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Analysis of Digital Literacy and Metaphoric Perceptions of Teacher Candidate

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Abstract: The aim of this study was to investigate the digital literacy skills and metaphorical perceptions of teacher candidates. The mixed approach has been used in the analysis. The quantitative dimension of the study consists of the "Digital Literacy Scale" scores collected from the teacher candidates, and the qualitative component is made up of the metaphors they have developed about the definition of digital literacy. The study was carried out with 297 prospective teachers who are pursuing their education at the Faculty of Education in Turkey. When the results of the study were analyzed, it was found that there was no significant difference between the digital literacy scores of the teacher candidates and the departments in which they were trained, but there was a significant difference in the grade and device ownership variables. The definitions were reached as a result of the study of the metaphors that were grouped under the headings "vitality," "integrity," "guidance," "complexity", and "eternity."

Keywords: *Teacher candidates, digital literacy, metaphor.*

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Introduction

In the digital world, the 21st century is turning into a knowledge society that incorporates many worlds with easier access to information and better sharing of information (Gulbahar, Tinmaz & Kose, 2006). These rapid changes in human life have become a necessity for many skills to be at the forefront of the education dimension of the new century. In such a context, the term 'New Literacy' as understood in the literature is a new way of reading on the Web. Traditionally, we used to read on the paper format (books, articles, reviews, etc.) but with the arrival of the Internet, a new way of reading appeared 'Digital texts' (Giron-Garcia & Navarro, 2014). In the past, however, there was a tradition of reading printed materials or writing on paper; today, with technology, the act of reading/writing has changed, and this has contributed to the emergence of new forms of literacy.

Throughout today's information age, individuals need to be familiar with advancements and improvements, to be aware of constantly updated technology, to be aware of making the best use of information sources, and also to make the best use of their skills. The impact of the 5.0 industrial revolution on society should be well observed while assessing this transformation. Transformation is not only a shift in industrial production over a definitive 5.0 society; it reflects a transition in all segments of society (Granrath, 2017). In this regard, the impact of society 5.0 on education includes the development of creativity, primary and secondary information technology literacy and lifelong learning (Keidanren, 2016). Increasing the pace of technology development and distribution in this knowledge society, which emerged from the transformation process, has made digital literacy not a right, but a requirement (Ekmen & Bakar, 2018). In this way, it can be said that digital literacy plays an important role in the development of society 5.0.

Ng (2012), on the other hand, describes the characteristics of an individual with advanced digital literacy skills as' (1) He/she can access information from daily sources during the research process. He/she can perform basic computer-based operations and access tools for daily use. (2) Selects and establishes the most appropriate tools to complete a task. (3) He/she can perform basic computer-based operations on a daily basis. (4) He/she protects himself/herself from harmful stimuli when using online resources. In this sense, digital literacy can be seen as an individual's use of

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technology, his/her own life skills and the transition of existing experiences to new situations when preparing his/her digital acts through his/her life. With this aspect, we can accept digital literacy as one of the competences that contributes to human life.

Dimensions of Digital Literacy

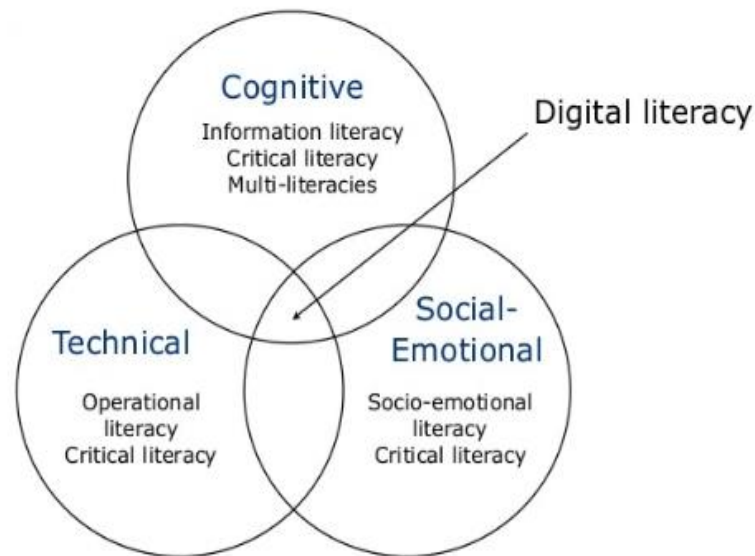


Figure 1. Dimensions of Digital Literacy. (Ng, 2012a)

As shown in Figure 1, it can be said that digital literacy has three dimensions: technological, cognitive and social. The cognitive aspect of digital literacy requires knowledge of protection in digital access, copyright, the ability to select and analyze suitable software programs, the development of online content and commerce. The technical aspect of digital literacy may include the use of information and communication technologies and the ability to connect to devices such as headsets, external speakers and smart boards. In addition, Ng's (2012b) research addresses the problem-solving and security of files across web-based tools in the technological context of digital literacy. Figure 1 shows, the ability to make effective use of social networks in the socio-affective aspect of digital literacy. Critical literacy is involved in all three dimensions of this digital literacy model. In this context, critical literacy includes understanding written, visual, oral, interactive texts in order to challenge and answer the behaviors, values, and beliefs that underlie the digital environment (Ng, 2012b).

Digital literacy is the capacity of individuals to generate new knowledge when engaging in their lives, access to digital data, interpret and synthesize, assess, make appropriate use of digital tools and learn about this process (Martin, 2005).

Students of the 21st century are expected to have skills such as being creative and innovative, problem-solving, flexible, entrepreneurial and self-managing, and literate in information and communication technologies. The curriculum should, therefore, be prepared, developed, and revised in accordance with these skills (Sak, 2017). The curriculum introduced by the Ministry of National Education at primary, intermediate and vocational levels; principles of digital literacy, technology, media, etc. are emphasized. Main competencies such as cultural awareness, initiative-taking and entrepreneurship, citizenship, learning to read, digital competence, and competence in the mother tongue and in foreign languages exist within the framework of the Turkey Qualification Framework (Ministry of National Education, 2017). Digital literacy, which is at the forefront of teaching programs, requires the correct use of different technologies and the ability to access, produce and share accurate information and to use technology in learning-teaching processes.

In addition, individuals' perceptions of digital literacy are important. People create many metaphors in their daily lives to show how they perceive the world. Metaphors are used as a cognitive tool in people's perception of the real world (Nikitina & Furuoka, 2008). Metaphor is not only a language feature, a device of poetic and fancy expression but also an indispensable element of thought, reasoning, and action. A metaphor is the quality of concepts, not words. In this state, metaphors make our perception of the world, our style of finding the way, and the way we communicate more meaningful. They direct actions and thoughts. From this point, the perceptions of the individual formed through metaphors can give information about the behavior of the individual. In this context, the metaphors they create about digital literacy have a strong influence on explaining the meaning of their digital literacy levels.

In this context, if we take digital literacy as a life skill, we can say that individuals have the ability to access digital resources, use digital tools, and access information safely and ethically through digital tools. Digital literacy, which is one of the main competencies in our curriculum, is thought to be important for the training of prospective teachers who will carry out the curriculum.

The aim of this study was to investigate the level of digital literacy and metaphorical perceptions of teacher candidates studying at the Faculty of Education. To this end, two research questions have been raised:

1. Does the level of digital literacy of prospective teachers differ by class, department, school, and computer-ownership?
2. With what metaphors do students explain the concept of digital literacy?

Methodology

In this analysis, a mixed approach has been used to integrate, interpret, and present the results of both qualitative and quantitative data within a basic framework. Quantitative and qualitative data were obtained together in this way; however, they were analyzed separately. The conclusions were outlined in the analysis and review section (Creswell, 2003). With this method, strong evidence for results can be provided by looking at the proximity and accuracy of the findings, since it is not limited to a single method, research questions can be answered more broadly (Johnson & Onwuegbuzie, 2004).

Participants

The research was conducted with 297 prospective teachers in the second, third, and fourth grades of the Sinop University Faculty of Education in the 2018-2019 academic year. The objective sampling approach was used to classify the participants. The main criteria for this sampling process are the taking of training technologies and content development, information systems, and educational technology courses. In the meantime, the criterion that these courses were taken from the same faculty members was taken into account. The distribution of the personal information of the participants in the study is shown in Table 1.

Table 1. Distribution of the personal information of the participants in the study

	Group	f	Percentage
Gender	Female	213	71.7
	Male	84	28.3
Grade	Second grade	96	32.3
	Third grade	113	38
	Fourth grade	88	29.6
Department	Preschool teaching	76	25.6
	Science teaching	54	18.2
	Classroom teaching	98	33
	Turkish language teaching	30	10.1
	Elementary maths teaching	39	13.1
Total		297	100

As shown in Table 1, the study included 213 female and 84 male participants. The research involved 96 second, 113 third, and 88 fourth grade teacher applicants. In addition, 76 Pre-school, 54 Science, 98 Primary School, 30 Turkish Language, and 39 Elementary Mathematics teachers participated in the study.

Data Collection

Two different data collection approaches have been adopted in this report, which seeks to assess the digital literacy of teacher candidates. In the first part of the study, a 17-item "digital literacy scale" was used that was tailored to Turkish (Hamutoglu, Gungoren, Uyanik & Erdogan, 2017). The scale was finalized based on opinions on the validity of the six experts in the fields of measurement and evaluation, curriculum development and training technology.

Table 2. Reliability coefficient of the scale used in the research

Scales	Reliability Coefficient	Item numbers
Digital Literacy Scale (2017)	.93	17
<i>Sub dimensions of Digital Literacy Scale</i>		
Attitude	.88	7
Technical	.89	6
Cognitive	.70	2
Social	.72	2

The scale used in this analysis is a mixture of four variables, which were attitude ($\alpha = 0.88$), technical ($\alpha = 0.89$), cognitive ($\alpha = 0.70$), and social ($\alpha = 0.72$). In the first adaptation process, the Cronbach's Alpha reliability coefficient of the scale was given as $\alpha = 0.93$. In this study, the reliability coefficient obtained from the scale data was calculated as $\alpha = 0.89$.

Second, in research with the form of metabolic determination, "Digital literacy is like Because they've been trying to determine the metaphors of digital literacy and the reasons that the teacher candidates have created in their minds.

Data Collection and Analysis

In the research, questions related to the "digital literacy scale" and the development of a metaphor were discussed with prospective teachers in the sample.

In the research process, the normality test was first applied to variables within the framework of the study, and it was analyzed whether the results showed a significant distribution. Digital literacy scores were shown to have a normal distribution on research variables such as class, department and grade level ($p < 0.05$). The level of importance at the level of 0.05 in the study requires the use of non-parametric tests; however, the lack of validity requires the use of parametric tests (Can, 2014). After this important study, the quantitative results of the research were analyzed using the t-test and the ANCOVA.

Qualitative data obtained in the research were analyzed using the content analysis tool. The aim of the content analysis is to bring together similar data in a conceptual and thematic framework and to interpret the data obtained in a way that the reader can understand (Yildirim & Siuisek, 2008). Since the qualitative aspect of the study was focused on a metaphor analysis, the phases of Saban's (2008) metaphor analysis were observed.

1.Coding and Screening: In the first place, the examples used by teacher applicants to describe their degree of digital literacy have been established. The relationship between the metaphor and digital literacy has been explored and invalid metaphors have been removed. In this sense, 109 valid metaphors have been reached by removing the forms that could not generate meaningful metaphors and the ones left blank.

2.Category Creation Stage: The 109 examples and descriptions provided by the candidates for teaching have been analyzed and an attempt has been made to explain how prospective teachers viewed digital literacy. An interpretation study was conducted on the source-subject relationship metaphors. A total of five groups associated with related metaphors have been created as a result of the content analysis.

3.Reliability and Validation Phase: Detailed information on the analysis of the data collection of the study process has been included in order to ensure validity and reliability. All of the generated metaphors have been listed in a list. Two faculty members were asked for expert opinions on the metaphors and the categories reached by the explanations. Necessary adjustments have been made in compliance with the input received.

Specific quotes from prospective teachers concerning the metaphors and descriptions in the categories produced have been included. In order to confirm the accuracy of the categories established in the analysis, the categories created, the metaphors generated and the explanations provided for these metaphors were given to a teacher who is an expert in the field.

The expert was asked to match the produced metaphors with the categories. After the expert opinion, the unconformable metaphors were analyzed and the types and metaphors constituting the category were finalized.

The reliability formula of Miles & Huberman (1994) ($\text{Reliability} = \text{Consensus} / (\text{Consensus} + \text{Disagreement})$) was used to measure the reliability coefficient of the sample. The reliability coefficient for the categories created was estimated to be 85%.

Findings

The Significance Levels of Teacher Candidates' Digital Literacy Levels According to Determined Variables

In the first sub-problem of the research, the question was: "Are there any significant differences depending on the variables determined with respect to the level of knowledge and program literacy of teacher candidates?" It was tried to be answered. Consequently, first of all, the distribution of variables within the scope of the research was examined by applying the normality test.

Table 3. K-S Test Applied to Determined Variables

	Normality Test (Kolmogorov-Smirnov)		
	Statistics	Degree of Freedom	Significance Level
Gender	.65	297	.14
Department	.66	297	.10
Grade	.71	297	.15

When Table 3 is analyzed, it is shown that the digital literacy scores display a normal distribution of the variables ($p < 0.05$). The level of significance at the level of 0.05 in the research requires the use of non-parametric tests; however, the lack of relevance requires the use of parametric tests (Can, 2014). For this reason, parametric tests have been used to analyze the findings of the research.

Findings Related to Digital Literacy Levels of Teacher Candidates:

In this context, the question of "Do the teacher candidates' digital literacy levels change according to gender, department, grade, and computer ownership?" was tried to be answered.

Table 4. *t* Test Results of Digital Literacy Scale Scores Related to Gender

	Gender	N	\bar{x}	SD	df	t	p
Digital Communication Literacy	Female	213	64.80	9.08	295	.55	.45
	Male	84	67.92	9.90			

When Table 4 was analyzed, a significant difference ($F=.55$; $p=.45$, $p > .05$) was observed between the scores of prospective teachers on their gender-specific level of digital literacy. Nevertheless, although the results were not relevant, it was seen that the level of digital literacy among male teacher candidates was higher than among female teacher candidates.

When examining the gender distribution of the teachers participating in the study, it was shown that the number of female teachers was 213 and the number of male teachers was 84. In view of these numbers, the fact that the number of participants in the gender variable was different from each other can be expressed as one of the limitations of the study. Table 5 indicates whether the digital literacy levels of teacher applicants differ according to their divisions.

Table 5. ANOVA results of digital literacy scores of teacher candidates regarding their departments

Department	N	\bar{x}	SD	Source of Variance	KT	df	KO	F	p
Preschool	76	3,78	,68	Intergroup	381.34	3	95.33	1.07	.36
Science	54	3,96	,54	In-Group	25838.15	292	88.48		
Classroom	98	3,83	,50	Total	26219.50	296			
Turkish Lan.	30	3,92	,47						
Maths	39	3,91	,43						
Total	297	3,86	,55						

Table 5 reveals that the digital literacy ratings of prospective teachers do not show a statistically significant difference according to the department variable ($F=1.07$; $p=.36$, $p > .05$). Table 6 shows whether there is a significant difference in the level of digital literacy among teacher candidates who own computers.

Table 6. The *t* test results of Digital Literacy Scale scores according to computer ownership

Computer Ownership		N	\bar{x}	SD	df	t	p
Digital Literacy	Yes	213	67.44	8.70	295	.21	.64
	No	84	67.17	9.82			

When Table 6 was analyzed, it was found that there was no substantial difference in the level of digital literacy among teacher candidates with respect to computer ownership ($F=.21$; $p=.64$, $p>.05$). It was found that having a private computer at home did not affect the digital literacy of prospective teachers. Table 7 shows whether the grades in which students are educated make a significant difference to the digital literacy scores of the teacher candidates.

Table 7. ANOVA results of digital literacy scores according to grade level of teacher candidates

Grade	N	\bar{x}	SD	Source of Variance	KT	df	KO	F	P
2nd grade	96	3,74	,58	Inter group	3,14	3	1.57	5.27	.00
3rd grade	113	3,98	,52	In group	87,580	294	.29		
4th grade	88	3,83	,52	Total	90,725	296			
Total	297	3,86	,55						

When Table 7 was examined, a significant difference ($F= 5.27$; $p=.00$, $p <.05$) was found between the level of digital literacy of prospective teachers based on the grade level they studied. The Tukey multiple comparison test was used to determine the source of the discrepancy based on the data collected from the research findings. Between the third ($x= 3.98$) and the second grade ($x= 3.74$) students, there was a significant difference in the level of digital literacy in favor of the third-grade teacher candidates.

The second research level, the results obtained from the metaphors developed by prospective teachers on the topic of digital literacy are summarized, then the categories generated from the metaphors are presented in figures and, finally, the phrases used by the teacher candidates to describe the metaphors are provided by quotation. Abbreviations are used for quotations from participants, T1, T2, etc. The metaphors obtained as a result of the research are shown in Table 8.

Table 8. Teacher Candidates' Metaphors on Digital Literacy

No	Metaphor	No	Metaphor	No	Metaphor	No	Metaphor
1	Water (f11)	28	World(f2)	55	Black hole	82	Wind
2	Book (f9)	29	Earth's core (f2)	56	Door	83	Live broadcast
3	Tree (f6)	30	Road (f2)	57	Safe	84	Organ
4	Cigarette (f5)	31	Sea	58	Guide	85	Mirror
5	Life (f5)	32	Balloon	59	Activity	86	Illumination
6	Library (f4)	33	Chocolate	60	Box	87	Lens
7	Key (f4)	34	Wheel	61	Bird	88	Onion
8	Need(f4)	35	Button	62	Savior	89	Junk food
9	Robot (f4)	36	Entertainment	63	Well	90	Carotid
10	Aircraft (f3)	37	Seat Belt	64	Culture	91	Umbrella
11	Compass (f3)	38	Garbage	65	Knife	92	Building
12	Computer(f3)	39	Food	66	Labyrinth	93	Plate
13	Encyclopedia(f3)	40	Conscious consumer	67	Leadership	94	Sweet
14	Education (f3)	41	Rainbow	68	Machine	95	Plant
15	Light(f3)	42	Fire	69	Occupation	96	Info Basket
16	Sun (f3)	43	Safe information	70	Season	97	Sloth
17	Teacher (f3)	44	Grey	71	Ladder	98	Ball
18	Love (f2)	45	Wedding Dress	72	Fruit Garden	99	Tractor
19	Glasses (f2)	46	Map	73	Candle	100	Drug
20	Child (f2)	47	Acrobatics	74	Antidote	101	Independence
21	Cloud(f2)	48	Treasure	75	Money	102	Kite
22	Driver (f2)	49	Nutrimint	76	Cake	103	Space
23	Television (f2)	50	Addiction	77	Rice	104	Vitamin
24	Telephone (f2)	51	Human	78	Diamond	105	Body
25	Eraser (f2)	52	Pen	79	Soldier	106	Star
26	Ocean (f2)	53	Paper	80	Friend	107	Pit
27	Universe (f2)	54	Cactus	81	Rocket	108	Instruction
						109	Innovation

When Table 8 was examined, a total of 109 different metaphors were reached. The most repeated metaphors among teacher candidates were water (f: 11), book (f: 9), tree (f6), life (f: 5), cigarette (f: 5), key (f: 4), need. (f: 4), robot (f: 4), library (f: 4), encyclopedia (f: 3), computer (f: 3), education (f: 3), sun (f: 3), teacher (f: 3), aircraft (f: 3), compass (f.3), love (f: 2), cloud (f: 2), core (f: 2), children (f: 2), world (f: 2), universe (f: 2), glasses (f: 2), light (f: 3), ocean (f: 2), eraser (f: 2), driver (f: 2), television (f: 2), telephone (f: 2), road (f: 2). When the metaphors formed by the prospective teachers

in the research sample about digital literacy are examined, it is noteworthy that they are generally associated with an object or abstract concepts.

The metaphors of the prospective teachers regarding digital literacy skills are given in Figure 2. As indicated in Figure 2, the metaphors that teacher candidates emphasize are seen more prominently in large fonts.



Figure 2. Word Cloud on Metaphors Reached in Research

Metaphors of teacher candidates relevant to digital literacy were evaluated and the categories reached were collected under the headings "vitality," "integrity," "guidance," "complexity" and "eternity."

Table 9. The metaphors and their definitions in these categories are given below in Research

Category	Metaphors Generated	Definition We Created	Samples
Vitality	Event, junk food, friend, love, fire, mirror, balloon, nutrient, knife, plant, cloud, magnifying glass, wheel, chocolate, infant, garbage, pit, button, entertainment, seat belt, fruit, sun, wedding dress, life, treasure, person, pen, paper, cactus, antidote, money, rice, diamond, wind, cigarette, eraser, onion, water, safe, savior, community, plate, candy, ball, vitamin,	By creating multiple metaphors in this category, prospective teachers in the sample highlighted the importance, requirement and value of digital literacy skills in life.	A teacher candidate says, "Digital literacy is like a friend, it supports us like a friend" (T21). Another teacher candidate says, "Digital literacy gives us faith in the use of other digital tools like a seatbelt" (T101).
Integrity	Tree, encyclopedia, illumination, universe, rainbow, robot, organ, computer, information basket, building, box, world, library, machine, seasons, body, and fruit garden	In this category, in which metaphors were created, the candidates expressed digital literacy skills as a whole in the system.	In this context, while a teacher candidate said, "Digital literacy is like a library and provides you with new resources as your skills develop." (T212) Another one compared it to an encyclopedia and said, "You can access any kind of information at any time" (T134).
Guidance	Key, candle, glasses, secure information, map, compass, rocket, lamp, need, instructor, door, guide, book, carotid artery, driver, TV, mobile, live broadcast, aircraft, leadership, profession, education, ladder, star, path, instruction	The importance of digital literacy as a leading force in the preservation of teaching as a career is highlighted in this category of many items.	The teacher candidate said that "A person can access the information he wants as a rocket at any time without being limited to a single location" (T243). Another candidate said, "This brings people closer to physical needs like a TV."

Table 9. Continued

Category	Metaphors Generated	Definition We Created	Samples
Complex	Soldier, addiction, freedom, conscious user, acrobatics, world heart, cat, labyrinth, umbrella, sloth, tractor, narcotics, and creativity	In this category, prospective teachers explained that they found digital literacy skills complex and boring.	While a teacher candidate said, "Digital literacy is like a drug because it makes people addictive" (T205), another explained, "Today, facebook, twitter and so on. Various social networks are used and therefore people with a high level of digital literacy are becoming addicted "(T95). These comments on digital literacy skills indicate that the term is perceived negatively.
Eternity	Black hole, ocean, well, sea, kite, space	In this chapter, it is stressed that there are no drawbacks to digital literacy skills.	A teacher candidate said, "Digital literacy is like a freedom-giving kite because, by learning digital literacy skills, people recognize that there are no human limitations" (T1279). Another approached digital literacy from a different perspective, saying, "Digital literacy is like a black hole, constantly pulling you in like you're on an endless path" (T177).

Discussion

Nowadays, the use of digital technology makes a difference in every aspect of life. In this sense, the ideology of Society 5.0 is that technology should be viewed by communities as an aid, not as a threat. The Science, Technology and Innovation Council of the Japanese Government describes Community 5.0 as a super-intelligent society in which cyberspace and physical space are highly integrated (Kent, 2019). The future of society is evolving due to the advancement of technology, and this change first affects educational institutions. In this phase, the education system through our country is creating a framework in which individuals can meet the age requirements. In this regard, the concept of digital literacy has been considered to be an important part of our country's education system and has been included in the core competencies of education.

Once prospective teachers who joined the study were tested, it was shown that their level of digital literacy did not differ according to the gender variable. When the level of digital literacy was analyzed by gender, it can be said that male and female students gave similar responses to the scale of digital literacy. In Kazu and Erten (2014) reports, there was no substantial difference in the level of digital literacy of prospective teachers based on gender. However, the fact that there is no significant difference between the level of digital literacy and gender in many of the studies that address the topic underpins the current research (Gokcearslan & Bayir, 2011; Donmez, 2019). In addition to studies supporting the results, the relevant literature also includes studies in which the level of digital literacy of teacher candidates varies by gender (Acar, 2015; Cetin, 2016; Kiyici, 2008; Korkmaz & Mahiroglu, 2009; Ozerbas & Kuralbayeva, 2018; Sarikaya, 2019; Timur, Timur & Akkoyunlu, 2014; Yildiz, Kahyaoglu & Kaya, 2012;).

In addition to the available results, there was a high level of digital literacy among both male and female teacher candidates in the study, indicating a similarity between the sexes. Although there was no difference in the gender variable, it was worth noting that the digital literacy average for male teacher candidates was higher than for female teacher candidates.

According to the "Household ICT Use Survey" conducted by the Turkish Statistical Institute, the computer and Internet usage rates for men are 68.6% and 50.6%, for women 80.4% and 65.5% (TURKSTAT, 2019). On this basis, it can be understood that male teacher candidates can easily access technical resources compared to female teacher candidates. Such data support a small disparity in gender in favor of male teacher applicants for digital literacy. In the report, it was decided that the digital literacy levels of prospective teachers did not show major departmental variations.

When studying courses in the faculties of education, courses such as computer science, information technology, education technologies, and material development in education are common courses in all departments. The lack of a difference in the degree of digital literacy in the department variable can be explained by the success of these specific courses.

The study found that the digital literacy levels of prospective teachers did not show a significant difference in the possession of a personal computer. This result is the opposite of some literature studies. In some literature research, there was no significant difference between computer-based instructor candidates and digital literacy (Clard, 2007; Goldag & Kanat, 2018; Kiyici, 2008). It is quite natural that the influence of technology on daily life is clearly observed. Because the existence of smart phones in each individual's pocket and the widespread use of the Internet in open spaces make the existence of a personal computer insignificant. In a study by Donmez (2019), approximately 70% of students were connected to the Internet for more than three hours a day; 40 per cent used social media for more than three hours, and 88% of students used smartphones extensively. The results of this research are supported by the results of the present study. According to Kozan and Ozek (2019) in the digital world, the ability of individuals to navigate digital resources in different ways improves users' familiarity with digital technologies.

It can be said that increasing knowledge and experience has an important role to play in increasing the level of digital literacy among candidates. According to research findings, the level of digital literacy of prospective teachers varies depending on the grade at which they study. It is known that the disparity that exists according to the grade level between the third grade and the second-grade teacher candidates is in favor of the third-grade teacher candidates. Moreover, although there is no difference in the average level of digital literacy, it is observed that it is higher in the fourth grade than in the second grade. In the research of Goldag and Kanat (2018), it was found that the level of digital literacy increased as the grade level increased.

It can be said that courses such as "Educational Technologies, Information Technology, and Content Production in Education" taught in the first years of undergraduate education are effective in creating a significant difference in the degree of digital literacy. The improvement in the expertise of the teacher applicants annually demonstrates the distinction that exists at the grade level. In this sense, it can be said that the level of digital literacy increases as the grade level increases.

Teacher candidates created 109 metaphors to clarify their views on the idea of digital literacy. The most widely used metaphors were water, book, tree, life, cigarette, key, need, robot, library, encyclopedia, machine, school, sun, teacher, plane, and compass. Metaphors such as a person, water, sun, wind, machine, robot, book, and the world created in this study were also produced in Karacam and Aydin's (2014) Metaphor Study with High School Students. It can be seen as a positive result that the metaphors created by students in younger age groups about the definition of digital literacy overlap with the metaphors provided by prospective teachers.

In addition, when the study of metaphors relating to digital literacy, education technology, technology, and computer concepts is studied, it can be seen that there are similar studies whose metaphors are similar to those of this research. For example, in the Kuru and Kuru study (2019), metaphors such as water, car, game, book, sun, spine, robot, room, and brain were created for the definition of educational technology. In the study of Durukan, Hacıoglu and Usta (2012), teacher, space, universe, light, game, human, life, water, book, and clock metaphors were produced by the teacher candidates. In the analysis of Ekici (2016), prospective teachers created brain, television, book, cigarette, encyclopedia, library, universal information box, buddy, mobile phone, and computer-related world metaphors.

The categories were reached as the metaphors were grouped under the headings "vitality," "integrity," "guidance," "complexity", and "infinity." It was determined that all the metaphors produced in these categories reflect positive perceptions of the concept of digital literacy. Prospective teachers have interpreted the definition of digital literacy that is essential for teacher education in the "vitality" category; positive for teacher education in the "integrity" category; a guide for prospective teachers in the "guidance" category; negative in the "complexity" category and as a term that offers endless opportunities for learning in the "infinity" category.

In the 21st century, the digital age of the world, our country's education programs are being developed within the framework of core competencies. However, the digital competencies of teacher candidates should be taken into account, as studies conducted on this subject cannot exceed the quality of any kind of education system. It is necessary to review our country's teacher training programs in compliance with the requirements of the digital age and to support the introduction of the programs in this direction. Many prospective teachers have found the concept of digital literacy complex. In this way, interactive learning platforms should be created in the student-teaching process, which will encourage the interest of prospective teachers and provide them with critical thinking opportunities. In this regard, training courses on digital content and the growth of digital literacy should be scheduled in the education faculties in particular.

Based on these results, the following suggestions can be made about new studies. The research focused on digital literacy levels of teacher candidates and metaphorical perceptions about digital literacy. Similar studies can be conducted with teacher candidates studying at the faculty of education, and the results can be compared. In the next

studies, the digital literacy of teachers and students can be studied. In addition, the digital literacy levels of prospective teachers can be determined, and trends between their digital literacy levels and their metaphorical perceptions can be examined.

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