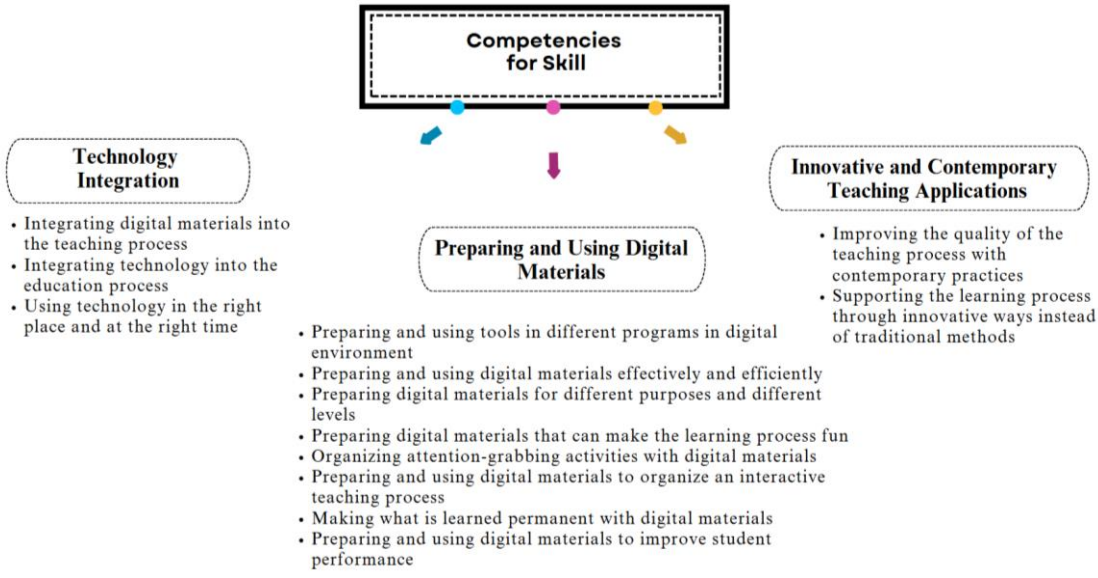
When the statements in the sub-theme of **"comprehending the usage areas and diversity of materials,"** which is among the competences gained by pre-service teachers in terms of knowledge of digital material applications, are examined, S11's statement draws attention: *"With the digital materials made in this course, I learned applications that I have not seen and used before but will be very useful in the future. For example, I will be able to use a video I will prepare in Powtoon to attract the attention of my students at the beginning of the lesson. There are so many and various materials that can be used in the teaching process!"* S11's opinion shows that pre-service teachers gained awareness about the usage areas and diversity of digital materials. The student discovered that digital tools can be used in many different and creative ways in teaching processes, going beyond being just tools for education. The most important point that stands out in this statement is the pre-service teacher's interest in applications that she had not seen or used before and her realization of how these tools can make great contributions to the teaching process. Especially animated video preparation tools such as Powtoon can be used to increase students' interest in the lesson by strengthening both visual and auditory aspects of the teaching process. S11 stated that she adopted the idea of creating fun and engaging content for students with tools such as Powtoon. Integrating such digital materials into teaching processes, unlike traditional methods, can be an effective way to attract students' attention, increase their interest in learning, and facilitate their understanding of the material. The student's statement *"there are so many and various materials"* shows that she understood how wide and varied the usage areas of digital materials are and developed a strong awareness of how functional these tools can be in education. This view enables pre-service teachers to understand the potential of digital tools in education by discovering their wide range of uses. Recognizing these tools and developing concrete ideas about how to use them in the teaching process is an important step toward increasing the effectiveness of digital materials in education. Thus, pre-service teachers become more open-minded and creative about how different digital tools can contribute to the learning process. Such digital tools not only diversify teaching methods but also create a more interactive and efficient learning environment by increasing students' interest and participation in lessons. The last sub-theme among the knowledge competences is "understanding the effective features of digital materials." The opinions of pre-service teachers regarding this sub-theme emphasize that they realized the features of digital materials such as accessibility, interaction, entertainment, and enhancing functionality in teaching and that they have gained knowledge about how to use these features in classroom applications. For example, S8's opinion: *"...the application with QR codes that students can respond to without using a phone or tablet attracted my attention. I learned that students can participate in interactive assessments in this way."* shows that she understood the

possibility of interactive assessment through QR codes and appreciated the accessible and practical features of digital materials for students. The fact that QR codes can be used even without a tablet or phone enabled the student to discover the flexibility and accessibility of these materials. This situation expresses an important gain in how digital materials can be efficiently integrated into classroom assessment processes. Similarly, the statements of S62 and S74 also draw attention to this sub-theme: S62: *"I have gained a lot in terms of the teaching profession, especially since I study English language teaching. I need to present the teaching process to students in a fun and interactive way. In this regard, I have recognized and seen the features of digital materials to increase entertainment and interaction."* S74: *"With the development of societies, the interest and need for education have increased. Developments in other fields have contributed to the development of education. We started to benefit from the developing technology to make education more functional. Teachers should use this developing technology in education. Students' interest in the lesson can be increased in this way. As a prospective teacher, I have learned what digital tools are, how we can benefit from them, and what their effective features are. I plan to make use of these tools that make lessons more fun and interactive."* These three statements reveal the level of pre-service teachers' comprehension of the effective features of digital materials and their competence to integrate these materials into the classroom environment.

Competences Gained by Digital Material Applications for Skills

In line with the opinions gathered in response to the third question of the research, this section focuses on the competences gained in terms of skills. The competences identified from the opinions are illustrated in Figure 2 below.

Figure 2. *Competences gained by digital material applications for skills*



The opinions of pre-service teachers about the competencies gained by the digital material applications in the course were analyzed in three sub-themes: "technology integration", "preparing and using digital materials", "innovative and contemporary teaching practices".

In the sub-theme of "**technology integration"**, pre-service teachers stated that they gained the competence to integrate technology into their teaching processes thanks to the digital applications made in the course. Here, it was emphasized that they gained the ability to integrate technological innovations and opportunities into the teaching processes through digital materials. For example, S40 explained this competence with the following statements: *"I have learned how to integrate technology, which is an indispensable part of our era, into education and which programs I can utilize, and I have improved my skills by preparing digital materials with various programs."* Similarly, S20 and S43 stated that they learned how to integrate digital materials into the teaching processes. These views can be interpreted as that the candidates realized the contribution of digital tools to the teaching process and gained competence on how to integrate these tools. In addition to these, S51 stated that he gained skills in this direction by saying *"I learned to integrate technology into the classroom and lesson by using it in the right place and at the right time"*. This statement reflects that the candidate gained the ability to integrate technology selectively and strategically according to the needs of the lesson instead of using it unplanned or randomly. This situation can be interpreted as that the candidate realized the importance of using technology consciously in order to reach the educational outcomes while adding technology to the teaching process. S52 stated that he gained skills in combining technology with the education process with the statement *"This course generally taught me how to combine technology with the education I will give in the following years"*. In this context, based on these views of the candidates, it can be interpreted that they improved themselves in preparing materials that will support the learning process in an appropriate way and developed a perspective to enrich the learning process in this way.

When the opinions of pre-service teachers under the sub-theme of **"preparing and using digital materials"** were analyzed, pre-service teachers stated that they gained the ability to prepare materials by using different digital tools. For example, S4's statement *"I learned to use various presentation tools in digital environment"* indicates that pre-service teachers developed their material preparation skills. Similarly, S41 stated that she felt herself much more advanced with the statement *"I improved my skills by preparing digital materials in various programs and benefited from the variety of applications"* and that she did not have to utilize the same applications such as PowerPoint but had different alternatives. The candidates stated that they learned how to use different digital tools effectively in classroom activities and course materials through experience. In this context, it can be interpreted that recognizing the diversity of digital tools enabled the candidates to use a wide range of materials in their teaching processes. When the opinions of the pre-service teachers who stated that they gained the ability to prepare and use digital materials effectively and efficiently are analyzed, it is seen that they gained an important skill. For example, S37's statement *"I am one of the members of the generation that is constantly exposed to technology. As a result of such exposure, I inevitably had a predisposition to technology and the ability to use it, but I did not know how to use it efficiently and effectively in the field of education. Thanks to this course, I learned how to prepare more effective presentations and what to pay attention to."* shows that the candidates learned to make the lessons more efficient by improving their material preparation skills. Similarly, S25's statement *"...I learned how to make the lesson more efficient for students by using digital materials"* indicates that the pre-service teachers not only prepared materials but also gained the ability to adapt these materials to the classroom more efficiently. These views reveal that pre-service teachers developed a strategic approach to the process of material production and gained competence in improving learning processes by using digital materials effectively in the classroom. Considering the opinions of pre-service teachers about preparing digital materials for different purposes and different levels, S11's statement *"Thanks to this course, I learned that there are applications for students at all levels and how to use them"* shows that pre-service teachers gained the competence to prepare materials suitable for students at all levels. Similarly, S25's statement *"I gained the*

ability to prepare different digital materials for different teaching purposes and how to use them effectively" shows that the candidates improved themselves in preparing materials according to different needs in education. In line with these views, it can be interpreted that the candidates gained competence in producing digital content that can appeal to students at all levels and developed the ability to prepare materials suitable for different student profiles. The statements of pre-service teachers who gained the ability to prepare digital materials that will make the learning process fun show how technology can be used effectively and creatively in education (S18, S24, S47, S55, S56). For example, S18's statement *"I saw how I can make my lessons more fun for my students."* reveals that the candidate gained an awareness about making the lesson more interesting and fun by using digital materials. Similarly, S24's statement *"...I learned how to make the lesson fun and interesting with digital materials in order to extend students' attention span and increase their interest in the lesson"* shows that the candidate discovered how to use digital tools effectively to increase the interest in the lesson and prolong students' focus time. With these statements, it can be understood that the pre-service teachers gained the ability to make the lesson more student-centered, fun and interesting by using digital materials rather than just transferring information. When the statements about organizing activities that will attract attention with digital materials are examined, S24's statement *"I gained the ability to attract students' attention to the lesson by using digital materials"* shows that pre-service teachers gained the ability to organize activities that can attract students' attention with digital materials. This view can be interpreted as that the pre-service teachers gained competence in increasing students' interest in the lesson by not only using materials in the learning process, but also learning to organize activities that draw attention and arouse interest. The statements of S66, *"I have learned how to include digital materials in the education process and how to utilize them"* and S32, *"I have learned how to use technology in the teaching process. At the same time, as a prospective teacher, I have seen that I can teach interactively with my students using digital materials"* reveal that the prospective teachers gained the ability to prepare and use digital materials to organize interactive teaching processes. These statements show that the pre-service teachers learned to increase student interaction with digital materials and learned to use these materials in a way to encourage active participation. Learning how to use digital materials effectively in creating an interactive learning environment for students contributes to make their teaching processes more efficient and student centered. In this context, it can be interpreted that pre-service teachers can design interactive teaching processes through digital materials and gain competence in creating digital materials that can encourage students' active participation. S65's statement *"I will be able to make the lessons fun and more memorable by breaking the monotony"* shows that the pre-service teacher gained the ability to create materials that will not only make the lessons fun and interesting by using digital tools, but also make the students' learning more permanent. The candidate's development of this skill reveals that she gained competence in preparing digital materials that will contribute to students' long-term learning processes and make their knowledge-based learning experiences permanent. Within the scope of the code of preparing and using digital materials that will increase student performance, it is understood from S18's statement *"I learned and prepared digital materials that will answer the question of how to increase my student's performance"* that she gained the skill of preparing digital materials that will support student performance. This shows that the candidates gained knowledge about how to use digital tools that will increase students' learning performance in the teaching process.

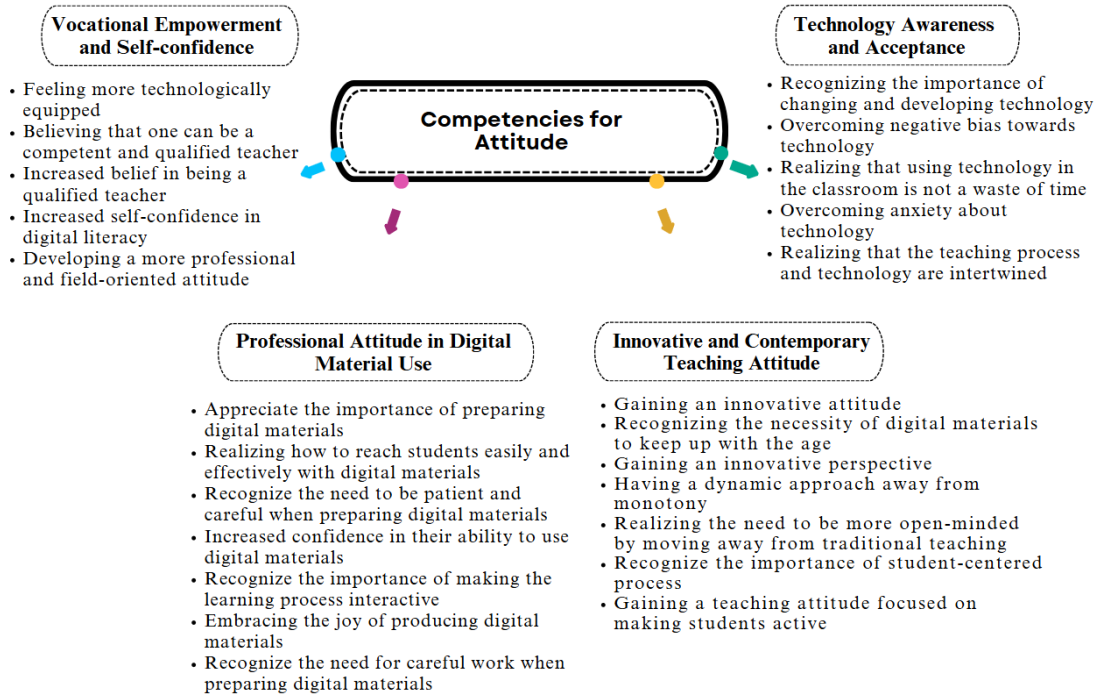
When the sub-theme of **"innovative and contemporary teaching practices"** is analyzed, it is seen that they have the opportunity to develop more innovative and interactive teaching approaches by overcoming traditional teaching methods thanks to digital tools and applications. Candidates state that they can make their lessons more dynamic, interesting and orientated to the needs of students thanks to the opportunities provided by digital materials and web 2.0 tools. In this context, S36's statement *"... I gained the competence to improve the quality of the learning process with*

contemporary applications such as digital materials in education." indicates that she gained the ability to improve the quality of digital materials in teaching and points to the contribution of these tools to improve the learning process. The skills gained by pre-service teachers in this process can be considered as an important step towards transforming teaching processes by using technology efficiently in education and creating a learning environment where students are more active, motivated and participatory. By using digital materials effectively, the candidates not only present content but also aim to provide students with an interactive and fun learning experience. This shows that the candidates have reached the competence of enriching teaching and adapting to today's educational needs by basing technology integration on solid foundations in their teaching profession. When the opinions about supporting the learning process with innovative ways instead of traditional methods are analyzed, it is seen that the students discovered how to shape their lessons with innovative, digital solutions beyond traditional methods. For example, S38's statement "*...As a result, as a teacher in the future, I discovered that I can support the learning process in a different, innovative and more accurate way rather than traditional methods."* reveals how she started to go beyond traditional teaching methods and how she will support the learning process in innovative ways.

Competences Gained by Digital Material Applications for Attitude

In line with the opinions obtained in the third question of the research, the competences gained for attitude were discussed and the competences obtained from the opinions are presented in Figure 3 below.

Figure 3. *Competences gained by digital material applications towards attitude*



The opinions of pre-service teachers about the competencies gained by the digital material applications in the course for attitude were analyzed in four sub-themes as "empowerment and self-confidence towards the profession",

"professional attitude in the use of digital materials", "innovative and contemporary teaching attitude" and "technology awareness and acceptance". Accordingly, pre-service teachers stated that they gained empowerment and self-confidence towards the profession thanks to the digital applications made in the course.

When the sub-theme of **"professional empowerment and self-confidence"** is examined, it is seen that the pre-service teachers emphasized their competencies in terms of gaining digital literacy, professionalism and professional self-confidence. S23's *"...These applications contributed a lot to me. Especially Canva was a turning point for me. I feel really equipped about technology now"* shows that digital material applications have an important effect on students in terms of professional development and self-confidence. This statement reveals that the student realizes that s/he has made progress in his/her technological skills and thinks that these skills contribute to his/her professional competences. In the context of professional empowerment and self-confidence, students' feeling themselves technologically equipped supports pre-service teachers to approach their professional roles in a more prepared and confident manner. This, in turn, increases their belief that they can more easily manage the digital processes they will encounter in both their personal and professional lives. Such an achievement shows that the process of preparing digital materials not only provides technical knowledge but also strengthens individuals' self-confidence. In addition, it can be said that such positive experiences can contribute to the development of professional identity and prepare the ground for students to become more effective educators in the future. S45's statement *"I believe that with the knowledge and skills I have acquired, I will become a competent and qualified teacher myself"* points to a very important dimension of digital material applications under the theme of empowerment and self-confidence towards the profession. This statement shows that the knowledge and skills gained by the student in the process of preparing digital materials positively affect not only his/her technological competences but also his/her self-confidence in the process of building his/her professional identity. The fact that the student emphasized the belief of being a "competent and qualified teacher" is a strong clue that such practices increase their motivation for their future professional life and strengthen their perceptions of professional competence. This allows pre-service teachers to feel equipped both technically and pedagogically. Moreover, these processes increase students' confidence not only in learning but also in the ability to apply what they have learned effectively. Such an acquisition prepares the ground for the experiences they will share with their colleagues and students in the future to be more efficient and effective. This situation reveals that digital material applications directly contribute to the professional identity formation of pre-service teachers. S48's statement *"It motivated me to be a qualified teacher"* clearly shows that digital material practices have an important effect on empowerment and self-confidence towards the profession. This statement reveals that the student's belief that s/he can gain the qualifications necessary for the teaching profession has increased thanks to his/her experiences in the process of preparing digital materials and this situation provides him/her with a strong motivation. In this context, the student's increasing belief that s/he can become a qualified teacher indicates that both professional competence and self-efficacy perceptions are strengthened. Digital material applications not only provide technical skills, but also help pre-service teachers to develop positive attitudes towards their profession and prepare themselves for a successful future in this field. The motivational element is particularly important because such experiences not only improve students' existing skills but also contribute to developing a vision of their profession and increasing their professional commitment. S48's statement strongly reflects that this process directly contributes to pre-service teachers becoming qualified, equipped and self-confident individuals in the future. S57's *statement "My self-confidence increased thanks to what I learned and the skills I acquired in this course. Now, when I get into a discussion with my friends on technology-related issues, especially on issues related to digital literacy, I do not say that I do not understand and stand aside."* This statement shows that with the development of their digital literacy skills, pre-

service teachers exhibit a more active and self-confident attitude on technology-related issues. This view reveals that digital literacy has become an important competence in the teaching profession and that these skills also make a difference in communication between colleagues. S42's statement *"I developed a more professional and field-dominant attitude"* shows that digital material preparation processes provided an important transformation in terms of professional competence and professionalism in students. This statement clearly shows that the student has experienced a maturation in his/her professional perspective and his/her awareness of field knowledge has increased. In the context of the theme of empowerment and self-confidence towards the profession, developing such an attitude shows that the student not only acquires knowledge but also has a professional approach on how to apply this knowledge. Experiences in the process of preparing digital materials develop both technical and pedagogical skills of students and increase their mastery of the field. This leads to a more conscious, planned and systematic teaching approach. In addition, professionalism and mastery of content knowledge enable pre-service teachers to make more effective decisions inside and outside the classroom, plan their lessons more efficiently and meet student needs better. This statement of S42 strongly supports that digital material applications positively shape not only individual skills but also professional attitudes and behaviors.

When we look at what pre-service teachers expressed about the sub-theme of **"professional attitude in the use of digital materials"**, it is reflected that preparing digital materials had deep effects on their attitudes and made significant contributions to their professional development. S3's statement, *"With the digital material applications we made in this course, I realized the place and importance of constantly developing and changing technology in education... I have seen the importance of making the process more efficient by using it correctly."* shows that the student comprehended the critical role of preparing digital materials in education and the importance of these materials in creating an efficient teaching process. In particular, the fact that he started to see technology as an effective tool indicates a transformation in the student's professional approach. This awareness increases the appreciation and commitment to the process of preparing digital materials. S8's view *"I realized that traditional teaching does not offer an effective process for every student and that digital materials can be the most effective tools with the correct usage."* emphasizes the flexibility and power of digital materials in responding to individuals' learning needs. The fact that the student develops a critical perspective on traditional teaching methods and sees digital materials as effective tools shows that he has an attitude towards the goal of being more accessible to his students by using these materials. S9's statement "...I realized that I should be more interested, patient and careful when preparing materials." reveals that the student realized the necessity of paying attention to the technical and pedagogical details of the digital material preparation process. Patience and attention are the basic elements of a professional teaching attitude, and it can be said that this process contributed to the student's self-discipline. S14's view that *"...my self-confidence in the skills required by technology increased, I realized the importance of digital tools in the learning-teaching process."* shows that the student gained self-confidence in his/her skills in using digital materials and this self-confidence improved his/her ability to integrate technology more effectively in the classroom environment. This increase reflects a positive change in the student's professional identity. S16's statement, *"...most importantly, I realized the importance of making my lessons interactive."* shows that the student attaches more importance to the interaction element in the teaching process and adopts the role of digital materials in this process. This awareness points to the potential of creating a more dynamic learning environment with students in the future. S20's view that *"...it also made me enjoy producing digital materials."* reveals that preparing digital materials is perceived not only as a task but also as a pleasant process. The student's adoption of this process shows that s/he will develop a more creative and motivated approach while preparing teaching materials. S23's statement, *"...I did not know that there should be so much detail and meticulous work in preparing materials."* shows that the student realized the importance of details and care in the process of preparing

digital materials. Understanding the necessity of meticulous work contributes to the student's development of a professional teaching attitude. When the sub-theme of "innovative and contemporary teaching attitude" is analyzed, it is seen that it includes transition from traditional teaching methods to innovative methods and adopting contemporary teaching processes with digital materials. For example, S19, *"...I met innovative and technological attitude, I learned many new things in the field of technology and effective teaching, and I am very pleased with this."* statement shows that digital material applications enabled the student to develop an innovative attitude in education. The student realized the innovations in education by using digital tools and saw them as a useful resource for his/her professional development. This attitude provided the student with both pedagogical and technological skills and enabled him to take a step towards an innovative teaching approach. The student's adoption of a teaching style integrated with technology by getting acquainted with digital materials shows that he is open to the transformation process in education and can adapt his future teaching practice to continuous innovations. S11's statement *"This course was very necessary and important for me because we live in the age of technology, and I will be a new generation teacher."* clearly reveals that he gained awareness about developing a teaching style in accordance with the requirements of the age by using digital materials and that he understood the place and importance of technology in education. The student realized the necessity of digital materials in the education process and understood the importance of these tools for professional development. This awareness will enable the student to gain the ability to use digital tools effectively while teaching in the age of technology. At the same time, realizing the necessity of digital materials gives the student a more proactive approach for future teaching processes, thus taking an important step towards becoming a teacher who adapts to the needs of the age. S12's opinion *"I was able to directly observe the contribution of digital materials to the learning process. For example, the games we played together over kahoot that we prepared in advance were very enjoyable, I can say that I moved away from traditional teaching and became more open to innovations by seeing the contribution of the use of such applications in the classroom."* shows that the student gained an innovative perspective by observing the contribution of digital materials in education, as well as developing a dynamic teaching process away from monotony. The integration of interactive digital tools such as Kahoot into the classroom environment allowed the student to move away from traditional teaching methods and adopt a more creative and dynamic teaching style. This transformation not only enabled the student to develop a more innovative perspective by using technology, but also to make the teaching process more interactive and livelier. By directly observing the contribution of digital materials to the teaching process, the student realized that it created a more interesting and interactive teaching process that moved away from monotony. This not only provides students with active participation in the lesson, but also increases the teacher's ability to make his/her lessons more dynamic. As a result, this view strongly suggests that the student's ability to use digital tools has increased as well as his/her openness to an innovative and interactive teaching approach. S16's view that *"...I realized that I should never be closed-minded in education, I should be more open-minded and most importantly I should make my lessons interactive."* shows that the student realized that he/she should adopt a more open-minded and flexible teaching approach with digital materials. Digital materials provide students with not only technical knowledge but also pedagogical skills. The student has tended to develop a more interactive and student-centered approach in the teaching process. This change enabled the student to shift from the traditional approach to a more open-minded attitude in education and to gain confidence in using more interactive methods in their lessons. S24, *"...I gained the attitude that the lesson should be student-oriented rather than teacher-oriented."* It is seen with his statement that he understood the importance of a student-centered teaching process through digital materials and started focusing more on this approach. This statement shows that digital materials encourage a student-oriented approach in education, not a teacher-oriented approach, and that the student realizes this

process. The student discovered the role of digital materials in ensuring the active participation of students and realized the necessity of shaping the teaching process according to student needs. Thus, the student, who will develop a more effective and student-oriented approach in his/her future teaching practice, will improve his/her professional skills in this direction. S12's statement, *"...I was able to directly observe the contribution of digital materials to the learning process. I can say that I moved away from traditional teaching and became more open to innovations by seeing the contribution of its use in the classroom to the lesson."* shows that the student gained the attitude of involving students more actively in the lesson by meeting digital materials. The student developed interactive applications that would increase students' participation in the lesson thanks to digital tools and observed the effectiveness of such materials. This skill he gained at the point of encouraging students' active participation will allow him to adopt a more interactive, student-oriented teaching approach in his future teaching profession.

When the sub-theme of **"technology awareness and acceptance"** is analyzed, it is seen that it covers the competencies of realizing technology, overcoming negative prejudice against technology and understanding the necessity of using technology in teaching. Candidates' acceptance of technology and adoption of its importance constitute the basis of other competences. For example, S3's statement, *"With the digital material applications we made in this course, I realized the place and importance of the constantly developing and changing technology in education. To me, using technology in the classroom seemed like a waste of time, but it was not, I saw the importance of making the process efficient by using it correctly.*" shows that the student realized the importance of technology in education and this awareness transformed his/her previous negative attitude towards technology. This view reveals that the student accepted the potential of using the developing technology in education to increase productivity and accepted that integrating technology in lessons is an indispensable need in the changing age. Thus, the previously negative perception of technology use was replaced by an awareness of the necessity and benefits of using technology effectively. S7's opinion, *"I have to admit that I had a negative prejudice against technology before taking this course, but when I saw its importance and effects by applying digital materials, it helped me overcome this prejudice "* clearly shows the process of overcoming the student's negative prejudices against technology. It is understood that the student's perception of technology has changed through the application of digital materials and this change has enabled him to approach the use of technology with a more open mind. The student's previous resistance and negative attitude towards technology was overcome with experience and this process revealed the positive effects of using technology effectively in education. This transformation helped them to develop a more positive and open-minded approach towards technology. In addition, S67's statement *"I believe that the digital material applications in this course played a milestone role in the pre-service teachers' realization of how technology makes the teaching process effective, efficient and attractive."* clearly shows how the student went through the process of overcoming the negative prejudice towards technology by observing the effect of digital materials on the teaching process. This statement emphasizes that by directly observing the efficiency, impact and attractiveness of digital materials in education, the student transformed his negative thoughts about technology into an understanding of accepting technology as an effective tool in teaching. In this process, the student gained awareness that the use of technology in the classroom makes the teaching process more effective and efficient. S/he realized how this plays an important role in the teaching profession. This transformation made the student more open to using digital tools and helped him/her overcome his/her negative thoughts and develop the ability to use technology efficiently in the classroom environment. Thanks to the digital material applications, the student left his negative attitudes towards technology behind and adopted technology as a powerful supportive tool in education. S10's opinion, "*Before this course, I was not aware that there were so many different digital material preparation programs. Thanks to this course, I learned that*

every area of the teaching process can be enriched with the digital materials we learned." shows that the student discovered the importance and efficiency of digital materials in the teaching process. By realizing how digital materials can be used effectively in education, the student understood that the idea that technology is a waste of time is wrong. This awareness enabled the student to see how digital tools can create a fun and efficient teaching process in education, thus leading to a more positive attitude towards the use of technology. S33 stated, *"I was a little anxious at the beginning of the course because I am not very good with technology. When I met new applications, it took me a lot of time to figure out how to use them. In this course, I learned the basic usage logic of many applications and what they do."* This statement reflects the process of overcoming the student's anxiety and concerns about the use of technology at the beginning. The student's anxiety about technology were overcome by learning the basic usage logics of the applications he learned in this course. This process enabled the student to replace his/her fear and anxiety towards technology with the feeling of confidence in this field. The elimination of the anxiety led the student to develop a more confident and comfortable approach towards using technology. The opinion of S30, *"Thanks to this course, I realized that the teaching process and technology are significantly intertwined. I learned that digital materials have such an importance in education. With the various digital material applications we used, I had fun throughout the semester and met materials that will contribute to my teaching."* shows that understanding how digital materials are intertwined with the teaching process and this awareness played a major role in the student's adoption of technology use in education. The student realized that digital materials used in education not only enrich teaching, but also enable students to actively participate in the teaching process and create a fun environment. This statement created a strong awareness that the teaching process and technology are intertwined, which increased the student's willingness to use technology.

CONCLUSION AND RECOMMENDATIONS

In this study, answers to three research questions were sought. In the first research question, the researchers examined whether digital material applications significantly affected pre-service teachers' self-efficacy levels towards educational technology standards. The results showed that there was a statistically significant increase in pre-service teachers' self-efficacy towards educational technology standards after digital material applications. When the arithmetic averages of the pretest and posttest scores of the scale were compared, it was found that the posttest scores were higher than the pretest scores. This situation points to the potential of digital material applications to improve pre-service teachers' self-efficacy. The effect of digital materials on pre-service teachers has also been emphasized in previous studies. Ertmer and Ottenbreit-Leftwich (2010) reported that pre-service teachers' self-efficacy in technology integration increased with the effective use of digital tools. In addition, Tondeur et al. (2017) stated that pre-service teachers' ability to use technology increased with digital material applications and this contributed to their ability to be more effective in educational processes. Similarly, in this study, it was observed that digital material applications increased pre-service teachers' self-efficacy perceptions towards educational technology standards. In order to evaluate the effect of the implementation in practice, the effect size was calculated with Cohen's d formula, and it was concluded that digital material implementations had a moderate effect on pre-service teachers' self-efficacy perceptions towards educational technology standards. This finding is in line with previous research showing that digital materials practices are an effective tool in increasing pre-service teachers' confidence in technology and their skills in this field (Koehler & Mishra, 2009). However, it is thought that more comprehensive and long-term implementation processes may be needed to increase this effect.

In the second research question, the researchers examined whether digital material applications significantly

affected pre-service teachers' self-efficacy levels towards educational technology standards according to the sub-dimensions of the scale. According to the results, when the pre-test and post-test mean scores of pre-service teachers regarding the sub-dimensions of "facilitating students' learning and encouraging creativity," "designing and developing learning environments and assessment activities suitable for the digital age," "pioneering the working and learning understanding of the digital age," "being a model in digital citizenship," and "participating in professional development and leadership activities" were compared, it was determined that the post-test scores showed a significant increase compared to the pre-test scores. These results revealed that digital material applications positively affected pre-service teachers' self-efficacy perceptions towards educational technology standards in all sub-dimensions. It can be said that digital material applications strengthen pre-service teachers' ability to use technology in education and support their adaptation to these standards. The findings that digital materials increase pre-service teachers' skills such as creative thinking, designing technology-based assessment activities and digital citizenship support the Technological Pedagogical Content Knowledge (TPACK) model proposed by Mishra and Koehler (2006). This model predicts that teachers should combine pedagogical knowledge, content knowledge and technology knowledge to design more effective instruction. The use of digital materials allows pre-service teachers to develop their knowledge and skills in these areas. In addition, this result obtained in the dimensions of "being a model in digital citizenship" and "participating in professional development and leadership activities" also shows that the use of digital materials can be an effective tool in complying with ISTE (International Society for Technology in Education) standards. In particular, ISTE's Teacher Standards (2016) recommend that teachers take a guiding role in digital citizenship and professional development. The results of this study reveal that digital material practices encourage pre-service teachers to adopt these roles. As a result, this study reveals that digital material practices have positive effects on pre-service teachers' self-efficacy towards educational technology standards and emphasizes the contribution of integrating such practices into education programs on pre-service teachers' professional development.

In the third research question, the researchers analyzed the views of pre-service teachers on the competencies gained by digital material applications for knowledge, skills and attitudes. When the results related to the competences gained by digital material applications for knowledge were examined, it was determined that digital material applications made significant contributions to the development of skills that would enable pre-service teachers to use technology effectively in teaching processes. In addition to having a wide range of knowledge about the diversity and functionality of digital materials, students also gained important awareness about how to use these tools and in which situations they can be useful. The process of "getting to know digital materials" enabled the pre-service teachers to get acquainted with digital tools that they had not known before and supported them in gaining knowledge about how these tools could be used in their teaching practices. In particular, the applications with tools other than PowerPoint allowed the pre-service teachers to explore different options offered by the digital world. This process enabled pre-service teachers to develop their skills in preparing presentations, video editing and online assessment with digital tools. In terms of responsibilities, pre-service teachers learned how to fulfill pedagogical and ethical responsibilities in the process of preparing digital materials. While preparing the materials, pre-service teachers realized not only technical knowledge but also how to integrate these tools into students' learning processes in the most appropriate way. This enabled them to adopt a responsible and conscious approach in their teaching process. In addition, the awareness they gained about the usage areas and diversity of the materials helped them understand how wide range of digital tools can be used in the teaching process. Students understood that digital materials can make teaching processes more interactive, engaging and student-centered. The knowledge they gained about the effective features of digital materials provided the pre-service teachers with the skills

to use these tools more efficiently. Features such as accessibility, interactivity, entertainment and functionality stand out as important tools to increase students' interest in the lesson and make teaching processes more efficient. Recognizing these features enabled pre-service teachers to gain important information about how to use digital materials more effectively in their future teaching processes. In general, the digital material practices increased the pre-service teachers' level of knowledge about digital tools and provided them with a strong foundation on how to integrate these tools into their teaching processes. The findings regarding the competences that the digital material practices provided for the pre-service teachers' knowledge show similarities with previous studies. In particular, it was emphasized that knowledge about digital tools increased and awareness of the effective use of these tools in teaching processes increased (Koehler & Mishra, 2009). In this context, pre-service teachers' recognition of digital tools and their awareness of the situations in which they will use them can increase the success of technology integration in education (Ertmer & Ottenbreit-Leftwich, 2010). In addition, the realization of the potential of digital materials to attract students' attention and provide interaction is in line with the studies on the subject (Chai et al., 2013).

The results of the research on the competences gained by digital material applications for pre-service teachers' skills show that these applications provide significant contributions to the development of pre- service teachers' professional and pedagogical skills. According to the statements of the participants, thanks to these practices, the candidates gained the competence to integrate technology into teaching processes consciously and effectively, to prepare materials enriched with digital tools and to use these materials efficiently. In addition, the candidates, who realized the potential of digital materials to make learning processes fun, interesting and interactive, learned to enrich learning environments by using these tools more creatively and strategically. Digital material applications contributed not only to the candidates' technical skills but also to their adoption of innovative and student-centered teaching approaches. In this process, candidates learned to use digital tools to produce materials that attract students' attention, increase interaction and support long-term learning. The gains obtained constitute an important basis for transforming teaching processes in a technology-supported way and responding to contemporary educational needs. Digital material applications contributed to both the individual development and professional competences of pre-service teachers, enabling them to adapt to the requirements of the digital age and gain competences that can support student-oriented learning processes. These gains enable pre-service teachers to become effective educational technology users in the future and to develop applications that will enrich learning processes. Similar research findings in the literature also show that digital material applications contribute significantly to the development of pre-service teachers' professional and pedagogical skills. These practices develop their skills of integrating technology into teaching processes effectively, preparing digitally enriched materials and using them efficiently (Saka & Saka, 2005; Demircioğlu & Yurt, 2024). Pre-service teachers learn to create engaging, interactive learning environments by using digital tools creatively and strategically (Tiryaki & Karakuş, 2019). The applications not only develop technical skills but also encourage innovative, student-centered teaching approaches (Çebi & Reisoğlu, 2019). Pre-service teachers develop competence in producing materials that will attract students' interest, increase interaction, and support long-term learning (Demircioğlu & Yurt, 2024). These gains form the basis for transforming teaching processes with technology and meeting contemporary educational needs. The skills gained support pre-service teachers to adapt to the requirements of the digital age and strengthen student-centered learning processes (Çebi & Reisoğlu, 2019).

When the results of the research on the competences gained by digital material applications on the attitude of pre-service teachers are examined, it is observed that they have a significant effect on professional empowerment and self-confidence. The students stated that these practices not only provided them with technological skills, but also

strengthened their professional identity and increased their self- confidence. This situation allows pre-service teachers to feel more competent and confident, and thus to approach their teaching tasks in a more prepared manner. It is also emphasized that digital materials contribute to professional development and strengthen pre-service teachers' commitment to their profession. The process of preparing digital materials allows pre-service teachers not only to improve their technical skills but also to strengthen their professional attitudes. Students who develop a more professional approach by understanding the place and importance of digital materials in education will be able to use these skills more effectively in their professional lives. This process also contributes to the development of an innovative teaching attitude of pre-service teachers. Students, through digital materials, tended towards a more interactive and student-oriented teaching approach different from traditional teaching methods. It was clearly observed that the use of such digital tools in the classroom contributed to both teachers and students to be more creative and effective in education. Finally, digital material applications transformed pre-service teachers' attitudes towards technology and helped them overcome their negative perceptions about technology. Students who realized the necessity of integrating technology into education embraced the power of digital materials in education. This enabled them to develop a more open-minded and innovative attitude towards technology. The application of digital materials has been an important tool that has shaped not only their technical knowledge but also their pedagogical vision. This process provides valuable contributions to their future teaching practices and professional development. Research on digital materials practices for pre-service teachers reveals significant effects on professional empowerment and self- confidence. Studies show that these practices not only develop technological skills but also strengthen professional identity and increase self-confidence (Tatlı & Bayramoğlu, 2015; Çebi & Reisoğlu, 2019). Research also shows that there is a positive relationship between teachers' self-efficacy in using instructional materials and their attitudes towards educational technologies (Akgün, 2020). The research results reveal the potential of digital material applications to improve the professional, pedagogical and technological competences of pre-service teachers. When compared with similar studies in the literature, it is seen that these practices positively transform pre-service teachers' attitudes towards technology, strengthen their pedagogical skills and enable more effective use of digital tools in education.

Future research can extend these findings by investigating how digital materials can be further integrated into pre-service teachers' professional development processes. In addition, given that digital material applications strengthen pre-service teachers' pedagogical, professional and technological skills, it is important to integrate such applications into more education programs. The competence of pre-service teachers to use digital tools effectively can improve the quality of their teaching processes. It is seen that digital material applications empower pre-service teachers in the fields of digital citizenship and professional development. Therefore, it is suggested that more training and awareness opportunities should be provided to pre-service teachers on digital citizenship, ethical use and professional development. In this way, pre-service teachers can take a leadership role in these issues. It was determined that digital material applications improved pre-service teachers' creative and strategic thinking skills. Encouraging more creative and student-centered teaching approaches with digital tools in educational processes may enable pre-service teachers to become more familiar with innovative teaching methods. It is important to develop the ability to recognize and use digital materials effectively. Ongoing training and support can be provided for pre-service teachers to gain more in-depth knowledge about digital tools and learn how to integrate these tools in their teaching process. This can make technology integration in education more efficient. Research shows that digital material applications transformed pre-service teachers' attitudes towards technology and increased their professional self-confidence. In this context, guidance and support programs should be developed to provide pre-service teachers with positive attitudes towards the use of technology. Understanding the

place of technology in educational processes can make pre-service teachers more open-minded and innovative. Research results show that digital material applications have significant effects on pre-service teachers' skills and attitudes. However, it is thought that the effects of such applications should be further analyzed in the long term. Future research can extend these findings by investigating how digital materials can be further integrated into pre-service teachers' professional development processes.

REFERENCES

Akgün, F. (2020). Examining the self-efficacy of pre-service teachers receiving pedagogical formation education towards utilising instructional materials and their attitudes towards instructional technologies. *Trakya Education Journal*, *10*(2), 412-428.

Aksoğan, M., & Bulut Özek, M. (2020). The relationship between prospective teachers' technology competences and their perspective on technology. *Gümüşhane University Institute of Social Sciences Electronic Journal*, *11*(2), 301-311.

Aydoğmuş, M., & Karadağ, Y. (2020). Information and communication technologies (ICT) competences of prospective teachers: The case of Ondokuz Mayıs University. *Mersin University Journal of Faculty of Education*, *16*(3), 686-705. https://doi.org/10.17860/mersinefd.715457

Berg, S. (2011). Web 2.0 technologies in higher education teaching: A practical introduction. *Kentucky Journal of Excellence in College Teaching and Learning*, *8*, 20-27.

Büyüköztürk, Ş. (2024). *Data analysis handbook for social sciences: Statistics, research design SPSS applications and interpretation* (31st ed.). PegemA.

Cengiz, C. (2014). The development of TPACK, technology integrated self-efficacy and instructional technology outcome expectations of pre-service physical education teachers. *Asia-Pacific Journal of Teacher Education*, *43*(5), 411-422. https://doi.org/10.1080/1359866X.2014.932332

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2013). A review of the research on the TPACK framework: Technology, pedagogy, and content knowledge. *Educational Technology & Society*, *16*(1), 31-51.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences.* Lawrence Erlbaum Associates.

Collis, B., & Moonen, J. (2008). Web 2.0 tools and processes in higher education: Quality perspectives. *Educational Media International*, *45*(2). https://doi.org/10.1080/09523980802107179

Creswell, J. W. (2014). *Qualitative research methods* (M. Bütün & S. B. Demir, Eds.). Siyasal Kitabevi. (Original work published 2013)

Çebi, A., & Reisoğlu, İ. (2019). A training activity for the development of digital competences of prospective teachers: Opinions of pre-service teachers in Böte and other branches. *Educational Technology Theory and Practice*, *9*(2), 539-565.

Demircioğlu, E., & Yurt, E. (2024). The importance of digital material design skills for classroom teachers' perceptions of professional competence: A relational study. *Cumhuriyet International Journal of Education*, *13*(2), 489-499. https://doi.org/10.30703/cije.1346916

Emre, İ., Kaya Atıcı, E., & Ayaz, E. (2020). Determining the level of technological pedagogical content knowledge of prospective primary school teachers in the context of achievements related to life domains. *Maarif Mektepleri International Journal of Social and Human Sciences*, *3*(2), 15-26. https://doi.org/10.47155/mamusbbd.787032

Erdemir, N., Bakırcı, H., & Eyduran, E. (2009). Determination of pre-service teachers' self-confidence in using technology in education. *Journal of Turkish Science Education*, *6*(3), 99-108. https://www.tused.org/index.php/tused/article/view/130

Ersoy, M., Kabakçı-Yurdakul, I., & Ceylan, B. (2016). Investigating preservice teachers' TPACK competencies through the lenses of ICT skills: An experimental study. *Education and Science*, *41*(186), 119-135. https://doi.org/10.15390/EB.2016.6345

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, *42*(3), 255-284.

Gürsoy, G., & Orhan Göksün, D. (2019). The experiences of pre-service science teachers in educational content development using web 2.0 tools. *Contemporary Educational Technology*, *10*(4), 338-357. https://doi.org/10.30935/cet.634168

ISTE. (2024). *ISTE standards: For educators.* International Society for Technology in Education. https://iste.org/standards

Karakuş, N., & Er, Z. (2021). Turkish teacher candidates' opinions on the use of WEB 2.0 tools. *IBAD Journal of Social Sciences*, *9*, 177-197. https://doi.org/10.21733/ibad.837184

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education*, *9*(1), 60-70.

Köksal, D., & Canlı, S. (2024). Examination of teachers' digital competencies. *Journal of Science, Education, Art and Technology (BEST Journal)*, *8*(1), 1-21.

McMillan, J. H. (2004). *Educational research: Fundamentals for the consumer.* Pearson/A and B.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*(6), 1017-1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Ozan, C., & Taşgın, A. (2017). Examining pre-service teachers' self-efficacy towards educational technology standards. *Educational Technology Theory and Practice*, *7*(2), 236-253.

Polat, E., & Göktaş, Y. (2023). Pedagogical digital skills competence level of public school teachers in Turkey. *Humanitas*, *11*(INCSOS VIII Special Issue), 298-318.

Saka, A. Z., & Saka, A. (2005). The development level of pre-service teachers' professional skills in instructional technology and material development course: Sakarya example. *Sakarya University Journal of Faculty of Education*, *10*, 81-177.

Starkey, L. (2019). A review of research exploring teacher preparation for the digital age. *Cambridge Journal of Education*, *50*(1), 37-56. https://doi.org/10.1080/0305764X.2019.1625867

Şimşek, Ö., & Yazar, T. (2017). Investigation of teachers' educational technology standards self-efficacy. *Journal of Pegem Education and Training*, *7*(1), 23-54. http://dx.doi.org/10.14527/pegegog.2017.002

Tatlı, Z., & Bayramoğlu, A. (2015). Reflecting the teaching practice process with digital stories. *Journal of Instructional Technologies & Teacher Education*, *4*(2), 16-28.

Tiryaki, E. N., & Karakuş, O. (2019). Examining the reading comprehension skills of prospective Turkish teachers through digital application. *Journal of Advanced Education Studies*, *1*(1), 1-11.

Wang, Y., & Lu, H. (2021). Validating items of different modalities to assess the educational technology competency of pre-service teachers. *Computers and Education*, *162*, 104081. https://doi.org/10.1016/j.compedu.2020.104081

Yıldırım, A., & Şimşek, H. (2016). *Qualitative research methods.* Seçkin.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Sage.