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Investigation of Pre-Service Teachers' Levels of Digital Citizenship, Digital Wisdom, and Digital Fluency

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Abstract

This research aims to examine the levels of pre-service teachers' digital citizenship, digital wisdom, and digital fluency. Data were collected from 841 pre-service teachers studying at a state university. The obtained data were analyzed using t-test, ANOVA, MANOVA, and regression tests. As a result of the research, it is obvious that the digital fluency scores of the male teacher candidates were higher than the gender of the teacher candidates. It is evident that the common effect of the prospective teachers' classes and departments differs significantly from the effect on the digital citizenship and digital wisdom levels. A significant difference was found regarding the joint and class effects of pre-service teachers' digital fluency, digital citizenship, and digital wisdom. According to the results of the regression analysis, it was seen that the digital citizenship of the teacher candidates significantly predicted the digital fluency and digital wisdom variables. At the end of the research, recommendations regarding the findings were made.

Introduction

Today, education is necessary for individuals to integrate into the society they live in and to meet the needs of society and the age. The importance of educating qualified teachers at the beginning of the education process is an undeniable fact (Ünsal, 2021). Teachers' knowledge of content and pedagogy is a part of their cognitive proficiency (Torbeyns et al., 2020). Teacher training enables teachers to use differentiated teaching approaches in classroom practices (Zoraloğlu &Şahin, 2022). Pre-service teachers should work in line with the principles of purposefulness, continuity, integration, consistency, and variability (Teslenko & Sebalo, 2020). A qualified teacher educates the individual as a good person and citizen to the society, and in this direction, increasing the quality of the training given to teachers is a situation that will cyclically affect the quality of education for students (Kozikoğlu & Özcanlı, 2020). Teacher competencies are complementary with their professional knowledge, and the development of teacher education can be achieved by implementing curricula that focus on the pedagogical aspects of education (Nousianinen et al., 2018). In this direction, modern teaching methods and techniques, which are aimed to be gained by teachers, can be provided by training teachers with 21st-century skills. 21st-century skills have provided students the opportunity of experiencing academic and life success in addition to basic skills (Chalkiadaki, 2018). The International Society for Technology in Education (ISTE) has classified 21st-century skills as empowered students, Digital Citizenship (DC), knowledge construction, innovative designers, digital thinkers, creative communicators, and global collaborators (ISTE, 2022).

According to the P 21 framework, the dimensions of 21st-century skills are classified as learning and renewal, information media and technology skills, life, and career skills (P 21, 2019). This classification covers the core skills of 21st-century skills which include learning and innovation, knowledge, media and technology, and life and career skills as the main skills (Gumus et al., 2021; Subasi et al., 2023; Yalçın, 2018). Information and technology literacy is also included among the skills determined from the basic 21st-century skills that teacher candidates should have (Başar, 2018; Ozturk, 2023). "Technology literacy is described as the skill to be used, understood, and managed to evaluate the technology" (ITEA, 2003, p.9). In this direction, it is expected that prospective teachers will be trained as technology-literate individuals (Ayvacı et al., 2019). Since DC, Digital Wisdom (DW), and Digital Fluency (DF) which are the basis of technology literacy, constitute complementary qualities, it was considered necessary to regard them together. The spread of digital technologies has necessitated the wise use of effective tools, and thus the need to be more productive has emerged (Matysek & Tomaszczyk, 2020). It is possible to say that the digital world is becoming more and more inclusive and has led to the emergence of many new concepts. Some of these concepts are DC, DW, and DF. DC is a norm of responsible behavior that includes educational competencies as well as access to technology and skills (Mossberger et al., 2008). Situations such as the sense of belonging to a national community and the use of the same digital environments worldwide in parallel with the understanding of globalization in the world have led to the development of the concept of DC (Çubukçu & Bayzan, 2013). Mark Ribble, one of the first researchers to use the concept of DC, expressed the necessity of being a digital citizen under three themes; respecting, education and communication, and protection principles (Rible et al., 2004). Choi (2016) discussed the basis of the concept of DC as 4 dimensions. These are ethics, media and information literacy, participation, and critical resilience. Thomas (2018) defined a digital citizen as a citizen who can use the internet accurately and effectively, knowing their rights and responsibilities in online environments. Today, a large area of life is carried out through digital environments. For this reason, having the skills required by the digital age has become a necessity without request (Aldemir & Avşar, 2020). Different concepts have emerged with the development of the digital world within the scope of DC. The concept of DW is one of these concepts.

According to Prensky (2012), DW is generally uses technology wisely in the stages of thinking and decision-making in life and shares the results of this situation. Skiba (2010) stated that DW is conceptualized as "the wisdom that results from the use of digital technology to access cognitive power beyond our innate capacity, and the wisdom in the careful use of technology to develop our abilities." According to Guliciuc (2013), digital wise does not mean creatively manipulating technology; in contrast, it means making smarter decisions because the person has developed with technology. DW, which is a complex structure, contains traces of many concepts including digital literacy, digital competence, DF, DC, digital participation, and 21st-century skills (Türk, 2017). Skiba (2010) regards DW as a competency that educators should have; he stated that it is necessary for educators to create richer technology usage standards for themselves, where students can learn and be taught, they can be guided to gain DW, and they can motivate students. In this context, it is stated that using technology wisely to increase the quality of education in professional learning and teaching environments, and the enhancement of "DW" by trainers can be achieved by the integration of technological pedagogical content knowledge (Blau et al., 2016). According to Sadiku et al., (2017), educational institutions should integrate DW into 21st-century curricula so that education can maintain its validity in the digital age. The significance of DW that can continue throughout

life has revealed the necessity of DF in individuals.

The concept of DF has also been put forward as a concept that reveals the requirements of the digital world. The effect of lifelong learning in a digital environment can be described by the concept of DF. Demir (2018) defined DF as having experience in information and communication technologies, using these technologies effectively and efficiently, thinking critically and producing solutions to problems, thinking abstractly about these technologies, keeping up with technological changes and transformations, and using information communication technologies for different purposes. Özer (2022) stated that DF is a competency that requires being active with technology adaptation to realize lifelong learning. Chigona (2018) stated that being digital fluent is more than having the technological ability to use digital tools. These definitions show that the basis of technological fluency is the effective use of life-long technology. In this direction, teachers need more training and investment to reach DF (Dias Trindade & Ferreira, 2020). Additionally, pedagogical approaches emphasizing DF should be undertaken to reduce technical skill gaps between instructors and students (Le & Pole, 2022). The necessity of laying the foundations of the use of technology, which will continue throughout life, with the right education should also be our priority in teacher training.

In the literature, Dias Trindade and Ferreira (2020) stated that the DF of teachers is not at a sufficient level. According to Chigona (2018), teachers' DF skills are not sufficient to effectively teach 21st-century students. Fulgence (2020) emphasized that educators should improve their DF in accordance with the age and that development programs should be organized on these deficiencies. Demir and Odabaşı (2022) stated that pre-service teachers have a high level of DF. Blau et al., (2016) state in their study that the differences in the digital work done by the teachers positively change their DW. Türk (2017) evaluated the DW of teacher candidates to different variables and found that there was a positive relationship in terms of variables such as digital literacy and technology use. In the study of Kaya and Kaya (2014), it was seen that most teacher candidates are unfamiliar with the concept of DC. In the study of Yılmaz and Doğusoy (2020), it was concluded that the DC levels of prospective teachers are at a high level and differ according to the variable of internet use. In his study, Kabataş (2019) concluded that pre-service teachers' perceptions of DC are positive. Türk (2017) states that DW is at the center of many concepts that emerged in the digital world with the development of technology and that traces of many concepts including DF, DC, and 21st-century skills.

The studies examined in the literature demonstrate that there are variables such as gender, class level, department, and internet usage times that affect DC, DW, and DF. For this reason, in this study, it was thought that the independent variables might have effects on the defined dependent variables and would contribute to the literature. It is foreseen that discussing the concepts of digital citizenship, digital wisdom, and digital fluency together on the integration of technology in education will make significant contributions to the literature. In this context, sub-problems were determined in the study with the thought DC, DW, and DF levels of teacher candidates can be effective together with the independent variables discussed. In this context, in this study, DC, DW, and DF levels of teacher candidates were examined. When the literature is investigated, any research has not been found in which DC, DW, and DF are discussed together. For this reason, it is evident that the data obtained from the study will benefit to literature.

Research Problem

What are pre-service teachers' levels of DC, DW, and DF?

Sub-problems

1. Do pre-service teachers' levels of DC, DW, and DF differ by gender?
2. Do pre-service teachers' levels of DC, DW, and DF differ significantly by class and department?
3. Do pre-service teachers' levels of DC, DW, and DF differ according to gender and department variables?
4. Do pre-service teachers' levels of DC, DW, and DF differ significantly according to the department and duration of internet use?
5. Do pre-service teachers' DC, DW, and DF levels differ according to the common effect of gender and department variables?
6. Do pre-service teachers' levels of DC, DW, and DF differ according to the common influence of their departments and classes?
7. Do pre-service teachers' DC levels predict their DF and DW levels?

Method

Research Design

In this study, it was purposed to analyze the levels of DC, DW, and DF of teacher candidates. For this reason, one of the quantitative research designs, the cross-sectional survey model was used. Survey research is a quantitative research design in which information is collected by applying it to the sample group or to the whole universe to measure the attitudes, behavior, views, or characteristics of the determined population (Creswell, 2012/2020). The survey model is a research method used to describe a phenomenon and obtain information about this phenomenon (Özdemir, 2014). The cross-sectional survey model is used to describe the characteristics of a phenomenon at any time. According to Creswell (2012/2020), survey researchers conduct cross-sectional research to investigate a phenomenon in terms of current attitudes, opinions, or beliefs. Cross-sectional studies are generally large-scale studies that involve investigating characteristics such as behavior, attitude, and developmental characteristics of groups with countless samples or different characteristics (Büyüköztürk et al., 2016).

Study Group

Students from seven different departments in an education faculty in Amasya in the fall semester of the 2022–2023 academic term consist of the study group of the research. In the determination of the study group, the sample group was chosen with the convenient sampling method, which is one of the non-random sampling methods. The convenient sampling method means collecting data from a sample group that the researcher can easily contact, minimizing the time, money, and labor loss of the researcher (Büyüköztürk et al., 2016:92). The convenient sampling method is a method that accelerates the research in cases where the researcher does not have the chance to use different samples and because he/she chooses sampling from an easy-to-access situation (Kılıç, 2013). The

distribution of this study group in terms of department, class level, and gender is summarized in Table 1. As shown in Table 1, 841 pre-service teachers attended in this study, and the participants consisted of 641 female and 200 male pre-service teachers. In total, there are 239 1st-grade, 230 2nd-grade, 209 3rd grade, and 163 4th-grade teacher candidates. The participants consisted of 112 Turkish teacher candidates, 135 Social Studies teacher candidates, 113 Pre-School, 113 Classroom, 145 Mathematics, 80 Science and 143 PCG teacher candidates.

Table 1. Distribution of Participants by Department, Class, and Gender

		Department							
		Turkish	Social Sciences	Pre-school	Class	Math	Science	PCG	Total
Grade	1st grade	35	35	37	36	30	28	38	239
	2nd grade	22	33	45	16	45	25	44	230
	3rd grade	34	40	9	40	40	12	34	209
	4th grade	21	27	22	21	30	15	27	163
	Total	112	135	113	113	145	80	143	841
Gender	Female	82	100	96	83	108	66	106	641
	Male	30	35	17	30	37	14	37	200
	Total	112	135	113	113	145	80	143	841

Data Collection Tools

Digital Citizenship Scale

In this research, the DC scale adapted by Erdem and Koçyiğit (2019) will be used to measure prospective teachers' DC levels. The DC scale, which consists of 18 items, consists of 5 factors. These factors are Political activism on the Internet (6 items), technical skills (4 items), local/global awareness (2 items), critical perspective (3 items), and network effectiveness (3 items). In the analysis, the fit indices were checked. First, the ratio of degrees of freedom (125) to chi-square (252.17) indicates a good fit ($\chi 2/df=2.01$). Other fit indices and cutoff values: Goodness of Fit Index (GFI: .99), Adjusted Goodness of Fit Index (AGFI: .98), Normed Goodness of Fit Index (NFI: .83), Mean Squared Error of Approximation (RMSEA: .061), and Standardized Mean Root Residue Squared (SRMR: .046) and Parsimony Norm Fit Index (PNFI: .68) were found within acceptable values. The Cronbach alpha values of the factors are $\alpha=.86$ for political activism on the internet, $\alpha=.93$ for technical skills, $\alpha=.83$ for local/global awareness, $\alpha=.61$ for critical perspective, and $\alpha=.87$ for network activity. The Cronbach alpha value of the scale is $\alpha=.87$. Within the framework of the data collected within the scope of this research, the Cronbach alpha value of the scale was found to be $\alpha=.84$.

Digital Wisdom Scale

In this research, the 31-item DW scale developed by Türk (2017) will be used to measure the DW levels of prospective teachers. The data collection tool consists of 31 items and 3 factors. These factors are thinking and decision-making (16 items), social sensitivity (11 items), and sharing (4 items). Confirmatory factor analysis was

applied to test the confirmability of the model created by confirmatory factor analysis. The χ2/sd ratio is 2.77 in the model created. The RMSEA value is .08 observed in DFA. The SRMR value was .06. The NFI value was 0.93 and the NNFI value is 0.95. The CFI value is 0.95. The GFI is 0.74. The AGFI value was 0.71. It can be revealed that the model put forward by using CFA has a good fit according to different fit indices. It is evident that Thinking and Decision Making=.93; Social Sensitivity=.90; Sharing = .83 considering the internal consistency coefficients of the data collection tool. The internal consistency coefficient of the overall data collection tool was .95. We observed that the data collection tool developed in line with these values could measure the DW efficacy perceptions of teacher candidates. The Cronbach alpha value of the scale was found to be α=.94 within the framework of the data collected under the scope of this research

Digital Fluency Scale

In this research, the DF scale consisting of three factors and 29 items developed by Demir (2018) will be used to measure the DF of prospective teachers. Factor loadings in the scale are in the range of 0.824–0.492. The explained variance values of the factors were 38.349 for the awareness factor, 9.596 for self-efficacy factor, and 6.705 for the affective factor. The overall internal consistency coefficient of the scale was found to be .923, and in line with this value, the scale can be accepted as reliable. The scale consisted of three factors. Awareness factor (14 items), self-efficacy factor (11 items), and affective factor (4 items). The first factor (αAwareness=.922), the second factor (αSelf-efficacy=.910), and the third factor (αAffective=.804). The internal consistency coefficients of these three factors were found to be within the specified ranges and to be reliable. When the fit indices of the model tested with Confirmatory Factor Analysis were examined, the square value ($\chi 2=189.10$, df=371, $p<0.001$) was found to be moderately significant. Other fit values of the developed model were found to be $\chi 2/df = 3.20$, RMSEA=0.09, SRMR=0.08, CFI=0.93, NFI= 0.90, NNFI= 0.92 GFI=0.78, and AGFI=0.74. It is seen that these values are in the range of values close to the acceptable and should be valued. The Cronbach alpha value of the scale was found to be α=.86 within the framework of the data collected within the scope of this research.

Data Analysis

Before starting the analysis of the data, 943 data were obtained. The Z values of the obtained data were examined, and 101 data determined as extreme values were excluded from the study. Normality tests were performed on the remaining 842 data. Since the sample size (n=842) was greater than 50, the Kolmogorov-Smirnov test was examined. According to the analysis, it was found that while the normal distribution was provided for the DF scale, the normal distribution was not provided for the DC and DW scales. (Tabachnick and Fidell, 2013). Analyses of data according to research problems were made using descriptive statistics T-test, ANOVA (2x2 two-factor design), MANOVA (multivariate analysis of variance), and Multiple Linear Regression tests. Before the tests, it was checked whether the assumptions were met. For this purpose, the homogeneity of the variances was checked for each test using Levene tests, and it was seen that the homogeneity of the variances was achieved ($p>0.05$). Mahalanobis distance values were examined, and data with 17,309 extreme values were deleted from the data (Çokluk et al., 2021: 29,). The analysis continued with 841 data to test the multivariate normality assumptions of the data. To decide the homogeneity of the variance-covariance matrices, which is another

assumption, it was determined that the values in the Box's test results were not statistically significant (p>0.05) and it was concluded that the homogeneity of the variance-covariance matrices was achieved (Pallant, 2005). In line with these values, it was seen that the assumptions of the analysis determined for the sub-problems were met. These analyses are detailed in the findings section.

Findings

The findings obtained in this study are given below. t-test results of pre-service teachers' DF, DC, and DW levels according to their gender are shown in Table 2. When the t-test results of pre-service teachers' DF, DC, and DW levels are examined in Table 2, there is a significant difference in DF to their gender (t(2–839)=5.03, p<.01). DF scores of male prospective teachers ($\bar{X}$=3.67) are higher than female teacher candidates ($\bar{X}$=3.49). Accordingly, it is evident that gender influences pre-service teachers' DF levels. The calculated value of η2 was .04. Accordingly, it can be stated that approximately 4% of the variance observed in DF scores is related to gender. However, although there was not any significant difference in DC levels of teacher candidates according to gender, they were rejected at the border (p=.07), and there was no significant difference in DW scores according to gender. Accordingly, it is clear that gender does not influence pre-service teachers' levels of DC and DW.

Table 2**.** DF, DC, and DW Levels of Pre-service Teachers by Gender

	Gender	N	$\bar{X}$	S	sd	t	p
DF	Female	641	3.4907	.44991	839	5.032	.000
	Male	200	3.6712	.41936			
DC	Female	641	4.3105	.85570	839	1.769	.077
	Male	200	4.4336	.86896			
DW	Female	641	5.0036	.89763	839	.279	.781
	Male	200	4.9835	.86463			

A two-way ANOVA test was conducted for the effect of teacher candidates' classrooms and departments on their DC levels. ANOVA analysis results are given in Table 3.

Table 3. Effect of Classes and Programs on DC Levels

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	58.882[a]	27	2.181	3.153	.000	.095
Intercept	13337.859	1	13337.859	19283.908	.000	.960
Program	25.811	6	4.302	6.220	.000	.044
Class	7.471	3	2.490	3.601	.013	.013
Program*Class	30.634	18	1.702	2.461	.001	.052
Error	562.318	813	.692			
Total	16460.531	841				

In Table 3, it was seen that the effect of the common effect of the prospective teachers' classes and departments on their DC levels differed significantly (F (18,813) =2,461, p<0,05), and the Partial eta 2 value (ηp 2=,052) was moderate. Since the variances were homogeneously distributed, it was seen that the difference was between the social studies and mathematics teaching departments and classroom and mathematics teaching departments according to the results of the Tukey test, which was made to determine between the departments and classes. Additionally, it was concluded that there was a significant difference between the 1st and 4th grades. It was found that there is a significant difference between the departments and grade levels in the levels of DC in the joint effect of the teacher candidates' classes and departments. A Two-Way ANOVA test was conducted on the effect of teacher candidates' classrooms and departments on their DW levels. ANOVA test results are given in Table 4.

Table 4. Effect of Classes and Departments to DW Levels

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta - Squared
Corrected Model	63.772[a]	27	2.362	3.197	.000	.096
Intercept	17946.141	1	17946.141	24287.459	.000	.968
Program	21.825	6	3.638	4.923	.000	.035
Class	4.028	3	1.343	1.817	.142	.007
Program* Class	40.301	18	2.239	3.030	.000	.063
Error	600.730	813	.739			
Total	21679.862	841				

In Table 4, it was seen that the common effect of the prospective teachers' classes and departments on their DW levels differed significantly F(18,813)=3.030, p<0.05. A partial eta 2 value (ηp 2=.063) was found to be moderate. As the variances were homogeneously distributed, according to the results of the Tukey test, which was conducted to determine between which departments and classes the difference was, it was seen that there was a significant difference between Social Studies and Preschool teachers, Social Studies and PCG teachers, Preschool and Science teachers, and Science and PCG teaching departments. According to this, it was concluded that there is a significant difference between the departments and classes in the levels of DW in the joint effect of the pre-service teachers' classes and departments. Table 5 summarizes the findings regarding the effect of teacher candidates' classes and departments on their DF levels.

Table 5. Effects of Classes and Departments on DF Levels

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta - Squared
Corrected Model	7.519[a]	27	.278	1.398	.087	.044
Intercept	8920.230	1	8920.230	44768.233	.000	.982
Class	1.175	3	.392	1.966	.118	.007
Program	2.939	6	.490	2.459	.023	.018
Class * Program	3.105	18	.172	.866	.621	.019
Error	161.993	813	.199			
Total	10670.766	841				

In Table 5, it was seen that the common effect of the prospective teachers' classes and departments on their DF levels was not significant. F(18,813)=,866, p>0.05. A partial eta 2 value (ηp 2=,019) was found to be low. According to these results, it was concluded that the common effect of the prospective teachers' classes and departments was not effective on their DF levels. Table 6 summarizes the findings related to the effect of pre-service teachers' gender and departments on their DF levels.

Table 6. The Effect of Gender and Departments on DF Levels

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta - Squared
Corrected Model	10.759[a]	13	.828	4.311	.000	.063
Intercept	7004.946	1	7004.946	36491.096	.000	.978
Gender	4.094	1	4.094	21.326	.000	.025
Program	1.473	6	.246	1.279	.264	.009
Gender*program	1.829	6	.305	1.588	.148	.011
Error	158.754	827	.192			
Total	10670.766	841				

In Table 6, it was seen that the common effect of pre-service teachers' gender and departments was not significant on their DF levels. F (6,827)=1.588, p>0.05. A partial eta 2 value (ηp 2=,011) was found to be at a low level. According to these results, it was seen that the common effect of the gender and departments of the pre-service teachers was not at a significant level on the DF levels. Table 7 summarizes the findings regarding the effects of pre-service teachers' gender and department on their DC levels.

Table 7. Effect of Gender and Departments on DC Levels

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta - Squared
Corrected Model	30.334[a]	13	2.333	3.266	.000	.049
Intercept	10512.242	1	10512.242	14713.367	.000	.947
Gender	2.777	1	2.777	3.887	.049	.005
Program	17.176	6	2.863	4.007	.001	.028
Gender * program	7.171	6	1.195	1.673	.125	.012
Error	590.866	827	.714			
Total	16460.531	841				

In Table 7, it was seen that the common effect of the gender and departments of the pre-service teachers did not have a significant effect on their DC levels. F(6,827)=1,673, p>0.05. A partial eta 2 value (ηp 2=.012) was found to be small. According to these results, it was seen that the common effect of the gender and departments of the pre-service teachers was not at a significant level on the levels of DC. Table 8 summarizes the findings regarding the effects of pre-service teachers' gender and departments on their DW levels.

Table 8. Effect of Gender and Department on DW Levels

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta - Squared
Corrected Model	24.169[a]	13	1.859	2.401	.004	.036
Intercept	13667.020	1	13667.020	17651.162	.000	.955
Gender	.243	1	.243	.314	.576	.000
Program	15.467	6	2.578	3.329	.003	.024
Gender * Program	3.728	6	.621	.802	.568	.006
Error	640.333	827	.774			
Total	21679.862	841				

In Table 8, it is evident that the common effect of gender and departments of teacher candidates on DW levels was not significant. F(6,827)=.774, p>0.05. A partial eta 2 value (ηp 2=,006) was found to be low. According to these results, it was seen that the common effect of gender and departments of prospective teachers was not at a significant level on their DW levels. Table 9 summarizes the findings on the effect of pre-service teachers' department and internet usage time on their DF.

Table 9. Effect of Department and Internet Use Periods on DF Levels

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta - Squared
Corrected Model	5.545[a]	20	.277	1.385	.121	.033
Intercept	8469.341	1	8469.341	42320.726	.000	.981
Program	3.125	6	.521	2.602	.017	.019
Internet Usage Time	.418	2	.209	1.044	.352	.003
Program *Internet Usage Time	1.632	12	.136	.680	.772	.010
Error	163.901	819	.200			
Total	10660.034	840				

Table 9 shows that the joint effect of the pre-service teachers' department and internet usage time on their DF levels was not significant. F (12,819)=.680, p>0.05. A partial eta 2 value (ηp 2=.010) was found to be low. According to these results, the common effect of pre-service teachers' departments and internet usage time was not significant on their DF levels. Table 10 summarizes the findings regarding the effect of pre-service teachers' department and internet usage duration on their DC.

In Table 10, it was seen that the common effect of the pre-service teachers' department and internet usage durations on the DC levels was not at a significant level. F(12,819)=.707, p>0.05. A partial eta 2 value (ηp 2=.024) was found to be small. According to these results, it was seen that the common effect of teacher candidates' departments and duration of internet use was not at a significant level on their DC levels.

Table 10. Effect of Department and Internet Use Periods on DC Levels

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta - Squared
Corrected Model	40.150[a]	20	2.007	2.841	.000	.065
Intercept	12756.418	1	12756.418	18050.986	.000	.957
Program	25.082	6	4.180	5.915	.000	.042
Internet Usage Time	4.895	2	2.448	3.463	.032	.008
Program *Internet Usage Time	14.385	12	1.199	1.696	.063	.024
Error	578.778	819	.707			
Total	16452.503	840				

Table 11 summarizes the findings regarding the effect of pre-service teachers' department and internet usage time on their DW.

Table 11. Effect of Department and Internet Usage Periods on their DW Levels

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta - Squared
Corrected Model	27.780[a]	20	1.389	1.789	.018	.042
Intercept	17032.652	1	17032.652	21936.747	.000	.964
Program	18.953	6	3.159	4.068	.000	.029
Internet Usage Time	1.599	2	.800	1.030	.358	.003
Program * Internet Usage Time	5.983	12	.499	.642	.807	.009
Error	635.908	819	.776			
Total	21663.078	840				

In Table 11, it was seen that the joint effect of the pre-service teachers' department and internet usage time on the DW levels was not at a significant level F(12,819)=,776, p>0.05. A partial eta 2 value (ηp 2=.009) was found to be small. According to these results, it was seen that the common effect of the pre-service teachers' departments and the duration of internet use was not at a significant level on the levels of DW. A Two-Way MANOVA analysis was conducted on the common effect of pre-service teachers' DF, DC, and DW's departments and Gender. MANOVA analysis results are given in Table 12.

Table 12. Common Impact of DF, DC, and DW on their Departments and Genders

Effect	Wilks's Lambda	F	Hypothesis df	Error df	Sig.	Partial Eta - Squared
Gender	.958	12.068[b]	3.000	825.000	.000	.042
Program	.946	2.551	18.000	2333.938	.000	.018
Gender*Program	.975	1.188	18.000	2333.938	.261	.009

When the MANOVA test results are examined in Table 12, the effect of DF, DC, and DW variables according to Wilks' Lambda values was found to be significant at the 0.05 level according to Gender and Programs ($p<0.05$). There was no significant difference according to the joint effect of gender and program ($p>0.05$). According to the Levene test results, it was observed that the DF, DC, and DW variances were equally distributed ($p>0.05$). The comparison of pre-service teachers' levels of DF, DC and DW according to gender, program and gender program interactions are shown in Table 13.

Table 13. Comparison of Levels of DF, DC and DW to Gender, Program and Gender *Program Interaction Separately

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta - Squared
Gender	Average of DF	4.094	1	4.094	21.326	.000	.025
	Average of DC	2.777	1	2.777	3.887	.049	.005
	Average of DW	.243	1	.243	.314	.576	.000
Program	Average of DF	1.473	6	.246	1.279	.264	.009
	Average of DC	17.176	6	2.863	4.007	.001	.028
	Average of DW	15.467	6	2.578	3.329	.003	.024
Gender*Program	Average of DF	1.829	6	.305	1.588	.148	.011
	Average of DC	7.171	6	1.195	1.673	.125	.012
	Average of DW	3.728	6	.621	.802	.568	.006
Error	Average of DF	158.754	827	.192			
	Average of DC	590.866	827	.714			
	Average of DW	640.333	827	.774			
Total	Average of DF	10670.766	841				
	Average of DC	16460.531	841				
	Average of DW	21679.862	841				

According to the gender variable in Table 13, DF p=.000; DC p=.049; and DW were found to be p=.576. As a result of this, a significant difference was found in the DF and DC variables according to gender ($p<0.05$). DF by program variable p=.264; DC p=.001; DW was found to be p=.003. As a result of this test, a significant difference was found in the DC and DW variables according to the programs ($p<0.05$). Due to the joint effect of gender and program, DF p=.148; DC p=.125; DW was found to be p=.568. It was observed that there was no significant difference depending on the joint effect of gender and program ($p>0.05$). The source of the difference was attempted be found with the Post Hoc tests conducted to find the source of the significant differences in the gender and program variables. According to the results of the Tukey test, between Turkish and Social Studies teaching in the DF variable; In the DC variable, between Social Studies and Mathematics teaching, Classroom and Mathematics teaching; In the DW variable, it was determined that there was a significant difference between Social Studies and Preschool teachers, Social Studies and PCG teachers, Preschool and Science teachers, Science - PCG teachers, PCG, and Turkish teaching. Table 14 summarizes the findings regarding the effect of pre-service teachers' DF, DC, and DW on their Programs and classes.

Table 14. The Joint Impact of DF, DC, and DW on their Programs and Classes

Effect	Wilks' Lambda	F	Hypothesis df	Error df	Sig.	Partial Eta - Squared
Program	.920	3.837	18.000	2294.340	.000	.028
Class	.961	3.642	9.000	1973.912	.000	.013
Program*Class	.874	2.063	54.000	2417.276	.000	.044

When the MANOVA test results in Table 14 were examined, it was found to be significant at the 0.05 level according to the Programs, Classes and Program*Class joint effect of the DF, DC, and DW variables according to Wilks' Lambda values ($p<0.05$). In Table 15, the findings regarding the comparison of the levels of DF, DC and DW of pre-service teachers according to program, class and program class interaction are summarized.

Table 15. Comparison of Levels of DF, DC, and DW According to Program, Class, and Program*Class Interaction Separately

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta - Squared
Program	Average of DF	2.939	6	.490	2.459	.023	.018
	Average of DC	25.811	6	4.302	6.220	.000	.044
	Average of DW	21.825	6	3.638	4.923	.000	.035
Class	Average of DF	1.175	3	.392	1.966	.118	.007
	Average of DC	7.471	3	2.490	3.601	.013	.013
	Average of DW	4.028	3	1.343	1.817	.142	.007
Program * Class	Average of DF	3.105	18	.172	.866	.621	.019
	Average of DC	30.634	18	1.702	2.461	.001	.052
	Average of DW	40.301	18	2.239	3.030	.000	.063
Error	Average of DF	161.993	813	.199			
	Average of DC	562.318	813	.692			
	Average of DW	600.730	813	.739			
Total	Average of DF	10670.766	841				
	Average of DC	16460.531	841				
	Average of DW	21679.862	841				

According to the Program variable in Table 15, DF p=,023; DC p=.000; DW was found to be p=0.000. As a result of this test, a significant difference was found in the variables of DF, DC, and DW according to the programs ($p<0.05$). According to the Class variable, DF p=,118; DC p=.013; DW was found to be p=.142. As a result of this test, there was a significant difference in the DC variable according to classes ($p<0.05$); There was no significant difference in the DF and DW variables ($p>0.05$). While there was no significant difference in the DF variable depending on the common effect of Program and Class ($p>0.05$); a significant difference was found in the DC and DW variables ($p<0.05$). The source of the difference was attempted to be found with the Post Hoc tests conducted to find the source of the significant differences in the program and class variables. According to

the results of the Tukey test, according to the DF variable according to the programs, between Turkish and Social Studies Teaching Programs; In the DC variable, between Social Studies and Mathematics Teaching Programs, Class and Mathematics Teaching Programs; In the DW variable, it was seen that there was a significant difference between Social Studies and Preschool Teaching Programs, Social Studies and PCG Teaching Programs, Preschool and Science Teaching Programs, Mathematics and Science Teaching Programs, Science and PCG Teaching Programs. As a result of the Tukey test, it was evident that there was a significant difference between the 1st and 4th classes in the DC by class variable. A multiple regression analysis test was conducted to predict pre-service teachers' DC predicts their DF and DW. The findings regarding the regression analysis are given in Table 16.

Table 16. Analysis Results on Predictions of DCs on their DF and DW

Variance	B	Standard Error $_B$	β	t	p	Double r	Partial R
Constant	1.149	.202		5.681	.000		
DF	.249	.063	.130	3.941	.000	.366	.135
DW	.462	.032	.478	14.446	.000	.542	.447
R=.554	R^2=.307						
$F_{(2,838)}$=5.922	p=.000						

When the bilateral and partial correlations between the predictor variables and the dependent variable are examined in Table 16, it is seen that there is a positive moderate (r=.366) relationship between DC and DF, and when the other variable is controlled, the correlation between the two variables is calculated as r=.13. When the bilateral and partial correlations are examined, it is seen that there is a positive moderate (r=.542) relationship between DC and DW, and when the other variable is controlled, the correlation between the two variables is calculated as r=.45. DF and DW variables together provide a moderate and significant relationship with pre-service teachers' DC scores R=.554, R2=.307, p<.01. Together, these two variables explain approximately 37% of the total variance in DC. According to the standardized regression coefficient (β), the significance of the predictor variables on DC is equal. When the t-test results regarding the significance of the regression coefficients are examined, it is seen that two variables are significant predictors of DC. The regression equation (mathematical model) for predicting DC according to the results of the regression analysis is given below:

DC=1.149+.249 DF+.462 DW

In summary, the results of the analysis show that according to Gender, the DF scores of male pre-service teachers were higher than that of female pre-service teachers, but there was no significant difference in DC and DW scores compared with Gender. It has been observed that the common effect of the teacher candidates' Classes and Programs differs significantly from the effect on the DC and DW levels. However, it was observed that the common effect of the teacher candidates' Classes and Programs on their DF levels did not differ significantly. It was seen that the common effect of Gender and Programs of teacher candidates on DF, DC, and DW levels was not at a significant level. We observed that the common effect of the program and Internet usage durations of the pre-service teachers on the levels of DF, DC, and DW was not at a significant level. While it was seen that there was no significant difference in the Two-Way Manova analysis regarding the joint effect of the Program and

Genders of DF, DC, and DW of the pre-service teachers, a significant difference was found in the DF and DC variables according to Gender, and a significant difference was found in the DC and DW variables according to the Program variable. A significant difference was found regarding the joint effect of pre-service teachers' DF, DC, and DW in Program and Class. According to the results of the multiple regression analysis, when the results of the DC of pre-service teachers are examined by the variables of DF and DW, it is seen that DF and DW are a significant predictor of their DC levels.

Discussion and Conclusion

It was tested whether the pre-service teachers' Digital Citizenship, Digital Fluency and Digital Wisdom differ according to the gender variable. It was concluded that the DF scores of the pre-service teachers were higher than the male pre-service teachers, but there was no significant difference in the DC and DW scores compared to the Gender. Accordingly, it can be said that gender has a significant but small effect on pre-service teachers' levels of DF but does not have a significant effect on the levels of DC and DW. When the studies in the literature are searched, the levels of DF, DC and DW are not considered together. However, when the studies on DF are examined, the Demir (2018) revealed that there is a statistically significant difference in the DF of male teacher candidates. Çukurbaşı and İşman (2014) stated that the DF of male teacher candidates is higher than the DF of female teacher candidates. However, Chou and Chiu (2020) in their study on pre-adolescent students concluded that female students' DF is better than male students. In parallel to these results, studies by Wang et al., (2013) stated that there is a relationship between DF and Gender. The results of the research conducted by Parahita (2017) demonstrate that there is no significant difference between Gender and DF. In their studies, Vural Som and Kurt (2018); Aygün (2019); Arcagök (2020); Yıldız et al. (2020); Yılmaz and Doğusoy (2020); Karasu Avcı et al. (2021); have revealed that there is a significant difference in terms of DC and gender of pre-service teachers. They also revealed in most of their studies that there is a significant difference for male prospective teachers. Türk (2017) concluded in his study on pre-service teachers' perceptions of DW competence that there is no difference in DW competences in terms of Genders of pre-service teachers. When the literature on DC is examined, Ono and Zavodny (2007); Çiftçi and Sakallı (2016); Aslan and Çakmak (2018); Dedebali and Daşdemir (2019); Erdem and Koçyiğit (2019); found that there was no significant difference in terms of Gender in the DC levels of teacher candidates. When the relevant literature is examined, it is seen that there are studies on the development of the DF of students (Bologa et al. 2009; Dias-Trindade & Ferreira 2020; Fulgence 2020; Le & Pole, 2022; Shiring, 2022). These findings and the findings of this study show that there are significant differences for gender in terms of DF, DC, and DW levels related to the gender variable.

When examining whether the pre-service teachers' levels of DC, DW, and DF differ significantly according to Class and Programs, it was observed that the common effect of the pre-service teachers' Class and Programs differed significantly from the effect on the DC and DW levels. In the literature, there is evidence that the levels of DW, DF, and DC differ according to the Programs that pre-service teachers study. (Türk, 2017; Demir, 2018; Yılmaz & Doğusoy, 2020). However, Vural Som and Kurt (2018); Erdem and Koçyiğit (2019); Yıldız et al., (2020); In their studies concluded that there is no differentiation in the level of DC between programs or faculties. When the literature is examined, it is found that different results have been reached in the research findings on the

effect of Classes and Programs on DC, DW, and DF. It is thought that the differentiation of the courses in the programs studied and the effect of maturation according to the Class levels may cause differences in the levels of DC, DW, and DF according to Class and Programs.

We observed that the joint effect of the program and internet usage durations of the teacher candidates on the levels of DF, DC, and DW was not significant. When the relevant literature is examined, any research has not been found on the joint effect of the program and internet usage times. However, Türk (2017); Dere and Yavuzay (2019); Erdem and Koçyiğit, (2019); concluded that there was no significant difference in the levels of DW, DF, and DW according to the frequency of internet use. However, İşman and Güngören (2013), Çiftçi and Sakallı (2016), Aslan and Çakmak (2018), Vural Som and Kurt (2018), Yılmaz and Doğusoy (2020), Yıldız et al., (2020), Karasu Avcı, et al., (2021) and Shi et al., (2022) in their studies concluded that there is a significant difference in the levels of DW, DF and DW in terms of computer or internet usage time. When the literature is examined, it is clear that different results have been reached in the levels of DF, DC, and DW according to the program and internet usage status. It is thought that these results may be due to studies conducted at different times, between different universities and programs. While there was no significant difference in the Two-Way Manova analysis regarding the joint effect of the Programs and Genders of Pre-service Teachers' DF, DC, and DW, according to Gender, a significant difference was found in the DF and DC variables, and a significant difference was found in the DC and DW variables according to the Program variable. A significant difference was found regarding the joint effect of pre-service teachers' DF, DC, and DW in Program and Class. When the relevant literature is examined, there aren't any study to investigate the common effects of demographic variables. However, in studies where demographic variables are examined one by one, Çiftçi and Sakallı (2016), Aslan and Çakmak (2018), Yılmaz and Doğusoy (2020), and Karasu Avcı et al., (2021) indicate that there is no significant difference between DC levels according to the Class level. Vural Som and Kurt (2018) and Demir (2018) observed that as the class level increased, the DC and DF averages also differed significantly. According to the results of the multiple regression analysis, when the results of the DC of the pre-service teachers are examined by the DF and DW variables, it is seen that their DF and DW are a significant predictor of their DC levels. When the literature is examined, there are no studies in which these variables are considered together. However, Xu et al., (2019) stated that interpersonal communication competence positively predicted DC, Shi et al., (2022) demographic factors predicted one's DC, Karakuş and Kılıç, (2022) found a positive, moderate correlation between Digital Competence and DF. Türk (2017) stated that there is a positive and moderate relationship between pre-service teachers' perceptions of DW efficacy and technology use proficiency.

Recommendations

- It may be suggested to investigate the reasons for the low DF of female pre-service teachers.
- It can be ensured that the digital skills of teacher candidates are developed at all Class and Program levels by increasing the effectiveness of technology in lessons at different class levels and in different programs, or by adding new technology-based lessons.
- In the study, it was seen that pre-service teachers' DC, DW and DF predict each other. In this context, different studies in which these variables are discussed together will contribute to the literature.

Limitations

The pre-service teachers voluntarily participated in this study. The number of female teacher candidates in the faculty of education is higher. The female teacher candidates participate in the study more voluntarily than the male ones. This situation is a limitation of the study.

References

Aldemir, C., & Avşar, M. N. (2020). Digital Citizenship Applications in the Pandemic Era. *Eurasian Journal of Research in Social and Economics, 7*(5), 148-169.

Aslan, S., & Çakmak, Z. (2018). An Investigation of Digital Citizens' Behaviors of Social Science Teachers for Some Variables. *Adıyaman University Journal of Educational Sciences, 8*(1), 72-99. https://doi.org/10.17984/adyuebd.296203

Arcagök, S. (2020). Investigation on Teachers' Perceptions of Digital. *Van Yüzüncü Yıl University Journal of Education, 17*(1), 534-556. https://doi.org/10.33711/yyuefd.693832

Aygün, M. (2019). *Examination of in Service and Pre-Service Social Studies Teachers' Digital Citizenship* (Master's Thesis). Yıldız Technical University, Institute of Social Sciences, Istanbul.

Ayvacı, H. Ş., Bülbül, S. & Ünsal, H. (2019). Comparison of Technology Literacy Levels of Pre-Service Teachers Studying in Different Programs. *Journal of Science, Mathematics, Entrepreneurship and Technology Education,* 2(1), 1-16.

Başar, S. (2018). *Self-Efficacy Beliefs İn The Use of Mathematics İn Science of The Candidate Science Teachers, 21. Century Skills and The Relationship Between These*. (Master's Thesis). Hacettepe University Institute of Educational Sciences, Ankara.

Blau, I., Peled, Y., & Nusan, A. (2016). Technological, pedagogical, and content knowledge in one-to-one classroom: teachers developing "digital wisdom". *Interactive Learning Environments, 24*(6), 1215-1230. https://doi.org/10.1080/10494820.2014.978792

Bologa, R., Lupu, A. R., & Sabau, G. (2009). Elements that advocate the nurturing of digital fluency. In *2009 International Conference on Future Networks* (pp. 83-86). IEEE.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F., (2016). *Bilimsel Araştırma Yöntemleri* (21. Baskı). [Scientific Research Methods] Ankara: Pegem Academy, 179.

Creswell, J. W. (2012/2020). Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research, 4th Edition. Halil Ekşi (Translation Editor). İstanbul: Edam, 481

Chalkiadaki, A. (2018). A systematic literature review of 21st century skills and competencies in primary education. *International Journal of Instruction, 11*(3), 1-16.

Chou, Y. C., & Chiu, C. H. (2020). The Development and Validation of a Digital Fluency Scale for Preadolescents. *The Asia-Pacific Education Researcher, 29*(6), 541-551.

Choi, M. (2016). A Concept Analysis of Digital Citizenship for Democratic Citizenship Education in the Internet Age. *Theory and Research in Social Education*, 44(4), 565-607. https://doi.org/10.1080/00933104.2016.1210549

Chigona, A. (2018). Digital Fluency: Necessary Competence for Teaching and Learning İn Connected

Classrooms. *The African Journal of Information Systems*, 10(4), 7.

Çiftçi, S., & Sakallı, H. (2016). The Investigation of The Relationship Between Digital Citizenship Levels and Cyber Bullying Tendencies of Prospective Primary School. *Educational Technology Theory and Practice*, *6*(2), 100-119. https://doi.org/10.17943/etku.97311

Çokluk, Ö., Şekercioğlu, G., & Büyüköztürk, Ş., (2021). In Multivariable Statistics for Social Sciences: Spss and Lisrel Applications. *Sosyal Bilimler İçin Çok Değişkenli İstatistik SPSS ve LISREL Uygulamaları* (6. printing). Ankara: Pegem Academy.

Çubukçu, A., & Bayzan, Ş. (2013). Perception of Digital Citizenship in Turkey and Methods of Increasing this Perception by Using the Internet Conscious, Safe and Effective. *Middle Eastern & African Journal of Educational Research,* 5, 148.

Çukurbaşı, B., & İşman, A. (2014). Examination of Teacher Candidates' Digital Natives Features (Example of Bartın University). *Bartın University Journal of Faculty of Education*, *3*(1), 28-54.

Dedebali, N. C., & Dasdemir, I. (2019). Social Studies Teacher Candidates' Perception of Digital Citizenship. *International Journal of Educational Methodology*, *5*(3), 465-477. https://doi.org/10.12973/ijem.5.3.465

Demir, K. (2018). Investigation of Digital Fluency of Teacher Candidates. (Doctoral Thesis). Anadolu University, Institute of Educational Sciences, Eskişehir.

Demir, K., & Odabaşı, H. F. (2022). Development of Digital Fluency Scale: Validity and Reliability Study. *Themes in eLearning*, *15*, 1-20.

Dere, İ., & Yavuzay, M. (2019). Examination of prospective social studies teachers through digital citizenship indicators. *MANAS Journal of Social Studies*, *8*(3), 2400-2414.

Dias-Trindade, S., & Ferreira, A. G. (2020). Digital Teaching Skills: Digcompedu Check-in as an Evolution Process from Literacy to Digital Fluency. *Icono* 14,18(2), 162-187. doi: 10.7195/ri14.v18i1.1519

Erdem, C., & Koçyigit, M. (2019). Exploring undergraduates' digital citizenship levels: Adaptation of the Digital Citizenship Scale to Turkish. *Malaysian Online Journal of Educational Technology,* 7(3), 22-38.

Fulgence, K. (2020). Developing Digital Fluency among Teacher Educators: Evidence from Tanzanian Schools of Education. *International Journal of Education and Development using Information and Communication Technology*, *16*(2), 158-175.

Guliciuc, V. (2013). From Wisdom to Digital Wisdom as Negotiated İdentity. *European Journal of Science and Theology*, *9*, 1-15.

Gumus, M. M., Cakir, R., Korkmaz, O., & Ugur Erdogmus, F. (2021). Analysis of IT Acceptance Levels, ICT Attitudes, and Individual Innovation Levels of Special Education Teachers and their Opinions. *International Journal of Technology in Education (IJTE)*, 4(3), 553-588. https://doi.org/10.46328/ijte.87

ITEA, International Technology Education Association (2003). Advancing Excellence İn Technological Literacy: Student Assessment, Professional Development, And Program Standards. Reston, Virginia

ISTE, (2022). ISTE standards: student. Available at: https://www.iste.org/standards/iste-standards-for-students

Isman, A., & Gungoren, O. C. (2013). Being digital citizen. *Procedia-Social and Behavioral Sciences*, *106*, 551-556. https://doi.org/10.1016/j.sbspro.2013.12.063

Kabataş, S. (2019). *Evaluation of Teacher Candidates' Perceptions of Digital Citizenship in Terms of Lifelong Learning Attitudes* (Master's thesis), Bartın University, Institute of Educational Sciences Department of

Lifelong Learning.

Karakuş, İ., & Kılıç, F. (2022). 'Digital' Overview at The Profiles Of Pre-Service Teachers: Digital Awareness, Competence And Fluency. *Problems of Education in the 21st Century*, *80*(2), 324.

Karasu Avcı, E., Faiz, M., & Recepoğlu, S. (2021). Determination Of Digital Citizenship Perceptions of Social Studies Teacher Candidates. *International Journal of New Approaches in Social Studies*, *5*(1), 46-62. https://doi.org/10.38015/sbyy.847507

Kaya, A., & Kaya, B. (2014). Teacher candidates' perceptions of digital citizenship. *Journal of Human Sciences*, *11*(2), 346-361. http://dx.doi.org/10.14687/ijhs.v11i2.2917

Kılıç, S. (2013). Sampling Methods. *Journal of Mood Disorders* 3(1), 44-6. https://doi.org/10.5455/jmood.20130325011730

Kozikoğlu, İ., & Özcanlı, N. (2020). The Relationship between Teachers' 21st Century Teaching Skills and Their Engagement to the Profession. *Cumhuriyet International Journal of Education*, *9*(1), 270-290.

Le, D., & Pole, A. (2022). Beyond Learning Management Systems: Teaching Digital Fluency. *Journal of Political Science Education*, 1-20. https://doi.org/10.1080/15512169.2022.2139268

Matysek, A., & Tomaszczyk, J. (2020). Digital Wisdom in Research Work. *Zagadnienia Informacji Naukowej-Studia Informacyjne*, *58*(2A (116A)), 98-113. http://dx.doi.org/10.36702/zin.705

Mossberger, K., Tolbert, C. J., & S. McNeal, R. S. (2008). Excerpts From *Digital Citizenship: The Internet, Society, and Participation*. Massachusetts Institute of Technology. United States of America.

Nousiainen, T., Kangas, M., Rikala, J., & Vesisenaho, M. (2018). Teacher competencies in game-based pedagogy. *Teaching and Teacher Education*, *74*, 85-97. https://doi.org/10.1016/j.tate.2018.04.012

Ono, H. & Zavodny, M. (2007). Digital inequality: A Five Country Comparison Using Microdata. Social Science Research. 36, 1135–1155. https://doi.org/10.1016/j.ssresearch.2006.09.001

Ozturk, O.T. (2023). Examination of 21st Century Skills and Technological Competences of Students of Fine Arts Faculty. *International Journal of Education in Mathematics, Science, and Technology (IJEMST), 11*(1), 115-132. https://doi.org/10.46328/ijemst.2931

Özdemir, E. (2014). Tarama Yöntemi [Survey Method]. M. Metin (Editör), *Kuramdan Uygulamaya Eğitimde Bilimsel Araştırma Yöntemleri i*çinde [Scientific Research Methods in Education from Theory to Practice] (77/97). Ankara: Pegem Akademi

Özer, N. (2022, 23-26 Haziran). *Çevrimiçi Öğrenme Ortamlarında Geleceğe Hazırlayan Bir Beceri: Dijital Akıcılık [A Future-Proofing Skill in Online Learning Environments]: Digital Fluency*. [Full Paper Proceedings]. 2. International Conference on Educational Technology and Online Learning- ICETOL, Ören, Balıkesir.

Pallant, J. (2005). *SPSS Survival Manual: A Step by Guide to Data Analysis Using Spss for Windows*. Australia: Australian Copyright.

Parahita, G. D. (2017). Mapping digital fluency in diverse socio-economic status of citizens of DKI Jakarta 2017. *Informasi*, *47*(2), 213-228.

Prensky, M. (2012). *Brain Gain: Technology for Digital Wisdom*. New York, NY: Palgrave Macmillan

P 21, (2019). Partnership for 21st Century Learning a Network of Battelle for Kids. Framework for 21st century learning. Retrieved from the http://static.battelleforkids.org/documents/p 21/P21_Framework_Brief.pdf 1.12.2022

Ribble, M. S., Bailey, G. D., & Ross, T. W. (2004). Digital citizenship: Addressing appropriate technology behavior. *Learning & Leading with technology*, *32*(1), 6.

Sadiku, M. N., Shadare, A. E., & Musa, S. M. (2017). Digital Wisdom. *International Journal of Advanced Research in Computer Science and Software Engineering*, *7*(8), 72.

Skiba, D. J. (2010). Digital wisdom: A necessary faculty competency? *Nursing Education Perspectives*, *31*(4), 251-253.

Shiring, B. (2022). Designing a Pathway to Digital Fluency: Considerations for Authentic Learning Design. In *Education 3.0 and eLearning Across Modalities* (pp. 231-251). IGI Global.

Shi, G., Chan, K. K., & Lin, X. F. (2022). A systematic review of digital citizenship empirical studies for practitioners. *Education and Information Technologies*, 1-23. https://doi.org/10.1007/s10639-022-11383-z

Subasi, S., Korkmaz, O., & Cakir, R. (2023). Cyberbullying, Digital Footprint, and Cyber Security Awareness Levels of Secondary School Students. *International Journal of Technology in Education and Science*, *7*(2), 129-151.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (sixth ed.) Pearson, Boston.

Teslenko, T., & Sebalo, L. (2020). Future teacher training for self-education activity in physical education at elementary school. *Electronic National Pedagogical Dragomanov University Repository*, *12*(1), 105-119. doi:10.18662/rrem/202

Thomas, S. N. (2018). Promoting digital citizenship in first-year students: Framing information literacy as a tool to help peers. *College & Undergraduate Libraries*, *25*(1), 52-64. https://doi.org/10.1080/10691316.2017.1329675

Torbeyns, J., Verbruggen, S., & Depaepe, F. (2020). Pedagogical content knowledge in preservice preschool teachers and its association with opportunities to learn during teacher training. *ZDM*, *52*(2), 269-280. https://doi.org/10.1007/s11858-019-01088-y

Türk, M. (2017). *Investigation of Pre-Service Teachers' Efficacy Perceptions Regarding Digital Wisdom*. (Doctoral Thesis). Anadolu University Institute of Education Sciences, Eskişehir

Ünsal, S. (2021). On The Definition and Importance of Teaching Profession and Changing Roles of Teachers; a Qualitative Descriptive. *İstanbul Ticaret University Journal of Social Sciences*, *20*(42), 1481-1504.

Vural Som, S., & Kurt, A. (2018). Investigation Of Digital Citizenship Indicators Through University Students' Perceptions. Educational Technology Theory and Practice, *8*(1), 60-80. https://doi.org/10.17943/etku.317713

Wang, Q. E., Myers, M. D., & Sundaram, D. (2013). Digital natives und digital immigrants. *Wirtschafts Informatik*, *55*(6), 409-420.

Yalçın, S. (2018). 21st Century Skills and Tools and Approaches That Are Used to Measure These Skills. *Ankara University Journal of Faculty of Educational Sciences (JFES)*, *51*(1), 183-201. https://doi.org/10.30964/auebfd.405860

Yıldız, E. P., Çengel, M., & Alkan, A. (2020). Determination of Digital Citizenship Levels of University Students at Sakarya University Turkey. *International Journal of Higher Education*, *9*(3), 300-308. https://doi.org/10.5430/ijhe.v9n3p300

Yılmaz, M., & Dogusoy, B. (2020). Determination of the Digital Citizenship Levels of Prospective

Teachers. *Kastamonu Education Journal*, *28*(6), 2362-2375. https://doi.org/10.24106/kefdergi.692492

Xu,S., Yang, H. H., Macleod, J, & Zhu, S. (2019). Interpersonal communication competence and digital citizenship among pre-service teachers in China's teacher preparation programs. *Journal of Moral Education*, *48*(2), 179-198. https://doi.org/10.1080/03057240.2018.1458605

Zoraloğlu, S., & Şahin, A. E. (2022). Teacher Competencies for Differentiated Instruction Approach. *Cukurova University Faculty of Education Journal*, *51*(2), 1377-1416. https://doi.org/10.14812/cuefd.107205

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