PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022
324

'DIGITAL' OVERVIEW AT THE PROFILES OF PRE-SERVICE TEACHERS: DIGITAL AWARENESS, COMPETENCE AND FLUENCY

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Abstract

The adaptation of the teachers to the digital age, the integration of their digital skills into the learning and teaching processes, their digital awareness, competencies and fluency constitute an important problem which is within the scope of lifelong learning.The aim of the present study is to examine the digital profiles of pre-service teachers within the framework of universal education principles and online learning theories during the pandemic period. To serve for this purpose, 'digital' profiles of pre-service teachers, who prepare individuals for the digital society, are going to be investigated. Furthermore, their digital awareness, competence and fluency levels are going to be highlighted, and the concepts are going to be discussed in the light of current developments that are under the effects of the pandemic. Thus, the level of relationship between the concepts are going to be underlined to offer solutions to current digital problems. As for the procedure, the study used relational screening model on 539 pre-service teachers. According to the results, digital awareness, competence and fluency levels of pre-service teachers were high. There is a positive, moderate and significant relationship between digital awareness and digital fluency; similarly, there is a positive, high level and significant relationship between digital fluency and digital competence. At this point, digital awareness and competence explained 62% of the variation in digital fluency. Via the present study, it is possible to note down that the concepts of digital awareness, digital competence and digital fluency might be explained thoroughly. Hence, the present study is expected to contribute to the literature and all stakeholders related to education.

Keywords: *digital awareness, digital education, digital competence, digital fluency, the relational survey model*

Introduction

Technological advances in the digital world appear as a phenomenon that transforms and improves human life; hence, every innovation that emerges in this field is revolutionary. Particularly with the development and spread of portable mobile technologies, a 'digital' process has started for all objects, people and institutions, in which innovations, such as education, develop rapidly, and this digitalization process is still going on.

In digital environments, Internet and digital tools are widely used by people due to activities aimed at meeting personal needs such as shopping, banking, social sharing, online and offline games. While performing these digital transactions, it is important that individuals need to be aware of their responsibilities, and they need to be directed correctly. Digital awareness is generally used to mean working with digital tools and contexts in research, communication, entertainment. Awareness in digital environments plays an important role in ensuring effective digital communication because participants must be aware of the behaviour and responsibilities of the people they interact with.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

Considering the studies on this subject, it is seen that individuals are exposed to the negative effects of digital technologies. To exemplify its negative effects: excessive use of technology, cyberbullying, internet or game addiction, exposure to pornography, meeting strangers online, etc. ,such risky online behaviors, can be added to the list (Cernikova et al., 2015). There are also studies that reveal some physical problems associated with technology use, including headaches and stomachaches, eye problems, and poor eating habits (Do et al., 2013). In addition, studies describing the negative health effects of technology use such as sleep problems, internet addiction, mental fatigue and aggression, have been found (Cernikova et al., 2015). It was emphasized that individuals, who do not pay attention to the reliability of the content, experience widespread passivity and cannot critically interpret digital content, emphasizing the importance of individuals using digital technologies safely (Bennett et al., 2008). Studies show that it is important for individuals to be aware of all these negativities caused by digital tools and uses so that they can have a healthy digital experience. It is important for teachers who will raise the individuals of the future to act with this awareness and to use digital tools correctly and beneficially in a way to increase the awareness of individuals in the learning-teaching process.

Digital competence began to be discussed in 2006 by the European Parliament, and the Council (European Council, EC) accepted it as one of the basic competences for 'lifelong learning', and by the European Union (European Union, EU) "Information society technology in business includes reliable and critical use of it for entertainment, learning, and communication." (Vieru, 2015). Digital competence generally refers to the skills and literacy that an average citizen needs to learn in the digital information society. Individuals, who are digitally proficient, can think creatively and critically. Moreover, they may constantly improve themselves digitally, have a technological consciousness and a technical understanding (Ferrari, 2013). This concept has become a key concept in both the national and international community in discussions about the kinds of skills and understanding students need in the digital society (Pettersson, 2018). Kelentrić et al., (2017) also created a theoretical 'digital competence framework' for teachers with their work. Sub-dimensions of the professional digital competence framework for teachers are as follows: (1) Subjects and basic skills, (2) Interaction and communication, (3) Pedagogy and content production, (4) Leadership of learning processes, (5) Change and development, (6) Social school and ethics. In order for individuals to be actively involved in digital societies, teachers need to be equipped with digital competencies both personally and professionally along with their instructional and pedagogical skills. In this context, it is vital for pre-service teachers to develop their digital competencies and reveal the educational potential of digital technologies.

It has been highlighted in the previous studies that modern digitalization has created an increasingly complex school environment (Hatlevik & Christophersen, 2013). Therefore, there is a need for teachers who can adapt the latest digital trends in education to their lessons and apply them competently. Just like other professions, since teachers have gained more access to digital tools, media and resources in recent years, students and teachers have begun to use various digital resources and social media networks in their teaching processes, which has affected how and how they interact with learning (Burden et al., 2016).

Thanks to the use of digital tools (computers, smart boards, mobile devices, internet, etc.) used in education in the classroom environment, the role of the teacher in the classroom has changed. Therefore it has become important to correctly guide students, who can access information anytime and anywhere, via technology. For this reason, the digital process experienced has also created some new problems in terms of teachers' methods in the context of pedagogical and classroom management, digital resource creation/development, content knowledge and development of basic skills (Kelentrić et al., 2017). In that sense, teachers should restructure their traditional approaches to education through digital technologies and create

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

strategies that can improve themselves in a 'digital' sense in order to survive this integration process in a good way.

Teachers should be able to successfully integrate digital technology into their teaching processes while educating individuals of the digital world. In the digital age of teachers, individuals need to obtain awareness, self-confidence, knowledge, skills, competence, ethical frameworks for the functionality of education. They also need to integrate these skills to facilitate individuals' adaptation to the future by integrating them with their own learning-teaching processes.

While dealing with the problems related to the digital adaptation of individuals to the digital age of the educational environments, the 'Coronavirus/Covid-19' pandemic, which emerged in 2019 and was effective all over the world in 2020, added new problems to individuals. It has brought comprehensive digital changes to all areas of our lives, education, in particular. Social distance and restrictive movement policies have significantly disrupted traditional education practices, and the digital education process has started quickly.

Throughout this process, the digital infrastructure of schools and the digital skills of teachers, serving the purpose of education, appear as an important indicator in terms of students' success (Yudiawan et al., 2021). The rapid and change in the way of teaching and learning due to the pandemic has prompted educators to seek skills and ways to effectively engage educators and students in the learning process. Against this background, it is crucial to highlight the need for the digital skills of solid and proven trainers. In the present study, it is considered that investigating the digital awareness, competencies, skills and fluency levels of pre-service teachers might make vital contributions to education, society and the education policies. It is significant to examine the concepts such as "awareness, competence and fluency within the scope of lifelong learning skills" in that they also constitute the basic dynamics of education of future teachers in a digital sense. In order to ensure an effective digital interaction, the individual must be aware of the attitude, behaviour and action displayed in digital environments and take responsibility for them. Individuals with digital competence are also expected to be conscious citizens in the digital world since they interact effectively and productively in the digital environment. The individual's ability to gain new knowledge and skills and to adapt to changes and transformations in technology throughout his/her life depends on their flexible thinking/behaviour and being fluent. It is accepted that it is important for all stakeholders of education to realize this digital integration in a correct, rational and functional way in terms of building the future digital society in a modern and healthy way. In this study, the research questions, to which answers were sought, are as follows: (1) What is the digital awareness, competence and fluency of pre-service teachers? (2) Is there a significant relationship among levels of digital awareness, digital competence and digital fluency of pre-service teachers? (3) Do digital awareness and competence of pre-service teachers predict their digital fluency?

There have been various studies conducted on this topic to find out answers. Cernikova (2018) examined the experiences of students aged 9-16 and their awareness of digital media use, and Yılmaz (2016) examined teachers' awareness of digital data security. In another study, Çebi and Reisoğlu (2020) examined pre-service teachers' views on their digital competence, and Pettersson (2018) examined the pedagogical aspects of digital competence in international research between 2007 and 2017. On the other hand, Guillén-Gámez (2018) examined the actual use of digital competence in education, and Svensson and Baelo (2015) examined pre-service teachers' digital competences. In the other related studies, Fulgence (2020) examined how teacher educators can improve digital fluency, Demir (2018) examined digital fluency of pre-service teachers, and Chigona (2018) examined teachers' digital fluency. When the literature is examined, it is seen that the concepts of digital awareness, competence and fluency are investigated as a single variable. In this study, it is aimed to examine the digital profiles of pre-service teachers within the framework of universal education principles and online learning theories during the pandemic period.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

The aim of the present research was to conduct research on the 'digital' profiles of pre-service teachers, who prepare individuals for the digital society, to find out their digital awareness, competence and fluency levels and to discuss the concepts in the light of current developments with the effect of the pandemic. It is expected that the levels of relations between the concepts are going to be revealed to solve current digital problems.

Research Methodology

Model

Studies conducted to examine the existence or degree of the relationship between the variables are evaluated in relational type. The relational survey model is a research approach that aims to detect the presence and/or level of variation between two or more variables (Karasar, 2012). In this study, the relationships between digital awareness, competence and fluency levels of pre-service teachers were examined.

Population and Sampling

The present research was conducted on 539 pre-service teachers studying at education faculties of 7 different geographical regions of Turkey in the 2020-2021 academic year. Easily accessible sampling method was used in sample selection. All prospective teachers studying at the faculty of education in Turkey constitute the population of the study. Universities from 7 different geographical regions of Turkey were identified via convenience sampling, and pre-service teachers were selected by simple random sampling technique. During the data collection process, ethical committee permissions were obtained from the institutions and consent was obtained from the participants. The demographic characteristics of the study group participating in the research are shown in Table 1:

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

Table 1
Demografic Variables of Study Groups

Variables		*N*	%
Gender	Female	432	80.1
	Male	107	19.9
Department	Preschool	71	13.2
	Turkish	60	11.1
	Primary School	59	10.9
	Psychological Counseling and Guidance	55	10.2
	Social Sciences	21	3.9
	Primary School Mathematics	20	3.7
	English	103	19.1
	Science	96	17.8
	Others	54	10.0
Grade level	1st grade	161	29.9
	2nd grade	115	21.3
	3rd grade	149	27.6
	4th grade	114	21.2
Geographical region of study	Mediterrenian	171	31.7
	Marmara	136	25.2
	Aegean	59	10.9
	Central Anatolia	92	17.1
	Black Sea	38	7.1
	Eastern Anatolia	29	5.4
	Southeastern Anatolia	14	2.6

Data Collection

In the course of 2020-2021 academic year, the participants in the research group were contacted during the collection of quantitative data, and they were informed about the purpose of the research and the volunteering principle through the 'Google Form'. The application forms including the personal information form and measurement tools prepared by the researcher were applied to a total of 539 pre-service teachers via the online platform. Information about the data collection tools to be used within the scope of the research is given below.

Personal Information Form

In the "Personal Information Form" prepared by the researcher, information such as "gender, department of education, class level, geographical region of education" was included in line with the opinions of 4 field experts (2 Turkish Education and 2 Curriculum and Instruction).

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

Digital Awareness Perception Scale

The Digital Awareness Perception Scale, developed by the researcher for this study, consists of 5 factors and 20 items. The scale includes 5 items in the 'risks of using digital tools' factor, 5 items in the 'positive effects' factor, 4 items in the 'adverse effects' factor, 3 items in the 'ethical-legal' factor and 3 items in the 'social-communication' factor. The internal consistency coefficients of the sub-factors of the original scale were found to be .68 for risks of digital tool use, .70 for positive effects, .72 for negative effects, .71 for ethical-legal dimension and .71 for social-communication dimension. In this study, the internal consistency coefficients of the sub-factors of the scale were found as: .89, .89, .90, .90 and .90, respectively, and a value of .88 for the whole scale was detected.

Digital Competence Perception Scale Of The Pre-Service Teachers

The Pre-Service Digital Efficiency Perception Scale, developed by the researcher for this study, consists of 26 3-dimensional items. There are 8 items in the 'media-communication competencies' factor of the scale, 8 items in the 'design competencies in digital environments' factor and 10 items in the 'information competencies' factor. The internal consistency coefficients of the sub-factors of the scale were found to be .90 for media-communication competencies, .90 for designing instruction in digital environments, and .88 for informatics competencies. In this study, the internal consistency coefficients of the sub-factors of the scale were found as .89, .88 and .88, respectively, and a value of .88 for the whole scale was revealed.

Digital Fluency Scale

The Digital Fluency Scale (DAS), developed by Demir (2018), is a five-point Likert-type instrument with 3 sub-factors and 29 items. There are 14 items in the "Awareness" factor, 11 items in the "Self-efficacy" factor, and 4 items in the "Affective" factor of the scale. The internal consistency coefficients of the sub-factors of the scale were found to be .92 for awareness, .91 for self-efficacy and .80 for affective. The internal consistency coefficients of the sub-factors of the scale used in this study were found to be: .87, .88 and .90, respectively, with the necessary permissions obtained, and the value of .88 for the whole scale was reached.

Data Analysis

So as to analyse the gathered data, the correlation coefficient was used while examining the relationships among digital awareness, competence and fluency levels of pre-service teachers. Correlation is a statistical technique that gives the degree of relationship among multiple variables. The Pearson Product-Moment Correlation Coefficient is used to find the relationship between two continuous variables. SPSS 20 package program was used to calculate the Pearson Correlation Coefficient between the variables. For multiple regression testing, Pearson Correlation Coefficient was also used. In the research, multiple regression analysis, which was conducted to show the predictive power of digital awareness and digital competence variables on digital fluency, is an analysis method for two independent variables to predict a dependent variable.

Furthermore, there is no missing data in the study as the data were collected through the online data collection method. According to the Kolmogorov-Smirnov test result for the normality assumption ($p>.05$), the gathered data are normally distributed (Terzi, 2019). The assumptions of multiple regression analysis were tested before the analysis of the data. When the outliers are examined, the Z values used in the detection of univariate outliers should be

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

between +3 and -3 (Tabachnick & Fidell, 2013), and no univariate outliers were found in the study. According to Cook's values, since there is no value above 1, there is no outlier in this respect. When Mahalanobis distances were examined, 66 data were found to have multiple outliers and were excluded from the analysis. As a consequence of the assumption tests analyses were made with 473 data.

Research Results

Results About Digital Awareness Levels of Pre-Service Teachers

The digital awareness levels and sub-dimensions of pre-service teachers are represented in Table 2.

Table 2
Digital Awareness Levels and Sub-Dimensions of Pre-Service Teachers

Items	*N*	$\bar{X}$	*SD*	Range
Risk	473	4.33	2.83	Extremely high
Positive Effects	473	3.59	4.63	High
Negative Effects	473	4.06	2.70	Extremely high
Ethical/Legal	473	4.27	1.91	Extremely high
Social/Communication	473	4.08	1.83	Extremely high
Total Awareness	473	4.05	9.05	Extremely high

In line with the data in Table 2, it can be said that the digital awareness levels of candidate teachers are extremely high for risk, negative effects, ethical/legal, social dimensions and the scale as a whole; on the other hand, it was observed that it is at a high level in the positive effects sub-dimension.

Results About Digital Competence Levels of Pre-Service Teachers

The results of digital competence levels of pre-service teachers and sub-dimensions are illustrated in Table 3.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

Table 3
Digital Competence Levels and Sub-Dimensions of Teacher Canditates

Items	*N*	$\bar{X}$	*SD*	Range
Media-Communication	473	4.23	5.15	Extremely high
Designing Teaching	473	3.92	6.73	High
Information Technologies	473	3.94	6.45	High
Total Competence	473	4.02	15.77	Extremely high

Considering the figures in Table 3, it can be said that digital competencies of pre-service teachers are at a 'high' level in the instructional design and informatics sub-dimensions. The competencies are at a 'quite high' level for the media-communication sub-dimension and the whole scale.

Results About Digital Fluency Levels of Pre-Service Teachers

The digital fluency levels and sub-dimensions of pre-service teachers are presented in Table 4.

Table 4
Digital Fluency Levels and Sub-Dimensions of Pre-Service Teachers

Items	*N*	$\bar{X}$	*SD*	Range
Awareness	473	3.59	10.03	High
Self-efficacy	473	4.03	6.41	Extremely high
Affective	473	3.04	3.44	Medium
Total Fluency	473	3.68	16.75	High

Taking the numbers in Table 4 into consideration, it is possible to claim that the digital fluency of the pre-service teachers is high for awareness and the whole scale, quite high for self-efficacy and moderate for the affective sub-dimension.

Results About The Relationship Among Levels Of Digital Awareness, Digital Fluency And Digital Competence For Pre-Service Teachers

The relationship among digital awareness, digital fluency, and digital competence levels of pre-service teachers was examined with Pearson Product Moments Correlation, and the results are shown in Table 5 below.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

Table 5

Pearson Product Moments Correlation Table

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1													
2	.260**	1												
3	.150**	.091*	1											
4	.386**	.340**	.303**	1										
5	.443**	.327**	.062	.372**	1									
6	.662**	.758**	.469**	.672**	.606**	1								
7	.450**	.389**	.042	.405**	.376**	.514**	1							
8	.492**	.428**	.077	.451**	.506**	.594**	.869**	1						
9	.121**	.019	-255**	-.001	.091*	-.010	.121**	.157**	1					
10	.483**	.401**	.002	.415	.438**	.533**	.956**	.935**	.338**	1				
11	.396**	.233**	.065	.272**	.579**	.437**	.463**	.572**	.061	.509**	1			
12	.305**	.498**	.231**	.447**	.300**	.574**	.652**	.653**	.031	.647**	.482**	1		
13	.476**	.385**	.082	.437**	.493**	.563**	.820**	.844**	.121**	.839**	.588**	.721**	1	
14	.455**	.446**	.153**	.458**	.519**	.618**	.765**	.811**	.083	.786**	.773**	.879**	.909**	1

(Variables: 1. Risk, 2. Positive effects, 3. Negative Effects, 4. Ethical /Legal, 5. Social/ Communication, 6. Total Digital Awareness, 7. Awareness, 8. Self-efficacy, 9. Affective, 10. Total Digital Fluency, 11. Media- Communication, 12. Designing Education, 13. Information Technologies, 14. Total Digital competence)

When the correlations between digital awareness, fluency and competence levels of pre-service teachers were examined, it was observed that there was a positive, moderate and significant relationship between digital awareness and digital fluency (r = .533, p < .05), compared to the general scales. In other words, there is a positive, moderate and significant relationship (r = .618, p < .05), and there is a positive, high and significant relationship between digital fluency and digital competence (r = .786, p < .05). Considering the correlations according to the sub-dimensions, it can be said that the highest correlation is between the self-efficacy dimension of fluency and the informatics dimension of competence (r = .844), and the lowest correlation is between the ethical/legal dimension of digital awareness and the affective dimension of digital fluency (r = -.001).

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

Results about the Predictions of Digital Awareness and Digital Competence Levels of Pre-service Teachers to Their Digital Fluency Levels

Multiple regression analysis was conducted to reveal whether the digital awareness and competences of teacher's candidates predict their digital fluency levels or not, and the results are presented in Table 6.

Table 6

Multiple Regression Analysis Results about the Predictions of Digital Awareness and Digital Competence Total Scores of Pre-Service Teachers on their Digital Fluency Levels

Vairables	*B*	*SE*	***B***	*T*	*p*	*Binary r*	*Partial R*
Invariant	13.278	4.327	-	3.069	.002	-	-
Total Awarenesss	0.142	0.067	0.077	2.123	.034	0.533	0.091
Total Competence	0.784	0.038	0.738	20.432	.000	0.786	0.686
$R = 0.788$	$R^2 = 0.621$						
$F = 385.013$	$p < .001$						

Digital awareness and digital competence that are thought to be effective on digital fluency of teacher's candidates, and they showed a significant relationship with digital fluency ($R = 0.788$; $R^2 = 0.621$) (F (2-470) = 385.012, $p < .01$. These two variables together explain 62% of the variation in digital fluency. According to the standardized regression coefficient (β), the relative importance of the predictor variables on digital fluency is for total competence (β = 0.738) and for total awareness (β = 0.077), respectively. Taking the results regarding the significance of the regression coefficients into account, it is possible to claim that digital awareness and digital competence are significant predictors of digital fluency ($p < .01$). Furthermore, when the relationships between predictive variables and digital fluency are examined, a correlation is observed at the level of digital awareness ($r = .533$) and digital competence ($r = .786$). Finally, when the effects of other predictor variables are controlled, the relationships are found. To highlight, correlation is observed at the level of digital awareness ($r = .091$) and digital competence ($r = .686$).

Discussion

In line with the findings, it has been revealed that digital awareness of pre-service teachers are high. Aksoğan and Özek (2020) found out that pre-service teachers had high levels of technological awareness and competences; similarly, Yılmaz et al., (2016) has also highlighted that teachers' digital data security awareness was highly high in their work. When the studies carried out up to now are taken into account, it is seen that similar results have been obtained with this study. Education faculties might improve the awareness of the participants not only in the security, legal or health issues but also in all areas. To make them have many

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

perspectives, they can affect the awareness of individuals via social events. It can be said that if pre-service teachers' digital awareness is high, they can adapt to the digitalized world more easily and integrate digital technologies into the learning-teaching process more functionally.

Furthermore, it has been emphasized in the present research that the digital competences of pre-service teachers are at high levels. Aydoğmuş and Karadağ (2020), Heerwegh et al., (2016) have also reported that the digital competence levels of pre-service teachers are at high levels. On the other hand, there are also studies which indicate different findings in the literature. Aksoğan and Özek (2020) indicated in the results that pre-service teachers did not feel competent enough to use technology for education. A study in a similar vein, Menzi et al., (2012) stated that they are not enough to use in technology yet, and they are not sufficient in advanced and technical areas such as databases, social, legal and ethical issues. With high digital competencies, it can enable them to solve problems that may occur in digital environments (Roll & Ifenthaler, 2021).

This situation might be explained by constant updates of legal and ethical issues due to the nature of digital technologies. This nature leads to changes in line with the emergence of new situations or conditions. In addition, elements such as the socio-economic level of the region where the research is made, access and usage levels of digital technologies could also affect. In this context, individual activities should be provided for relatively insufficient pre-service teachers in the learning process so as to increase their technological interest and requests.

It has been observed that the digital fluency of pre-service teachers is also at a high level. Demir (2018) found out in his study that pre-service teachers' digital fluency was moderate. Chigona (2018), in his study with teachers, reported that the digital fluency of the participants was insufficient, and they could not benefit from digital connections in the learning-teaching process; thus, they obtained a different result from the study. On the other hand, Pinho and Lima (2013) stated in his study with teachers that digital fluency is a motivational factor, a necessary competence in a remarkable and active learning process, and it is important to provide institutional support to teachers in becoming digital fluent. The digital fluency of pre-service teachers can be handled within the scope of lifelong learning, and this skill can be associated with life in their professional and social lives. In such a context, their digital adaptation can be achieved in a life-long and more functional way. It can be said that teacher candidates' digital fluency is high, they can follow current developments in digital technologies, they can be flexible with students in the classroom environment and organize activities creatively.

When the studies in the literature is examined (Ferrari, 2013; Spencer, 2015), it is seen that there are no clear definitions that can reveal the differences between the concepts of 'digital awareness, digital competence and digital fluency', and the features that meet these concepts are sometimes used interchangeably. Hence, if it is necessary to make a complex definition in the light of the literature on these concepts, digital awareness might be defined as the ability to sense, know and perceive the events surrounding the individual about digital technologies and tools, and to be conscious of digitalization, while digital competence might be defined as 'the knowledge necessary to use digital tools effectively; skills and attitudes.' Another concept, digital fluency, can be defined as 'the ability of an individual to adapt to digital technologies and realize learning and experiences in digital environments within the scope of lifelong learning'.

Taking the national and international literature into consideration, no study has been found that deals with the relationship between 'digital awareness, digital competence and digital fluency'. However, considering the definitions and explanations for these three concepts in the literature (Sparrow, 2018; Spencer, 2015), it is seen that these concepts are almost intertwined. Briggs and Makice (2012) describes the characteristics of digitally fluent individuals as "(1) being aware of when and how digital tools should be used, (2) being able to use digital tools very effectively and making digital tool use an automated skill and (3) new technologies as digital technologies change and evolve". According to this explanation, it can be said that

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

the first characteristics of digital fluent individuals is digital awareness, the second is digital competence, and the third is digital fluency.

Conclusions and Implications

In the present study, digital awareness, competence and fluency of pre-service teachers are at a 'high' level. This can be explained by the fact that digital technologies/tools are actively used in all areas of life, particularly with the effect of the Covid-19 pandemic process. Furthemore, it is important to note down that pre-service teachers were born in this digital world, and they started to interact with digital tools from an early age. The fact that these skills of teacher candidates are high can help them establish virtual collaborations with digital communication tools in the classroom environment.

Considering the relationships between digital awareness, fluency and competence levels of pre-service teachers, it has been concluded that there is a positive, moderate and significant relationship between digital awareness and fluency and between digital awareness and competence, and it has been revealed that there is a positive, high level and significant relationship between digital fluency and competence. Digital awareness and competence together showed significant associations with digital fluency. At this point, digital awareness and competence explain 62% of the variation in digital fluency. Based on this result, it can be said that digital awareness and competence affect digital fluency, but there may be other variables that affect fluency. Research can be done on what different variables might be.

In this study, the aim was to clearly define and explain the concepts of 'digital awareness, digital competence and digital fluency', to determine the level of relationship between the features of these concepts and concepts, to examine the predictive levels of digital awareness and competences of pre-service teachers for their digital fluency. It is thought that it can contribute to the literature and all stakeholders related to education.

Suggestions to researchers and practitioners may also be as follows: The conceptual relationships between digital awareness, proficiency and fluency can be explored with students studying at different teaching levels. Course contents and learning environments of all departments of Education Faculties can be delivered by integrating with digital technologies. Another examination on this issue could be done with qualitative research patterns (namely phenomenology, case study and action research) in which there could be chances to examine digital competences thoroughly from many perspectives.

This research can be a useful resource for scientists and policy makers working on the digitalization of education, the digital integration of learning environments and the digital competences of educators. Instructors can use the results of this study as a guide. It can create awareness in all stakeholders of education, especially trainers, in order to digitalize learning environments in a functional way and to reveal the digital profiles of trainers.

Note

This study was produced from the doctoral thesis prepared by the first author under the supervision of the second author.

Declaration of Interest

The authors declare no competing interest.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 80, No. 2, 2022

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PROBLEMS
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