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Digital Transformation Profiles of Prospective Teachers

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Ümit Şahin[2], **Fulya Torun**[1]

Abstract

Determining the digital skills, awareness and responsibility levels of prospective teachers is critical for both their individual development and their future teaching roles. In this context, determining the current status of prospective teachers in areas such as digital citizenship, security and addiction is necessary to reveal their adaptation to the digital transformation process and the risks they may face in this process. For this reason, within the scope of the study, it was aimed to examine the digital transformation profiles of prospective teachers within the framework of digital citizenship, digital security and digital addiction dimensions. The study, which was based on the relational survey model, was conducted with 476 prospective teachers studying at the faculty of education. Surveys consisting of three dimensions were applied to the participants. The findings revealed that prospectiveteachers' digital citizenship levels were high, but their digital addiction tendencies were also at a remarkable level. While a significant difference was found in favor of women in digital citizenship according to gender variable, no significant difference was found in digital security and addiction levels. A strong positive correlation was found between digital citizenship and digital security. The study shows that prospective teachers have developed levels of ethical and responsible behavior in digital environments; however, they need support in terms of self-regulation, psychological resilience and digital well-being. In this context, it is recommended to include digital awareness, security and addiction issues in teacher training programs with a holistic approach.

Keywords: Digital Transformation, Prospective Teachers, Digital Security, Digital Citizenship, Digital Addiction

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[1] Corresponding Author, 0000-0001-6942-888X, Aydın Adnan Menderes Üniversitesi, fulya.torun@adu.edu.tr
[2] 0009-0000-9092-4028, Aydın Adnan Menderes Üniversitesi, umitsahin@gmail.com
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INTRODUCTION

The use of digital technologies in all areas of life is fundamentally changing the way people access information and their daily lifestyles. People, predominantly young people, actively use digital tools for various purposes, including communication, information gathering, shopping, and socializing. UNESCO (2023) reports that students' lives are becoming increasingly digitalized and that they carry out activities such as online social interaction, information search, and shopping largely using technological tools. However, this widespread and often unregulated use also brings with it serious risks in terms of digital security, ethics, privacy, and legal responsibilities (Çiftçi, 2021; Altıntaş & Barkuş, 2023).

The concept of “digital citizenship,” which emerged as a result of the transformation, defines individuals who use the internet regularly and effectively. While digital citizenship involves active participation in the digital world while using technology, it also includes acting responsibly and ethically and being aware of online rights and responsibilities. This concept, which has become increasingly important with technological developments, has increased the necessity of digital citizenship skills, especially in the digitalized world with the impact of the pandemic, as individuals perform various activities such as socializing, receiving education, shopping and benefiting from government services on digital platforms. In this process, frameworks such as the Digital Citizenship Model have formed an important basis for understanding and developing the dimensions of digital citizenship (Ribble, 2015).

Digital citizenship is an indispensable concept for individuals to take a responsible and active role in today's society and consists of multiple elements. Individuals need to have digital literacy skills in order to use digital technologies in a safe and inclusive manner. Research in Türkiye shows that the digital literacy literature is developing and studies are increasing in this field. The bibliometric analysis conducted by Er Türküresin (2024) provides important information about educational research in the field of digital literacy.

The concepts of digital communication, digital governance and digital citizenship are directly related to each other. Dede (2024) states that digital communication produces new forms and updates existing forms. Institutions such as the Presidential Communication Center (Cumhurbaşkanlığı İletişim Merkezi - CİMER) create a framework based on the principles of digital citizenship and digital governance and provide their services accordingly.

In Türkiye, especially in the field of education, digital citizenship has started to be researched more and more. Studies by Yeşiltaş and Çinpolat (2022) show that academic studies in the field of digital citizenship have increased since 2014 and this trend continues. These studies address a variety of topics such as prospectiveteachers' digital citizenship levels, digital citizenship perceptions, and digital literacy skills. For example, Kaya and Kaya (2014) examined preservice teachers' perceptions of digital citizenship. Sevigen and Yılar (2022) investigated the trends in postgraduate theses on digital citizenship written in the field of education in Türkiye.

Research in this field in Türkiye reveals that digital citizenship should be handled holistically with its different dimensions and importance. In this case, digital citizenship education should be integrated into the curriculum under a separate heading, disseminated and studies should be carried out to expand the target audience. It is also important to encourage users to use digital technologies ethically and to develop digital literacy skills. Koç and Koç (2021) examined the reflections of the digital citizenship phenomenon in Türkiye during the pandemic period. Akduman and Karahan (2022) draw attention to the importance of analyzing the digital citizenship status of digital age students. As a result of the studies conducted, the results generally reveal that they lack knowledge and awareness of digital citizenship components, make irresponsible posts that violate ethical obligations, and do not

know their digital rights or are not aware of legal boundaries (Akduman & Karahan, 2022). This lack of awareness can cause various problems not only at the individual level but also in the social and societal framework. Among the main problems encountered are issues such as the inability to develop safe behavior on online platforms, inability to protect from cyber-attacks, and inability to protect personal data, which may cause life-threatening effects in the future.

Digital security, which is one of the most important problem areas, is the protection of information systems and digital environments against unauthorized access, use, modification, damage or destruction of the data in its content. In the digitalizing, changing and globalizing world, the concept of security is being redefined and it is stated that digital security has a critical importance in this respect (Çiftçi, 2021). The OECD states that students lack the ability to distinguish between biased content and malicious digital content (such as fake news and phishing attempts) in the digital world, and are vulnerable to digital threats such as manipulative content (OECD, 2021). Digital security includes various elements such as protecting the personal data of individuals, securing the information assets of organizations and taking measures against cybercrimes. Altıntaş and Barkuş (2023) draw attention to the importance of personal data security in digital environments and focus on the existing risks in this area and methods of protection against them.

Raising awareness of individuals and institutions and training in this direction play an important role in ensuring digital security. Çoban (2024) examined the effect of interactive educational video design for digital security education on students' academic achievement and digital security self-efficacy perception, and Ulutaş (2022) examined the effect of cyber security education on the knowledge, behavior and awareness levels of prospective teachers. These studies emphasize the importance of digital security education to be prepared and implemented for different target groups.

Altun and Yükseltürk (2024) examined the concepts of digital literacy and cyber security in high schools and found that there is a positive relationship between these two concepts. This finding shows that improving digital literacy can contribute to cybersecurity knowledge. In another analysis study, it is revealed that studies in the field of cyber security are increasing and the importance of research in this field is revealed (Sanli et al., 2024). This analysis provides a comprehensive framework for the cybersecurity literature and can be a guide for future research.

On the other hand, excessive and uncontrolled use of digital technologies creates the risk of digital addiction in individuals, which has a negative impact on social relationships, academic achievement and psychological health. Digital addiction, which occurs as a result of excessive or problematic use of digital technologies, has become a problem that significantly affects individuals' psychological health and social functioning (Khang et al., 2013; Singh & Singh, 2019). This type of addiction is especially prevalent among young adults and negatively affects the daily life process (Arslan et al., 2015).

Individuals with digital addiction have difficulty in fulfilling their digital citizenship responsibilities as well as moving away from productive digital behaviors (Koç & Koç, 2021). Looking at the underlying causes of digital addiction, it is seen that factors such as psychological resilience and lack of self-control play an important role (Baumeister, 2003; Kaçar, 2022). Self-control, which is defined as the ability of individuals to regulate their emotions, thoughts and behaviors, shows a negative relationship with digital addiction (Tangney et al., 2018).

Findings indicate that individuals with high psychological resilience are less likely to engage in digital addiction behaviors (Çutuk, 2022; Sağar & Sağar, 2022). Psychological resilience is defined as an individual's ability to adapt and cope with adverse life events

(Earvolino-Ramirez, 2007). The positive relationship between psychological resilience and self-control found in the literature further highlights the joint effect of these two variables on digital addiction (Kaçar, 2022; Özer, 2013).

Studies show that there is a lack of knowledge and awareness regarding digital citizenship and security issues, and that individuals do not fully understand their digital rights and responsibilities. This situation leads to various security vulnerabilities, ethical issues, and psychosocial problems at both the individual and societal levels. Therefore, it is of great importance to develop individuals' digital literacy, ethical awareness, psychological resilience, and self-regulation skills in order to lead an effective and healthy life in the digital world.

Considering all these factors, it is important to assess prospective teachers' current status in terms of variables related to digital citizenship, digital security, digital literacy, and digital addiction using a holistic approach, both for their individual development and their future professional roles. Determining the digital transformation profiles of prospective teachers will also provide valuable data for the effective planning of digitalization processes in education and the integration of digital citizenship education into teacher training programs. In the first phase of the planned research, a comprehensive survey will be conducted to obtain quantitative data on the digital transformation profiles of teacher candidates. The survey form is structured to include multidimensional scales such as digital literacy levels, digital security awareness, perceptions of digital citizenship, and tendencies toward digital addiction. The research seeks to answer the following questions:

With survey mean scores is there a:

1. significant difference between genders?
2. significant difference between class levels?
3. significant difference between departments?
4. significant difference between all survey mean scores?
5. significant relationship between digital security awareness?
6. significant relationship between digital addiction awareness?
7. significant relationship between digital citizenship awareness?
8. significant relationship between all survey mean scores?

METHOD

Under this heading, detailed explanations are first provided regarding the research model, the universe in which the research was conducted, and the sampling. Information is then provided regarding the data collection tool, the statistical analysis methods used in the research, and research ethics.

Research Model

In this study, the correlational survey model, one of the quantitative research approaches, was used. The correlational survey model is part of survey research and allows for the examination of the level and direction of relationships between specified variables. This model is preferred especially for evaluating correlations between previously specified variables. Additionally, it can be used in some cases to test theoretical and complex relationships between different structures (Hutchinson, 2004).

In order to ensure the validity of the research, it is assumed that participants answered the questions truthfully and sincerely. However, although it is essential that all items are understood in the same way by the participants, it is a basic condition that expert opinions should be consulted during the development of the scale items (Hocaoğlu & Akkaş Baysal,

2019). In relational survey models, it is investigated how multiple variables change together. For this purpose, statistical methods such as correlation analysis, cross tabulations, regression analysis or structural equation modeling are used. Due to the nature of the research problem, researchers may only use correlation analysis to determine whether there is a significant relationship between pairs of variables (Tuncer, 2020).

Study Group

The study group of the research consists of those who volunteered to participate in the research among the prospective teachers studying at Aydın Adnan Menderes University Faculty of Education in the 2024-2025 academic year. In this context, data were collected from 476 volunteer students. In the selection of the study group within the scope of the research, considering the limitations of time, cost and access, the convenience sampling method was adopted in order to make the process efficient (Büyüköztürk et al., 2014).

Data Collection Tools

Within the scope of the aim of the study, in order to determine the digital addiction status, digital security awareness and digital citizenship competencies of prospectiveteachers, the researchers conducted a literature review and created survey forms for prospectiveteachers.

A digital security survey was developed to determine prospectiveteachers' levels of digital security. While developing the questionnaire, items were created based on digital security criteria by reviewing relevant literature. Then, two experts who had completed their doctorates in Computer Education and Instructional Technology (CEIT) were consulted. They were asked to score the criteria form and provide their suggestions. In this regard, the inter-rater reliability percentage was calculated as 90%. As a result of analyzing the data obtained in the validity and reliability study of the survey using the SPSS Program, the Cronbach Alpha value was found to be .847.

The digital addiction survey was developed to determine the digital addiction levels of prospectiveteachers. During the survey development process, the relevant literature was reviewed and then same two experts' opinions were taken. the inter-rater reliability percentage was calculated as 80%. As a result of analyzing the data obtained in the validity and reliability study of the survey using the SPSS Program, the Cronbach Alpha value was found to be .861.

The digital citizenship survey was developed to determine the digital citizenship levels of prospectiveteachers. While developing the survey, the relevant literature was reviewed and then same two experts' opinions were taken. The data obtained from the validity and reliability study of the survey were analyzed using the SPSS program, and the Cronbach Alpha value was found to be very high at .929.

A Cronbach's alpha coefficient of .70 or higher is sufficient for the measurement tool to be considered reliable (George & Mallery, 2010). All surveys consist of five-point Likert-type items, with "Strongly Disagree = 1," "Disagree = 2," "Undecided = 3," "Agree = 4," and "Strongly Agree = 5." The Digital Addiction Survey consists of 10 items, the Digital Security Survey consists of 10 items, and the Digital Citizenship Survey consists of 32 items.

Data Collection Process and Analysis

The data collection process for this study was planned to include prospective teachers in their 1st, 2nd, 3rd, and 4th years of study at the Faculty of Education. According to a pre-prepared schedule, the study was conducted simultaneously in the relevant course sections,

and prospective teachers were informed about the purpose, scope, and confidentiality principles of the study. The survey, developed using the Google Forms platform to facilitate digital access for participants, was administered online on a voluntary basis. Each participant was required to respond only once, and the platform's response verification mechanisms were utilized to ensure the reliability of the responses.

The data collection process was conducted in accordance with ethical principles. No personal data was collected from participants, and all responses were evaluated anonymously. In this context, the necessary ethical approval for the study was granted by Aydın Adnan Menderes University's Education Research Ethics Committee Meeting dated April 22, 2025, and numbered 2025/5. Thus, both the scientific validity and ethical integrity of the research were ensured.

Various statistical methods were used to analyze the data collected in the study. An independent samples t-test was applied to determine the significant difference between the mean survey scores of participants according to the gender variable. Spearman's rank correlation analysis was preferred to examine the relationship between class level and survey scores. A one-way analysis of variance (ANOVA) was conducted to determine whether there were significant differences in survey scores based on participants' primary fields of study. Additionally, a repeated measures ANOVA analysis was performed to test whether there was a significant difference in the overall mean survey scores. Furthermore, Pearson correlation analysis was used to determine the relationships between the mean scores obtained from the survey and digital security, digital addiction, digital citizenship awareness, and total survey scores.

Table 1. *Skewness and Kurtosis Analysis*

	N	$\bar{x}$	Skewness	Kurtosis
Gender	476	1,28	1,010	-0,984
Class	476	2,43	0,508	-0,512
Department	476	7,18	0,012	-0,695
Level of awareness towards digital security	476	3,45	-0,063	0,083
Level of awareness towards digital addiction	476	3,47	-0,097	-0,104
Level of awareness towards digital citizenship	476	3,46	-0,052	-0,246
Digital addiction mean	476	3,4653	-0,616	0,796
Digital security mean	476	3,8641	-0,432	0,989
Digital citizenship mean	476	4,1091	-0,334	1,134

The data obtained within the scope of the research were analyzed using IBM SPSS Statistics 27.0.1 software. Descriptive statistical analyses were performed for each survey. Thus, the current status of prospective teachers was determined. Subsequently, the relationships between teacher candidates' digital addiction status, digital security awareness, and digital citizenship competencies obtained from the surveys were examined. As a result of the research, a dataset of 476 individuals was obtained. A normal distribution test was first applied to the obtained data.

The kurtosis and skewness values were examined to determine the normality of the data. It is recommended that the kurtosis and skewness values be within the range of ±2 for the normality assumption (George & Mallery, 2010). When the kurtosis and skewness values of the scales used in the study were examined, they were found to exhibit a normal distribution.

FINDINGS

This section of the study presents findings from the analysis of data obtained from participants regarding the scale.

Table 2. *Gender Distribution of Participants*

Gender	N	%
Female	345	73
Male	131	27
Total	476	100

Table 2 shows that women predominate in the distribution of participants according to gender. Accordingly, female participants make up 735% (n=345) of the sample, while male participants make up 27% (n=131).

Table 3. *Class Distribution of Participants*

Class	N	%
1	46	9,7
2	256	53,8
3	99	20,8
4	75	15,8
Total	476	100

Table 3 shows that 9.7% (n=46) of participants are first-year students, 53.8% (n=256) are second-year students, 20.8% (n=99) are third-year students, and 15.8% (n=75) are fourth-year student teachers.

Table 4. *Department of Participants*

Departments	N	%
Science Teaching	37	7,8
English Language Teaching	20	4,2
Mathematics Teaching	29	6,1
Music Teaching	9	1,9
Preschool Teaching	108	22,7
Special Education Teaching	91	19,1
Guidance and Psychological Counseling	51	10,7
Art and Work Teaching	5	1,1
Classroom Teaching	37	7,8
Social Studies Teaching	51	10,7
Turkish Language Teaching	38	8,0
Total	476	100,0

Table 4 details the distribution of participants according to their main fields of study. This distribution represents the academic fields of the individuals in the sample and is important in terms of showing which disciplines the data obtained in the study were collected from. These data on the main field of study variable were used as a basis for evaluating the interdisciplinary

representation level of the study.

Table 5. *Significance Between Participants' Digital Profiles According to Gender - Independent Sample T Test*

Factor	t	t(df)	p(2-tailed)
Digital Addiction	1.336	474	p = .182
Digital Security	0,623	474	p = .534
Digital Citizenship	2.210	474	p = .028

Table 5 shows the results of the independent sample t-test conducted to determine the difference between digital addiction, digital security, and digital citizenship levels according to gender. In the analysis of digital addiction scores, p = 0.182 was found; according to this result, no statistically significant difference was determined between genders in terms of digital addiction levels. When digital security scores were examined, p = 0.534, indicating that there was no significant difference between genders in terms of digital security levels.

In the analysis conducted in terms of digital citizenship scores, a value of p = 0.028 was obtained. This result reveals that there is a statistically significant difference in digital citizenship levels according to the gender variable and that this difference is in favor of female participants (Table 6).

Table 6. *Digital citizenship survey mean scores by gender*

Gender	N	$\bar{x}$	S
Female	345	4,14	,393
Male	131	4,03	,515

According to the results of the analysis conducted on Table 7, the relationships between the participants' class level and other variables were evaluated as follows:

- Digital Addiction: There is a weak positive and significant relationship with class level (rs =.173, p = .001). This indicates that digital addiction tendencies may increase slightly as class level increases.
- Digital Security: There is no significant relationship with class level (rs =.058, p = .128), indicating that class level has no significant effect on the perception of digital security.
- Digital Citizenship: A weak positive and significant relationship was observed with class level (rs =.128 p = .005). It can be said that there is a slight increase in digital citizenship tendencies as class level increases.

As a result, it was determined that class level is only slightly related to digital addiction and digital citizenship, but does not show a meaningful relationship with digital security.

Table 7. *Significant Difference between Digital Profiles and Class Levels - Spearman Correlation Analysis*

Variable	Class Level
Digital Addiction	0,173*
Digital Security	0,058
Digital Citizenship	0,128*

n = 476. p < .001 $-1 \leq r \leq +1$

Referring to Table 8, a one-way analysis of variance (ANOVA) was applied to examine whether the participants' levels of digital addiction, digital security, and digital citizenship differed across disciplines.

Table 7. *Digital Profiles ANOVA Analysis by Department*

Variable	Source of Variance	Sum of Squares	sd	Mean Squares	F	p
Digital Addiction Mean Score	Between groups	5,08	10	,508	1,366	,193
	Within groups	172,88	465	,372		
	Total	177,96	475			
Digital Security Mean Score	Between groups	4,456	10	,446	1,254	,254
	Within groups	165,20	465	,355		
	Total	169,66	475			
Digital Citizenship Mean Score	Between groups	2,48	10	,248	1,332	,210
	Within groups	86,50	465	,186		
	Total	88,98	475	,508	1,366	,193

Table 8. *Welch Analaysis*

Variable	t	(df1)	(df2)	p
Digital Addiction Mean Score (Welch)	1,466	10	71,322	,170
Digital Security Mean Score (Welch)	1,320	10	71,016	,237
Digital Citizenship Mean Score (Welch)	,998	10	71,071	,453

The results of the one-way analysis of variance (ANOVA) and Welch test revealed that there was no significant difference in participants' levels of digital addiction, digital security, and digital citizenship according to the major variable. According to the ANOVA results, digital addiction (F (10, 465) = 1.366, p = .193), digital security (F (10, 465) = 1.254, p = .254), and digital citizenship (F (10, 465) = 1.332, p = .210) did not show statistically significant differences between groups. Similarly, the Welch test applied in the case of a violation of the assumption of variance homogeneity also showed no statistically significant differences between the groups in terms of digital dependency (F (10, 71.322) = 1.466, p = .170), digital security (F (10, 71.016) = 1.320, p = .237), and digital citizenship (F (10, 71.071) = 0.998, p = .453) variables. These results indicate that the group variables under consideration do not have a decisive effect on the digital indicators in question and that the participants exhibit similar characteristics in terms of these variables.

Table 10. *Significance between Survey Mean Scores and All Survey Mean Scores - Repeated Measures ANOVA*

Factor		Sum of Squares	sd	Mean Squares	F	p	Partial eta squared
Survey	Greenhouse-Geisser	100,502	1,727	58,191	344,683	,000*	,421
Error(Survey)	Greenhouse-Geisser	138,500	820,379	,169			

The ANOVA analysis results of the repeated measurements in Table 10 evaluate whether there is a significant difference between the survey mean scores and all survey mean scores. Since the normality assumption was met but the sphericity assumption was not, the significance values were interpreted using Greenhouse-Geisser rather than "assumed sphericity." According to the analysis results, there is a significant difference between the participants' survey means and the overall means, and this difference has

a statistically strong effect. These findings reveal that the measured dimensions show a significant differentiation and that the results are supported by a significant effect size.

Table 11. *Direction of Significance*

Survey	Survey	Mean	Std. Error	p	Direction of Significance
Digital Addiction	Digital Security	-,399	,028	,000*	D. Addiction < D. Security
	Digital Citizenship	-,644	,026	,000*	D. Addiction < D. Citizenship
Digital Security	Digital Addiction	,399	,028	,000*	D. Security > D. Addiction
	Digital Citizenship	-,245	,019	,000*	D. Security < D. Citizenship
Digital Citizenship	Digital Addiction	,644	,026	,000*	D. Citizenship > D. Addiction
	Digital Security	,245	,019	,000*	D. Citizenship > D. Security

In this regard, when looking at which surveys the meanings favor, it is seen that digital security and digital citizenship surveys are rated higher than digital addiction surveys. The highest meaningful difference is seen in digital citizenship, while the lowest is seen in digital addiction (Table 11).

Table 12 shows that digital security awareness has a moderate positive correlation with digital addiction ($r=0.311$, $p<0.001$), digital security ($r=0.453$, $p<0.001$), and digital citizenship ($r=0.397$, $p<0.001$). Digital addiction awareness shows the weakest correlation with digital addiction ($r=0.145$, $p=0.001$) and the strongest correlation with digital citizenship ($r=0.234$, $p<0.001$). Digital citizenship awareness has similar correlation values with digital security ($r=0.327$, $p<0.001$) and digital citizenship ($r=0.330$, $p<0.001$). Strong positive correlations were found between digital addiction and digital security ($r=0.487$, $p<0.001$) and digital citizenship ($r=0.459$, $p<0.001$). The correlation between digital security and digital citizenship is also quite high ($r=0.704$, $p<0.001$).

Table 12. *The Relationship between the Mean Scores of the Survey and the Mean Scores of the Whole Survey - Pearson Correlation Test*

Variable		Digital Addiction Mean	Digital Security Mean	Digital Citizenship Mean
Level of Awareness on Digital Security	Correlation	,311	,453	,397
	Significance	0,000	0,000	0,000
Level of Awareness on Digital Addiction	Correlation	,145	,188	,234
	Significance	0,001	0,000	0,000
Level of Awareness on Digital Citizenship	Correlation	,200	,327	,330
	Significance	0,000	0,000	0,000
Digital Addiction Mean	Correlation	1	,487	,459
	Significance		0,000	0,000
Digital Security Mean	Correlation		1	,704
	Significance			0,000
Digital Citizenship Mean	Correlation			1
	Significance			

CONCLUSION, DISCUSSION, AND RECOMMENDATIONS

This study was conducted to reveal the profiles of prospective teachers regarding digital transformation processes. The study examined three key dimensions: digital citizenship, digital security, and digital addiction. These dimensions were analyzed in terms of various demographic variables (gender, grade level, field of study). The findings revealed that prospective teachers tend to behave responsibly in digital environments but may be vulnerable to digital addiction.

As a result of the research, it was determined that prospective teachers had high levels of digital citizenship. Therefore, it is understood that prospective teachers are conscious about ethical and responsible behaviors in digital environments. According to Ribble (2015), this awareness is the most important component of digital citizenship. The fact that this level of awareness is relatively high among the same individuals who are digitally dependent suggests that prospective teachers may be inclined to use technology for non-educational purposes or without supervision (Singh & Singh, 2019; Tangney et al., 2018). The fact that individuals' high level of knowledge does not translate into behavior indicates a “knowledge-action gap,” or lack of application. It appears that possessing digital citizenship knowledge alone is not sufficient to prevent addiction. It was determined that the digital citizenship levels of prospective teachers according to their gender showed a significant difference in favor of women. This situation confirms various findings that women exhibit more ethical and responsible behaviors in digital environments (Altıntaş & Barkuş, 2023). An in-depth analysis of the reasons for this difference should be conducted. However, the fact that a similar difference is not observed in the areas of digital security and digital addiction indicates that behavioral patterns and awareness levels do not vary significantly according to gender.

The observation of an increase in the levels of digital citizenship and digital addiction in prospective teachers as the grade level increases may be associated with more intensive interaction with digital tools as the grade level increases. On the one hand, digital citizenship knowledge and awareness are increasing, but on the other hand, digital addiction tendencies are also on the rise. This situation can lead to both positive (increased digital responsibility) and negative (increased risk of addiction) outcomes (Kaçar, 2022). An international report published by the World Health Organization (WHO) in 2018 states that there is a strong positive correlation between mental health and problematic use of technology, and that digital addiction in young people particularly leads to depression, anxiety, and attention deficit disorder. The absence of significant differences in comparisons made according to academic discipline indicates that digital competencies have developed at a similar level among all teacher candidates. This may be a result of the homogeneous presentation of digital content in education faculties (Yeşiltaş & Çinpolat, 2022).

Repeated measurements revealed significant differences between the dimensions of digital citizenship, digital security, and digital addiction according to analaysis with the highest difference being in favor of digital citizenship. This situation shows that candidates are more aware of digital rights and responsibilities, but they struggle to translate this awareness into behavior that reduces digital addiction. Baumeister (2003) states that there is a direct relationship between an individual's self-control skills and their behavior in digital environments. Digital addiction is known to be related not only to technology but also to the psychological resilience of the individual (Dede, 2024). In this context, digital well-being seminars should be organized in collaboration with psychological counseling centers so that prospective teachers can cope with problems such as digital stress, online burnout, and digital distraction.

The positive and high correlation between digital citizenship and digital security indicates that ethical digital behavior develops alongside safe online habits. This correlation shows that

prospective teachers have a sense of responsibility to protect both themselves and others in the digital world (Altun & Yükseltürk, 2024). In a report published by the OECD (2021), digital citizenship and digital security skills were addressed together; it was stated that these two dimensions must be developed together so that students can both protect their personal data and defend their rights in the digital environment. The fact that the level of digital security is above mean but not as high as citizenship indicates that information is not being used sufficiently in practice. In education faculties, topics such as cybersecurity, personal data protection, password management, and phishing should be supported with technical applications; prospective teachers should be taught decision-making skills within digital security scenarios (Altun & Yükseltürk, 2024).

High digital citizenship scores among participants are a significant advantage. However, for this awareness to translate into lasting behavior, practical activities, problem-solving scenarios, and case study analyses based on digital ethics, rights, and online responsibility should be developed (Ribble, 2015). Such content not only enables students to acquire knowledge but also to translate it into behavior. The fact that female candidates have higher digital citizenship scores shows that awareness of responsibility and ethical behavior in digital environments may be related to gender. This difference can be seen as a positive example, and gender-based digital awareness projects can be developed. At the same time, supportive measures should be designed for male candidates. Higher authorities such as the Ministry of National Education (Milli Eğitim Bakanlığı) and the Council of Higher Education (Yükseköğretim Kurulu) should ensure that digital competencies are systematically incorporated not only in terms of content but also in assessment, teacher recruitment criteria, and in-service training. Digital citizenship and ethical awareness should be prioritized not only in terms of technology use but also in terms of human-centered education.

This study demonstrates that prospective teachers approach their role in the digital environment not only at the user level but also at the social and ethical responsibility level. Digital transformation is not only about an individual's access to technology, but also about the purpose, manner, and extent to which they use this technology. In this regard, the high level of digital citizenship and security awareness among prospective teachers is a positive indicator. However, the relatively high level of digital addiction highlights the need to support this awareness at the behavioral level. The relatively high level of digital addiction compared to other dimensions indicates that prospective teachers experience difficulties in self-regulation in their relationship with technology. Therefore, seminars, workshops, and guidance activities covering topics such as self-regulation, time management, and digital detox should be systematically planned in teacher training programs. Baumeister (2003) and Tangney et al. (2018) have demonstrated that an individual's self-regulation skills are directly related to their digital behavior. The lack of significant differences between academic disciplines shows that digital transformation is shaped within the framework of individual awareness and general education programs. In this context, in addition to common compulsory digital literacy courses for all teacher candidates, field-specific (branch-based) digital skills modules should also be developed. For example, accessible digital content production for special education teachers, simulation-supported learning for science teachers, etc. The current study is cross-sectional in nature. However, in order to understand how digital transformation develops in individuals and how it changes over time, long-term monitoring of the same individuals should be conducted. Such longitudinal studies will provide more in-depth information about the permanence of digital transformation.

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