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Examination of the Relationship Between Pre-Service Teachers' Digital Literacy and Digital Citizenship Levels

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Abstract

The aim of this study is to examine the relationship between pre-service teachers' digital literacy and digital citizenship levels. The research utilizes the correlational survey model, a quantitative research method, and the study group consists of 260 pre-service teachers. The research data was collected using the Digital Citizenship Scale and the Digital Literacy Scale. SPSS 22 software was used for data analysis. In the study, the digital citizenship and digital literacy levels of pre-service teachers were analyzed using descriptive analysis techniques. The research concluded that pre-service teachers have a moderate level of digital citizenship and a high level of digital literacy. Furthermore, it was determined that there were no significant differences in the digital citizenship and digital literacy levels of pre-service teachers based on variables such as gender, grade level, and frequency of daily internet use. Moreover, it was determined that there was no significant relationship between the digital citizenship levels and digital literacy levels of pre-service teachers, and these two attributes did not predict each other. Due to the research results differing from several studies present in the literature, conducting in-depth examinations could be recommended to determine the digital citizenship and digital literacy levels of pre-service teachers based on various variables.

Keywords: Digital citizenship, digital literacy, digital skills, pre-service teachers', relational survey model,

1. Introduction

1.1. Introduction to the problem

In the 21st century, with the completion of the transition from an industrial society to an information society, advancements in information and communication technologies have brought about changes that have led to innovations in knowledge production and sharing. In today's world, accessing accurate information, storing knowledge, and sharing it through proper channels necessitate the effective

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utilization of digital resources. Digital resources used in various fields such as education, healthcare, communication, commerce, and entertainment have introduced us to an entirely new world, making it inevitable to adapt and live within this 'digital realm.' In order for individuals to exist securely in the digital world, they need to possess the skills demanded by this digital environment. The United Nations Development Programme (UNDP) has announced the 'Digital Strategy 2022-2025' plan with the objective of expediting the achievement of the Sustainable Development Goals by reducing inequalities and promoting inclusivity in the digital realm among nations and communities, while also addressing climate change and enhancing economic opportunities. The aforementioned strategic plan will provide guidance to the United Nations Development Programme in supporting countries to build inclusive, ethical, and sustainable digital societies. In this century, digital technology is a fundamental force that is reshaping economies, governments, and civil society, thereby serving as a key power driving transformative changes that affect nearly every aspect of development (UNDP, 2022). Digital information is potential power until it is used and at that point it transforms into kinetic power. To put people into this power equation means that power can be used for either good or evil purposes (Farmer, 2010). In the digitized world, individuals carry out activities such as benefiting from public services, accessing educational content from distant parts of the world, scheduling appointments for healthcare services, conducting banking transactions, shopping, marketing, entertainment, and more, using digital tools. In order for these activities to be carried out in a reliable manner, it is necessary to use digital resources correctly and effectively. At this point, the concepts of digital citizenship and digital literacy come into play.

Digital citizenship can be defined as the ability to use technology in a secure, responsible, critical, productive, and civic manner (Farmer, 2010). Digital citizenship assists all technology users in becoming more aware of the legal consequences of their technology usage by establishing behavioral norms related to technology use. (Rible, 2004). A digital citizen is an individual who can actively, positively, and responsibly engage in local, national, or global online and offline communities by developing a broad range of competencies. Digital citizenship and participation encompass a wide array of activities, ranging from creating, consuming, sharing, playing, and socializing to researching, communicating, learning, and working. Competent digital citizens can effectively handle situations related to learning, employment, employability, leisure, and community engagement while respecting human rights and intercultural differences (Council of Europe booklet). Digital citizenship is not merely a knowledge to be acquired, but rather a practice that individuals need to sustain throughout their lives in line with the continuous advancement of technology. In this context, digital citizenship necessitates individuals to develop an appropriate, responsible, and empowered

approach to relevant technological applications across all aspects of social life (Kurt and Odabaşı, 2021). The fact that digital technologies can be used from many points of the world, which was tested during the Pandemic Period, shows that all citizens of the world can be digital citizens with equal rights and responsibilities (Çubukçu and Bayzan, 2013). Looking at these definitions, it becomes evident that digital citizenship is a concept quite distinct from classical citizenship. While classical citizenship places emphasis on belonging to the state, digital citizenship focuses on how the digital realm can be used securely, beneficially, problem-solvably, respectfully, and productively (Çatlı and Keskin, 2021). According to the standards set by ISTE (International Society for Technology in Education), an international organization aimed at promoting the use of technology in education, digital citizenship involves utilizing technology to improve society and shape public policies, respectfully interacting with individuals of diverse beliefs in online environments and determining the reliability of online sources of information. In this context, students are expected to recognize the rights, responsibilities, and opportunities of living, learning, and working in the digital world, and to act in secure, legal, and ethical ways (ISTE, 2021). Digital technologies are constantly evolving; therefore, the development of digital skills is an ongoing process that should start from early childhood at home and school, within both formal and informal educational environments, and continue throughout one's lifetime. In the Council of Europe booklet, educators can not only assist students in protecting themselves from harm but also teach them how to use and create digital knowledge for the greater good (Lesley Farmer (2010). Ribble (2011), who has conducted extensive work in the field of digital citizenship education, has identified nine elements related to digital citizenship in order to provide educators with a framework for technology use and to guide technology leaders' focus on digital citizenship topics. These are: 1. Digital Access, 2. Digital Commerce, 3. Digital Communication, 4. Digital Literacy, 5. Digital Ethics, 6. Digital Law, 7. Digital Rights and Responsibilities, 8. Digital Health, 9. Digital Security. The nine dimensions of digital citizenship emphasize the necessity of using digital tools that bring technology to children in a more accurate and responsible manner, teaching them how to use these tools within a framework of correctness and responsibility (Çubukçu and Bayzan, 2013). In the Handbook for Digital Citizenship Education prepared by the Council of Europe, one of the principles considered a prerequisite for digital citizenship is functional digital literacy skills. Citizens lacking digital literacy skills cannot access information from digital sources, cannot use this information, and cannot express themselves in the digital world (Council of Europe, 2019). Gilster (1997), who introduced the concept of digital literacy to the literature, defines digital literacy as the ability to comprehend, use, and analyze information from a variety of sources via computers and the skill to adapt these abilities to lifelong learning. In the Global Framework for Digital Literacy developed by UNESCO (2018) to serve as the foundation for Indicator 4.4.2 of the Sustainable

Development Goals, digital literacy is defined as the ability to securely access, manage, understand, integrate, communicate, evaluate, and create information through digital technologies for employment, decent work, and entrepreneurship. Bacon and MacKinnon (2016) have classified digital literacy into three levels. These are: 1. *Basic Digital Literacy Skills*: Includes the skills necessary for everyone in society to use existing online systems. 2. *Digital Skills for the General Workforce*: Encompasses the skills required to use software and systems needed by businesses. 3. *Digital Literacy for Professional Occupations*: Encompasses advanced skills that include a wide range of software and system design, developing and configuring new tools and products. According to Martin (2003), digital literacy refers to an individual's possession of awareness, skills, and reflective-evaluative approaches necessary to work comfortably in knowledge-rich and information communication technology-supported environments. In line with these definitions, digital literacy encompasses the set of competencies required to effectively use digital technologies in social, cultural, and economic realms, evaluate information and information sources, be aware of the risks brought by digital transformation, and, in the most general sense, adapt to the digital age. (Bayrakçı, 2020).

In terms of adapting to the digital age, education plays an incredibly important role. Prensky (2001), who coined the term *'digital natives'* for individuals born into the digital era, points out that traditional-style education does not effectively address to today's students who are digital natives. In order to effectively utilize technology in the learning process, it is essential to possess a certain level of digital literacy skills. Digital literacy for learning goes beyond knowing how to use technology; it involves proper information management, critical thinking skills, and adopting correct online behaviors. (Tang and Chaw, 2016). When students witness adults using technology in inappropriate ways, they might assume that it's a norm. This can lead to negative behaviors among students. Educators need to encourage students to use technology responsibly. (Rible, 2004). Teachers are expected to be well-versed in their fields, possess pedagogical competence, and effectively use information communication technologies. (Altun and Güngör, 2020). In this regard, it's important to assess teachers' digital competencies starting from the pre-service period. Examining the current status of pre-service teachers' digital citizenship and digital literacy skills is also crucial.

1.2. Literature review

Upon reviewing the studies conducted with pre-servcie teachers on the subject, it can be observed that the literature includes research that examines the levels and sub-dimensions of digital citizenship among pre-service teachers according to various variables (Aktay, 2009; Sincar, 2010; Kocadağ, 2012; Görmez, 2016; Aslan, 2016, Bakır, 2016). There are also qualitative and mixed-methods studies aimed at

determining pre-service teachers' perceptions of digital citizenship (Kaya and Kaya, 2014; Lindsey, 2015; Kuzu, Odabaşı and Günüç, 2013; Alexander, 2015; Aygün, 2019), scale development studies on digital citizenship conducted with pre-service teachers (İşman and Güngören, 2014; Metin and Cin, 2021), and relational studies regarding the relationship between pre-service teachers' digital citizenship levels (Sakallı, 2015; Çiftçi and Aladağ, 2016). In addition, there are research studies focusing on determining the levels of digital literacy among pre-service teachers (Aldemir, 2004; Lei, 2009; İşman & Çukurbaşı, 2014, Göldağ and Kanat, 2018; Ocak and Karakuş, 2018; Peled, 2021). There are also studies involving the development and adaptation of digital literacy scales for pre-service teachers (Techataweewan & Prasertsin, 2017; Üstündağ, Güneş and Bahçivan, 2017; Hamutoğlu, Güngören, Uyanık, Erdoğan, 2017), relational studies concerning pre-service teachers' digital literacy levels (Tyger, 2011; Kozan & Bulut Özek, 2019), and qualitative research aimed at determining pre-service teachers' perceptions of digital literacy (Campbell, 2016; Çam & Kıyıcı, 2017; Önger & Çetin, 2018). Studies examining the relationship between pre-service teachers' digital citizenship and digital literacy skills are limited in number. Buchholz, DeHart, and Moorman (2020) have examined digital citizenship and digital literacy in the context of applications during the COVID-19 pandemic. In their research, Pangrazio and Sefton-Green (2021) examined the concepts of digital citizenship and digital literacy conceptually within the framework of digital rights. Similarly, Milenkova and Vladislava (2021) examined digital citizenship in the context of necessary digital literacy skills during the pandemic. In their study targeting pre-service teachers, Erdem, Oruç, Atar, and Bağcı (2022) examined the mediating effect of digital literacy in the relationship between media literacy and digital citizenship.

1.3. Purpose of the research

Studies in the literature generally address the digital citizenship and digital literacy skills of pre-service teachers separately. In a limited number of studies, these two complementary concepts have been examined together. Some of these studies have focused on digital literacy and digital citizenship within the context of the pandemic. No research has been found regarding the assessment of pre-service teachers' current levels of digital citizenship and digital literacy. In the future, individuals who will teach *'digital natives'* need to possess the competencies of the digital age in order to accurately and effectively utilize the skills required by the digital world during the educational process and guide their students in this regard. In line with this, the aim of this research is to examine the relationship

between pre-service teachers' digital literacy and digital citizenship levels. Within the scope of this aim, the following research questions were investigated:

1. What are the levels of digital citizenship of pre-service teachers?

2. Do pre-service teachers' digital citizenship levels show significant differences in terms of gender, grade level, and frequency of internet usage?

3. What are the levels of digital literacy of pre-service teachers?

4. Do pre-service teachers' digital literacy levels show significant differences in terms of gender, grade level, and frequency of internet usage?

5. Is there a significant relationship between pre-service teachers' digital citizenship levels and digital literacy levels?

2. Method

In this research, the quantitative research method of relational survey model was used to examine the relationship between pre-service teachers' digital literacy and digital citizenship levels based on various variables. Survey research is a research model that allows for the description of general trends and attitudes in the population through studies conducted on a selected sample from the population (Creswell, 2014). Relational survey research is a quantitative research design that aims to examine the relationship between the characteristics of the sample group without any intervention (Büyüköztürk et al., 2012). Descriptive-relational survey type research is a type of research that describes an event or phenomenon as it is and aims to present the effects or degree of the variables believed to influence or be related to the given event or phenomena without any manipulation (Kaya, Balay, and Göçen, 2012). This approach, which aims to determine the presence of co-variation between two or more variables, seeks to establish whether the variables change together and, if so, how the change occurs (Karasar, 2011).

2.1. Study Group

The study group of the research consists of 260 pre-service teachers enrolled in the Faculty of Education, Departmant of Social Studies at Akdeniz University

during the 2021-2022 academic year. Demographic information of the study group is provided in Table 1.

Table 1. Demographic Information of the Study Group

Variables		**Frequency**	**%**
Gender	Female	175	67,3
	Male	85	32,7
	Total	260	100
Grade level	1	63	24,2
	2	81	31,2
	3	42	16,2
	4	74	28,5
	Total	260	100
Daily internet usage frequency	Less than 1 hour:	6	2,3
	1 - 2 hours	29	11,2
	2 – 3 hours	59	22,7
	3 – 4 hours	69	26,5
	4 hours and more	97	37,3
	Total	260	100

According to Table 1, 67.3% (175) of the participating pre-service teachers are female and 37.7% (85) are male. Moreover, 24.2% (63) of pre-service teachers are 1st-year students, 31.2% (81) are 2nd-year students, 16.2% (42) are 3rd-year students, and 28.5% (74) are 4th-year students. Additionally, 2.3% (6) of pre-service teachers reported using the internet for less than 1 hour, 11.2% (29) for 1-2 hours, 22.7% (59) for 2-3 hours, 26.5% (69) for 3-4 hours, and 37.3% (97) for 4 hours and more.

2.2. *Research Ethics Approval*

This research was conducted in accordance with ethical principles based on the approval of the Akdeniz University Rectorate Social and Humanities Scientific Research and Publication Ethics Board dated 20.04.2022 and numbered 157.

2.3. Data Collection Tools

As part of the study, the Digital Citizenship Scale and Digital Literacy Scale were applied to the pre-service teachers in the study group. In addition, information about gender, grade level, and daily internet usage frequency of the pre-service teachers was collected using a demographic information form. Permission was obtained from the creators of the data collection tools identified in the study for the use of the scales.

Digital Citizenship Scale: In the study, the 'Digital Citizenship Scale' developed by Kuş, Güneş, Başarmak, and Yakar (2017) was used to determine the level of digital citizenship of pre-service teachers. The scale consists of eight factors and 49 items, using a five-point Likert-type scale ranging from strongly agree (5), agree (4), neutral (3), disagree (2), to strongly disagree (1) to rate the items. The lowest possible score that can be obtained from the scale is 49, while the highest score is 245. The exploratory factor analysis revealed that the 49-item scale consists of 8 factors. These factors were identified as follows: Factor 1 - Communication (6 items), Factor 2 - Rights and Responsibilities (9 items), Factor 3 - Critical Thinking (7 items), Factor 4 - Participation (5 items), Factor 5 - Security (6 items), Factor 6 - Digital Skills (5 items), Factor 7 - Ethics (4 items), and Factor 8 - Commerce (7 items). The internal consistency of the scale was examined using Cronbach's alpha reliability coefficients. It was determined that the reliability coefficients for each factor ranged from 0.733 to 0.829. Based on the obtained values, it can be seen that the scale is capable of producing reliable measurements.

Digital Literacy Scale developed by Bayrakcı (2020) was used in the study to determine the digital literacy levels of pre-service teachers. The scale consists of 29 items and six factors, with each item rated on a five-point Likert scale: strongly agree (5), agree (4), neutral (3), disagree (2), strongly disagree (1). The exploratory factor analysis revealed that the 29-item scale consists of 6 factors. These factors are determined to be associated with 1- Ethics and responsibility (7 items), 2- General knowledge and functional skills (6 items), 3- Everyday use (6 items), 4- Professional production (2 items), 5- Privacy and security (4 items), 6- Social dimension (4 items). The reliability coefficients for each factor were found to range between 0.719 and 0.875. The Cronbach's Alpha value for the scale was calculated as 0.911, indicating that the scale is reliable and internally consistent.

The data collection tools used in the study were applied to pre-service teachers studying at the Faculty of Education, Akdeniz University, during the 2021-2022 academic year through Google Form.

2.4. Data Analysis

SPSS 22 program was used for data analysis. The digital citizenship and digital literacy levels of pre-service teachers were analyzed using descriptive analysis techniques in the study. Skewness and kurtosis values were calculated to determine whether the dataset exhibited a normal distribution. Based on the obtained values, it was concluded that the skewness coefficient values of the variables were within the range of -1.09 to 1.34, and the kurtosis coefficient values were within the range of -0.49 to 3.95. According to these values, due to the data not following a normal distribution (Büyüköztürk, 2006), non-parametric analysis techniques (Mann Whitney U, Kruskal Wallis) were used.

3. Findings

3.1. Findings Related to the First Sub-Problem

In the context of this study, which examines the relationship between pre-service teachers' digital literacy and digital citizenship levels, the first step involved determining the digital citizenship levels of pre-service teachers. Descriptive statistics regarding pre-service teachers' digital citizenship levels are presented in Table 2.

Table 2. Digital Literacy Levels of Pre-service Teachers

Variable	Average	Standard Deviation	Level
Communication	3,91	0,73	High
Rights and Responsibilities	2,84	0,63	Moderate
Critical Thinking	3,46	0,66	High
Participation	2,86	0,93	Moderate
Security	3,70	0,67	High
Digital Skills	2,20	1,03	Low
Ethics	3,47	0,66	High
Commerce	2,21	0,95	Low
Total Digital Citizenship Score	*3,08*	*0,50*	Moderate

In the scale mean scores obtained within the scope of the research, a five-point scale was used. The group interval coefficient was calculated for the 3 groups determined as low, medium and high in the five-point scale and 1.3 was found (5-1=4, 4/3=1.33). Accordingly, the range of 1.00-2.33 was determined as low, 2.34-3.67 as moderate and 3.68-5.00 as high.

The average total digital citizenship score of pre-service teachers is calculated as 3.08. In other words, the digital citizenship levels of the participating pre-service teachers are at a moderate level. When examined by sub-dimensions, the highest

average is obtained in the "Communication" (3,91) dimension. The lowest average is observed in the "Commerce" (2,21) dimension.

3.2. Findings Related to the Second Sub-Problem

Table 3. The results of the u test regarding the comparison of the scores of the pre-service teachers from the digital citizenship scale according to their gender

	Gender	n	Average Rank.	Total Rank	U	p
Communication	Female	175	141,04	24681,50	5593,500	,001*
	Male	85	108,81	9248,50		
	Total	260				
Rights and Responsibilities	Female	175	131,50	23012,00	7263,000	,758
	Male	85	128,45	10918,00		
	Total	260				
Critical Thinking	Female	175	134,63	23560,50	6714,500	,202
	Male	85	121,99	10369,50		
	Total	260				
Participation	Female	175	124,34	21759,50	6359,500	,057
	Male	85	143,18	12170,50		
	Total	260				
Security	Female	175	135,73	23752,50	6522,500	,106
	Male	85	119,74	10177,50		
	Total	260				
Skills	Female	175	124,45	21779,50	6379,500	,062
	Male	85	142,95	12150,50		
	Total	260				
Ethics	Female	175	128,05	22409,00	7009,000	,447
	Male	85	135,54	11521,00		
	Total	260				
Commerce	Female	175	121,68	21294,50	5894,500	,006*
	Male	85	148,65	12635,50		
	Total	260				
Overall	Female	175	129,84	22721,50	7321,500	,838
	Male	85	131,86	11208,50		
	Total	260				

*$p<0.05$

There was no significant difference in the scores obtained by the study group students from the digital citizenship scale based on gender [U=7321.5; p>.05]. There was no significant difference in the overall digital citizenship levels of pre-service teachers based on their genders. This indicates that there is no significant difference in digital citizenship levels between females and males.

When examined in terms of sub-dimensions, there were significant differences based on gender in the digital communication sub-dimension in favor of females [U=5593.5; p>.05], and in the digital commerce sub-dimension in favor of males

[U=5894.5; p>.05]. However, no statistically significant differences were found based on gender in the other sub-dimensions of the digital citizenship scale.

Table 4. Kruskal Wallis H Test Results for the Differences in Digital Citizenship Scale Scores of the Study Group According to Grade Levels

	Grade	n	Average Rank	x^2	p	Difference U
Communication	1	63	129,32	3,231	,357	-
	2	81	122,97			
	3	42	148,38			
	4	74	129,60			
	Total	260				
Rights and Responsibilities	1	63	137,15	2,524	,471	-
	2	81	121,60			
	3	42	125,08			
	4	74	137,65			
	Total	260				
Critical Thinking	1	63	141,10	4,554	,208	-
	2	81	124,66			
	3	42	113,51			
	4	74	137,51			
	Total	260				
Digital Participation	1	63	134,13	3,087	,378	-
	2	81	118,58			
	3	42	139,17			
	4	74	135,54			
	Total	260				
Digital Security	1	63	145,56	5,388	,145	-
	2	81	134,61			
	3	42	116,85			
	4	74	120,93			
	Total	260				
Digital Skills	1	63	124,25	8,959	,030*	4-1
	2	81	119,46			4-2
	3	42	122,64			
	4	74	152,36			
	Total	260				
Ethics	1	63	150,16	11,641	,009*	1-3
	2	81	137,24			1-4
	3	42	103,42			
	4	74	121,76			
	Total	260				
Digital Commerce	1	63	118,67	7,029	,071	-
	2	81	124,77			
	3	42	125,64			
	4	74	149,60			
	Total	260				
Overall	1	63	134,00	5,385	,146	-
	2	81	117,27			
	3	42	126,00			
	4	74	144,56			
	Total	260				

*p<0.05

The results of the Kruskal-Wallis H test regarding the levels of scores obtained from the digital citizenship scale by students in different grade levels are provided in Table 4. According to the analysis results, there is no significant difference in the levels of scores obtained from the digital citizenship scale by the participants in the study group based on their grade levels [χ^2(sd=3; n=260) = 5.385; p > 0.05].

When examined in terms of sub-dimensions, significant differences were found in the Digital Skills sub-dimension between 4th-grade students and 2nd and 1st-grade students in favor of the 4th-grade students [χ^2(sd=3; n=260) = 8.959; p < 0.05]. Additionally, in the Ethics sub-dimension, significant differences were found between 1st-grade students and 3rd and 4th-grade students in favor of the 1st-grade students [χ^2(sd=3; n=260) = 11.641; p < 0.05]. No statistically significant differences were found in the other sub-dimensions of the digital citizenship scale according to the grade level.

Table 5. Kruskal-Wallis H Test Results for Differences in Scores Obtained from the Digital Citizenship Scale Based on Daily Internet Usage Frequencies of the Study Group

	Daily Internet Usage	n	Average Rank.	x^2	p	Difference U
Communication	Less than 1 hour	6	78,42	14,128	,007*	2-1/2-3/ 2-4/2-5
	1-2 hours	28	172,68			
	2-3 hours	59	135,84			
	3-4 hours	69	125,10			
	4 hours or more	97	120,80			
	Total	259				
Rights and Responsibilities	Less than 1 hour	6	160,75	5,122	,275	-
	1-2 hours	28	105,02			
	2-3 hours	59	125,81			
	3-4 hours	69	131,79			
	4 hours or more	97	136,59			
	Total	259				
Critical Thinking	Less than 1 hour	6	124,83	6,768	,149	-
	1-2 hours	28	162,79			
	2-3 hours	59	119,09			
	3-4 hours	69	127,56			
	4 hours or more	97	129,23			
	Total	259				
Participation	Less than 1 hour	6	202,25	9,015	,061	-
	1-2 hours	28	147,63			
	2-3 hours	59	134,42			
	3-4 hours	69	120,46			
	4 hours or more	97	124,54			
	Total	259				

	Daily Internet Usage	n	Average Rank.	x^2	p	Difference U
Security	Less than 1 hour	6	180,08	9,495	,050	-
	1-2 hours	28	150,79			
	2-3 hours	59	139,54			
	3-4 hours	69	129,42			
	4 hours or more	97	115,51			
	Total	259				
Skills	Less than 1 hour	6	173,33	5,821	,213	-
	1-2 hours	28	144,39			
	2-3 hours	59	138,97			
	3-4 hours	69	118,64			
	4 hours or more	97	125,79			
	Total	259				
Ethics	Less than 1 hour	6	91,92	8,467	,076	-
	1-2 hours	28	155,07			
	2-3 hours	59	124,94			
	3-4 hours	69	141,48			
	4 hours or more	97	120,03			
	Total	259				
Commerce	Less than 1 hour	6	152,75	1,556	,817	-
	1-2 hours	28	132,57			
	2-3 hours	59	126,64			
	3-4 hours	69	123,62			
	4 hours or more	97	134,43			
	Total	259				
Overall	Less than 1 hour	6	180,33	7,106	,130	-
	1-2 hours	28	152,89			
	2-3 hours	59	133,19			
	3-4 hours	69	126,96			
	4 hours or more	97	120,51			
	Total	259				

*$p<0.05$

The results of the Kruskal-Wallis H test regarding the differences in scores on the digital citizenship scale among students with different levels of daily internet usage are presented in Table 5. According to the analysis results, there is no significant difference in the scores that participants in the study obtained from the digital citizenship scale based on their levels of daily internet usage [x^2(sd=4; n=259) = 7.106; $p > 0.05$]. When examined in terms of sub-dimensions, significant differences were found in the Digital Communication sub-dimension between students with a daily internet usage frequency of 1-2 hours and other students, in favor of students with a daily internet usage frequency of 1-2 hours [x^2(sd=4; n=259) = 14.128; $p < 0.05$]. There was no statistically significant difference in terms of daily internet usage frequency in the other sub-dimensions of the Digital Citizenship Scale.

3.3. Findings Related to the Third Sub-Problem

Descriptive statistics regarding pre-service teachers' digital literacy levels are presented in Table 6.

Table 6. Digital Literacy Levels of Pre-Service Teachers

	Average	Standard Deviation	Level
Ethics and Responsibility	3,91	1,09	High
General Knowledge and Functional Skills	3,12	0,98	Moderate
Daily Use	3,64	1,01	High
Professional Production	2,58	1,20	Low
Privacy and Security	3,84	1,10	High
Social Dimension	3,15	0,96	Moderate
Total Digital Literacy Score	*3,48*	*0,78*	*High*

The average score of pre-service teachers' total digital literacy is calculated as 3.48. In other words, the pre-service teachers participating in the study have a high level of digital literacy. When examined in terms of sub-dimensions, the highest average is obtained in the dimension of ethics and responsibility (3,91). The lowest average is observed in the dimension of professional production (2,58).

3.4. Findings Related to the Fourth Sub-Problem

Table 7. Results of the U Test for the Comparison of the Scores Obtained from the Digital Literacy Scale by Gender

	Gender	n	Average Rank	Total Rank.	U	p
Ethics and Responsibility	Female	175	140,40	24570,00	5705,000	,002*
	Male	85	110,12	9360,00		
	Total	260				
General Knowledge and Functional Skills	Female	175	117,67	20593,00	5193,000	,000*
	Male	85	156,91	13337,00		
	Total	260				
Daily Use	Female	175	134,98	23621,00	6654,000	,167
	Male	85	121,28	10309,00		
	Total	260				
Professional Production	Female	175	121,97	21344,50	5944,500	,008*
	Male	85	148,06	12585,50		
	Total	260				
Privacy and Security	Female	175	137,04	23981,50	6293,500	,042*
	Male	85	117,04	9948,50		
	Total	260				
Social Aspect	Female	175	126,27	22097,00	6697,000	,191
	Male	85	139,21	11833,00		
	Total	260				
Overall	Female	175	131,54	23019,50	7255,500	,749
	Male	85	128,36	10910,50		
	Total	260				

*$p<0.05$

There is no significant difference in the digital literacy scores obtained by the study group students based on gender [U=7255.5; p>.05]. There is no significant difference in the overall digital literacy levels between female and male pre-service teachers. This result indicates that there is no significant difference in digital literacy levels between females and males.

Significant differences were found in favor of females in the dimensions of ethical and responsibility [U=5705.0; p<.05] and privacy and security [U=6293.5; p<.05]; while in the dimensions of general knowledge and functional skills [U=5193.0; p<.05] and professional production [U=5944.5; p<.05], males had a significant advantage.

Table 8. Kruskal-Wallis H Test Results for Differences in Scores on the Digital Literacy Scale Based on Daily Internet Usage Frequencies

	Daily Internet Usage	n	Average Rank	x^2	p
Ethics and Responsibility	Less than 1 hour	6	102,17	4,476	,345
	1-2 hours	28	154,63		
	2-3 hours	59	131,51		
	3-4 hours	69	128,94		
	4 hours or more	97	124,45		
	Total	259			
General Knowledge and Functional Skills	Less than 1 hour	6	105,83	1,839	,765
	1-2 hours	28	142,11		
	2-3 hours	59	125,67		
	3-4 hours	69	126,76		
	4 hours or more	97	132,94		
	Total	259			
Daily Use	Less than 1 hour	6	93,83	2,139	,710
	1-2 hours	28	135,68		
	2-3 hours	59	126,48		
	3-4 hours	69	135,75		
	4 hours or more	97	128,65		
	Total	259			
Professional Production	Less than 1 hour	6	167,08	3,954	,412
	1-2 hours	28	114,29		
	2-3 hours	59	126,50		
	3-4 hours	69	126,26		
	4 hours or more	97	137,03		
	Total	259			
Privacy and Security	Less than 1 hour	6	84,92	3,170	,530
	1-2 hours	28	137,63		
	2-3 hours	59	126,19		
	3-4 hours	69	136,07		
	4 hours or more	97	128,59		
	Total	259			

	Daily Internet Usage	n	Average Rank	x^2	p
Social Aspect	Less than 1 hour	6	124,33	1,543	,819
	1-2 hours	28	133,75		
	2-3 hours	59	125,14		
	3-4 hours	69	123,99		
	4 hours or more	97	136,50		
	Total	259			
Overall	Less than 1 hour	6	99,25	2,143	,710
	1-2 hours	28	144,70		
	2-3 hours	59	128,47		
	3-4 hours	69	129,82		
	4 hours or more	97	128,72		
	Total	259			

The results of the Kruskal-Wallis H Test for the differences in scores on the Digital Literacy Scale among students with different daily internet usage frequencies are provided in Table 8. According to the analysis results, there is no significant difference in the scores obtained by the participants in the digital literacy scale based on their daily internet usage frequencies [χ^2(sd=4; n=259) = 2.143; $p > 0.05$]. When examined within the sub-dimensions, there is no statistically significant difference in the scores obtained by the students in the digital literacy scale based on their daily internet usage frequencies.

Table 9. Results of the Kruskal Wallis H test for the differences in the scores obtained from the digital literacy scale among the study group based on their grade levels

	Grade	n	Average Rank	x^2	p	Difference U
Ethics and Responsibility	1	63	136,89	1,362	,715	-
	2	81	126,98			
	3	42	137,20			
	4	74	125,11			
	Total	260				
General Knowledge and Functional Skills	1	63	101,85	13,913	,003*	2-1
	2	81	141,44			4-1
	3	42	126,30			
	4	74	145,30			
	Total	260				
Daily Use	1	63	118,33	2,985	,394	-
	2	81	136,98			
	3	42	139,93			
	4	74	128,41			
	Total	260				
Professional Production	1	63	101,88	18,285	,000*	2-1
	2	81	138,32			4-1
	3	42	118,35			4-3
	4	74	153,20			
	Total	260				

	Grade	n	Average Rank	x^2	p	Difference U
Privacy and Security	1	63	133,29	3,523	,318	-
	2	81	141,00			
	3	42	125,58			
	4	74	119,43			
	Total	260				
Social Aspect	1	63	100,50	14,353	,002*	2-1
	2	81	139,31			3-1
	3	42	131,54			4-1
	4	74	145,81			
	Total	260				
Overall	1	63	118,65	2,540	,468	-
	2	81	138,00			
	3	42	128,24			
	4	74	133,66			
	Total	260				

*p<0.05

The results of the Kruskal Wallis H test for the differences in the scores obtained from the digital literacy scale among students at different grade levels are presented in Table 9.

According to the analysis results, there is no significant difference in the scores obtained from the digital literacy scale among participants in the study group based on their grade levels [x2(sd=3; n=260) = 2.540; p> ,05].

When examined within the sub-dimensions, in the General Knowledge and Functional Skills sub-dimension, there was a significant difference between 1st-grade students and 2nd/4th-grade students, favoring the 1st-grade students [x2(sd=3; n=260) = 13.913; p< ,05]; In the Professional Production sub-dimension, there was a significant difference between 1st-grade students and 2nd/4th-grade students, favoring the 1st-grade students [x2(sd=3; n=260) = 18.285; p< ,05]. Moreover, a significant difference was observed between 3rd-grade students and 4th-grade students, favoring the 3rd-grade students [x2(sd=3; n=260) = 18.285; p< ,05]. Additionally, in the Social Dimension sub-dimension, there was a significant difference between 1st-grade students and 2nd/3rd/4th-grade students, favoring the 1st-grade students [x2(sd=3; n=260) = 14.353; p< ,05]. In the other sub-dimensions of the digital literacy scale, there was no statistically significant difference found based on grade level.

3.5. Findings Related to the Fifth Sub-Problem

Table 10. Results of the Spearman Rank-Order Correlation Test on the Relationship between Students' Digital Citizenship Levels and Digital Literacy Levels in the Study Group

			Digital Citizenship	Digital Literacy
Spearman's rho	Digital Citizenship	Correlation coefficient	1,000	-,111*
		p	.	,074
		N	260	260
	Digital Literacy	Correlation coefficient	-,111*	1,000
		p	,074	.
		N	260	260

*. Correlation is significant at the 0.05 level (1-tailed).

Since the data obtained from the study group did not show a normal distribution, the non-parametric Spearman rank difference correlation test was conducted in order to reveal the level of relationship between the digital citizenship levels and digital literacy levels of the pre-service teachers. According to the test results, it was found that there is a low-level, insignificant, negative correlation between pre-service teachers' digital citizenship levels and digital literacy levels. Based on this finding, it can be interpreted that there is no relationship between the digital citizenship levels and digital literacy levels of the participants in the study group, and these two attributes do not predict each other.

4. Conclusion, Discussion and Recommendations

In this section, the results obtained from the examination of the relationship between pre-service teachers' digital literacy and digital citizenship levels are presented. The conclusions drawn based on these findings and the recommendations developed in line with the results are included in this section.

The research concluded that the level of digital citizenship among pre-service teachers was found to be at a moderate level. When examining the participants' digital citizenship levels based on sub-dimensions, it was determined that they had high levels in communication, critical thinking, security, and ethics dimensions, moderate levels in rights and responsibilities and participation dimensions, and low levels in digital skills and commerce dimensions. This result differs from the findings of Cender and Doğu (2021), who used the same scale in their study. Cender & Doğu (2021) determined that pre-service teachers had high levels of digital citizenship, with the highest values in the dimensions of digital commerce and digital skills, and the lowest values in the dimensions of digital ethics and digital participation. Similarly, studies conducted by Sakallı (2015), Bakır (2016),

Dinlemez (2021), Çolak & Öztürk (2022), and Sevinç, Akyüz & Dönmez (2022) have also reached the conclusion that pre-service teachers have high levels of digital citizenship. However, the findings of this study align with the similar research in the literature. In the study conducted by Baysan and Bayra (2022), they found that pre-service teachers had a moderate level of digital citizenship. Sincar (2010), in his study, concluded that pre-service teachers did not possess the desired awareness level in the sub-dimensions of digital citizenship and were not able to exhibit the required behavioral norms. There are studies that indicate that pre-service teachers' knowledge about digital citizenship and its sub-dimensions is not at the desired level (Görmez, 2016) and that they do not use technologies correctly, which are indicators of digital citizenship (Jwaifell & Alkhales, 2019). In line with the results obtained in this study, it is recommended to conduct comparative studies to determine the digital citizenship levels of pre-service teachers.

In the research, it was determined that there is no significant difference in the levels of digital citizenship of pre-service teachers based on the gender variable. This result is in line with the studies of Çiftçi & Sakallı (2016); Aslan & Çakmak (2018); Aygün (2019); Yaman (2019); Çolak & Öztürk (2022); Sevinç, Akyüz & Dönmez (2022) found in the literature, which also show parallels. However, it differs from the studies of Som-Vural (2016); Kocadağ (2012); Dedebali & Dasdemir (2019); Öztürk (2019); Arcagök (2020); Karasu Avcı, Faiz & Recepoğlu (2021); Baysan & Bayra (2022); and Yılmaz & Doğusoy (2020) that found significant differences in gender's impact on digital literacy. The varying results obtained in studies on the impact of the gender variable on digital citizenship in the literature are noteworthy. Generally, the findings in the literature suggest that gender creates differences in digital citizenship levels. This shows that the result of the study differs from the literature. To uncover the reasons behind this, in-depth research should be conducted on the influence of gender on digital citizenship.

The study found that there was no significant difference in the digital citizenship levels of pre-service teachers based on the variable of grade level. This result is in line with the studies of Çiftçi & Sakallı (2016); Aslan & Çakmak (2018); Yaman (2019); Karasu Avci, Faiz & Recepoğlu (2021); Baysan and Bayra (2022); Çolak and Öztürk (2022), while differing from the findings of Som-Vural (2016) and Yılmaz & Doğusoy (2020), which identified a significant difference in digital literacy based on grade level. The varying results obtained in studies regarding the impact of the grade variable on digital citizenship in the literature are noteworthy.

The study found that there was no significant difference in the digital citizenship levels of pre-service teachers based on the variable of daily internet usage frequency. This result is in parallel with the study of Yaman (2019); Yılmaz & Doğusoy (2020); Çolak ve Öztürk (2022) in the literature, however, it differs from the findings of studies conducted by Çiftçi & Sakallı (2016); Som-Vural (2016); Aslan & Çakmak (2018); Aygün (2019); Öztürk (2019); Karasu Avci, Faiz &

Recepoğlu (2021), which found that the level of daily internet usage frequency significantly affects digital literacy. The findings in the literature generally indicate that the frequency of internet usage has a positive impact on digital citizenship levels. This situation indicates that the results of the study differ from the literature.

In the study, it was determined that the digital literacy levels of pre-service teachers were at a high level. When the participants' digital literacy levels were examined according to sub-dimensions, it was observed that the highest average was in the ethics and responsibility dimension, while the lowest average was in the professional production dimension. In the literature, similar content was used and Çelikkaya & Köşker (2023) found a good level of digital literacy in their study on social studies pre-service teachers, while Örnek (2023) found a high level in his study on science teachers. In other studies, found in the literature aiming to determine digital literacy levels, different results were obtained. According to their levels, Göldağ (2021), Yontar (2019), and Göldağ & Kanat (2018) found that digital literacy levels were at a moderate level. Can, Çelik & Çelik (2020) found that digital literacy levels were at a good level in their study. In the studies of Arslan (2019); Karakuş & Ocak (2019); Kozan & Bulut Özek (2019); Bayrakçı (2020); Kaya (2020); Pala & Başıbüyük (2020); Uyar (2021); Aksoy, Karabay, & Aksoy (2021); Sevinç, Akyüz & Dönmez (2022); and Şahin & Kalkan (2022), it was determined that digital literacy levels were at a high level. This situation can be interpreted as differences in digital literacy levels based on the study group. In order to uncover the reasons behind this, more in-depth research can be conducted, and factors/variables that influence digital literacy can be identified through this process.

In the study, it was determined that there were no significant differences in the digital literacy levels of pre-service teachers based on the gender variable. This result is consistent with the studies of Aslan (2019); Kozan & Bulut Özek (2019); Karakuş & Ocak (2019); Kul (2020); Aksoy, Karabay, & Aksoy (2021); Uyar (2021); Sevinç, Akyüz & Dönmez (2022); Örnek (2023); however, it differs from the studies conducted by Göldağ & Kanat (2018); Özerbaş & Kuralbayeva (2018); Boyacı (2019); Yontar (2019); Bayrakçı (2020); Can, Çelik & Çelik (2020); Pala & Başıbüyük (2020); Göldağ (2021); Şahin & Kalkan (2022); Çelikkaya & Köşker (2023). The variations in findings regarding the impact of gender on digital literacy in the studies conducted in the literature are noteworthy. Generally, the literature demonstrates that gender creates differences in digital literacy levels. This situation indicates a divergence of the study results from the literature. In order to uncover the reasons behind this, in-depth research should be conducted.

In the study, it was determined that there is no significant difference in the digital literacy levels of pre-service teachers based on the variable of daily internet usage frequency. This finding is consistent with the studies conducted by Boyacı (2019) and Aksoy, Karabay & Aksoy (2021) in the literature. However, it differs

from the results obtained by Aslan (2019), Kozan & Bulut Özek (2019), Can, Çelik & Çelik (2020), Kul (2020), Pala & Başıbüyük (2020), and Şahin & Kalkan (2022). The findings in the literature generally indicate that the frequency of internet usage has a positive impact on digital literacy levels. This situation highlights that the results of the current study diverge from the existing literature.

Since the data obtained from the study group did not show a normal distribution, the non-parametric Spearman rank difference correlation test was conducted in order to reveal whether there is a relationship between the digital citizenship levels of the pre-service teachers and their digital literacy levels. According to the test results, a low-level negative and non-significant relationship was found between pre-service teachers' digital citizenship levels and digital literacy levels. Based on these findings, it can be concluded that there is no relationship between the digital citizenship levels and digital literacy levels of the pre-service teachers in the study group, and these two attributes do not predict each other. It should be noted that other studies examining the relationship between digital citizenship levels and digital literacy levels in the literature have obtained different results. For instance, Çolak and Öztürk (2022) found a significant positive relationship between digital citizenship levels and digital literacy levels among social studies pre-service teachers; Sevinç, Akyüz & Dönmez (2022) observed a low but significant positive relationship between digital citizenship levels and digital literacy levels among primary school teachers; Kaya (2020), in a study with secondary school students, identified a moderate and statistically significant positive correlation between digital citizenship scores and digital literacy scores. The studies mentioned in the literature indicate that digital citizenship levels and digital literacy levels predict each other. However, the results obtained in this study diverge from the literature in this aspect.

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