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A Mixed-Method Research on Digital Literacy of Middle School Students

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ABSTRACT

The purpose of this study was to reveal middle school students' digital literacy levels and their opinions about digital literacy. Convergent parallel design, one of the mixed-method designs, was used in the study. Quantitative part involved survey while qualitative part included case-study model. Digital literacy scale and semi-structured interview form were used to collect the data. The participants in the quantitative part involved 367 students studying at a state middle school in Kırşehir while 12 students took part in the qualitative part. The data analysis was conducted separately, and general conclusions were drawn and combined during interpretation. Although students had high scores from the digital literacy scale, the in-depth qualitative analyses showed that they did not have adequate information about the concept of digital literacy. Moreover, the quantitative results showed that students, who used digital technologies for research purposes, had higher scores from the security dimension of digital literacy scale than the students who used digital technologies for studying. However, the qualitative results revealed that students used digital technologies most commonly for entertainment. It was found that students' digital literacy was significantly differed by their gender, grade level, book-reading duration, and internet-use duration while it did not significantly differ by their purpose of using digital technologies. Additionally, based on the qualitative results, students agreed that social studies course contributed to their digital literacy.

Key words: Digital Literacy, Digital Literacy Education, Social Studies Education, Digital Literacy in Turkey

INTRODUCTION

The proliferation of technologies in the digital age exposes individuals to situations that require the use of ever-increasing technical, cognitive and sociological skills in order to perform effectively in digital environments. These skills are called "digital literacy" in the literature (Bawden, 2001, 2008; Blikstad-Balas, 2012; Eshet-Alkalai, 2004; 2012; Eshet-Alkali & Amichai-Hamburger, 2004; Gilster, 1997; Hague & Payton, 2011; Honan, 2008; Lankshear & Knobel, 2006; 2008; Martin, 2005, 2008; Ng, 2011; 2012; Ribble, 2011; Sefton-Green et al., 2009).

When the literature is examined, it is seen that the definitions related to the concept of digital literacy have become more complex with the effect of changes and transformations in information and communication technologies. In the early stages, Lanham (1995) states that since digital resources can produce many forms of information (text, image, sound, etc.), a kind of "multimedia literacy" is needed to make sense of these new forms of presentation, which is quite different from traditional literacy (Bawden, 2001). Gilster (1997), who meets this need with the concept of digital literacy, drew attention to the ability to understand and use information from a wide variety of sources in multiple formats. That is because this new literacy does not only consist of using the computer well, but also points to a special skill related to mastering ideas (Lankshear & Knobel, 2006). Martin (2005, p.135) explained digital literacy quiet descriptively: "Digital literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process.". While Eshet-Alkalai (2004) states that this type of literacy means having the cognitive, sociological, and emotional skills necessary to understand the digital world, benefiting from the opportunities of this world, and using technology effectively and efficiently, Ribble (2011) defines digital literacy as the process of teaching and learning about technology and its use. As a matter of fact, digital literacy includes many skills that cannot be limited to the ability to use digital devices. Surfing the web, using social networks, working with databases, etc. includes many cognitive skills (Eshet-Alkalai & Amichai-Hamburger, 2004). In other words, it is a combination of awareness, attitudes, and skills necessary for

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individuals to use digital tools effectively. That is because digital literacy includes not only accessing information, but also using it, reflecting on daily life and critical questioning of the information gained (Martin, 2005; 2008).

Comprehensive definitions of digital literacy also appear to include critical thinking and problem-solving processes, beyond being skills-based, including the ability to solve problems effectively in a technology-rich environment. This concept was expanded by Eshet-Alkalai (2004, p. 94) as "photovisual literacy, reproduction literacy, information literacy, branching literacy and socio-emotional literacy". Honan (2008) categorized these skills as breaking the code of texts, participating the meaning of the texts, using the texts functionally and critically analyzing and transforming the texts. Hobbs (2011) indicates that digital literacy includes some competencies such as "Access (the use of technologies to access information), analyze and evaluate (higher-order skills such as evaluation, analysis, and synthesis), create (the ability to compose and create artifacts), reflect (the engagement in reflective thinking), act (the activity of sharing knowledge individually and collaboratively publicly)" (as cited in Marty et al., 2013, p. 410). In another definition, digital literacy is expressed more broadly. It involves eight basic skills including functional skills, creativity, critical thinking, cultural and social understanding, collaboration, the ability to find and select information, effective communication, and e-safety (Hague & Payton, 2011).

Since the concept of digital literacy connotes a large number of competencies, skills and knowledge, it is superficial to simply equate it with using digital technologies (Sefton-Green et al., 2009). This type of literacy is a much broader concept than specializing in technical skills (Blikstad-Balas, 2012) and consists of important skill sets (Techataweewan & Prasertsin, 2018). When the literature is examined, it is seen that there are some changes in the definitions of digital literacy from past to present. While the first definitions emphasized the skills of accessing and using information, there were various changes in these emphases in the following years. The term digital literacy has been associated with a variety of skills, including computer literacy, information and communication technology literacy, media literacy, information literacy and e-literacy etc. This relationship has been reflected on a wide range of spectrum from the definitions emphasizing "basic skills and competencies" (Bawden, 2008) to definitions viewing digital literacy as "ideas, not keystrokes" (Gilster, 1997). In the first of such definitions, the traditional concept of literacy was expanded to take into account emerging new technologies and formats. In later definitions, literacy was seen as a dynamic process by focusing on the effects of socio-cultural perspectives (Bawden 2008; Lankshear & Knobel, 2008). Especially in parallel with the developments in information and communication technologies, the skills of accessing digital resources, creating digital resources, evaluating and interpreting them have come to the fore. It was also considered as a set covering many skills such as communication, computer, technology, media, internet literacy. Later, the ability to effectively use digital resources and produce content was added to all these skills. In definitions of digital literacy, a complex picture of digital literacy emerges, including having functional technology skills and understanding and applying socio-cultural norms that must be followed while using technology (Watulak, 2016).

Being digitally literate in the 21st century means that teachers and students must understand the impact of digital media on our society, develop strategies to analyze it critically, and be openminded to adopting new teaching and learning tools (Sadaf, 2019). Understanding what people do with technological devices in their daily lives and knowing how they engage in reading, writing and communication in daily digital literacy practices is important to reshape literacy teaching (Tour, 2017). Digital developments especially in recent years have been widely used in educational environments and have had an impact on what kind of competencies and skills students will be equipped with. As a matter of fact, this situation has also been reflected to education policies and curriculums. This process, which resulted in the enrichment of teaching activities, offered many new opportunities to students and increased the possibilities of producing, sharing and reaching information. All these developments have required students to analyze, synthesize and evaluate the information obtained from various sources with a critical perspective (Özerbaş & Kuralbeyeva, 2018; Pala & Başıbüyük, 2020a).

For an individual to be digitally literate is directly related to adaptation to new or emerging technologies (Ng, 2012). Digital literacy encompasses the effective use of the knowledge and skills necessary to perform a wide variety of complex tasks in digital environments (Lee, 2014). Digital literacy requires more than the skills to use software and operate a digital device. In other words, the rapid development of digital technologies in the digital age confronts individuals with situations that require the use of ever-increasing technical, cognitive and sociological skills necessary to solve problems in digital environments (Eshet-Alkalai & Amichai-Hamburger, 2004).

A digitally literate individual should be able to use the computer effectively, have a good command of the applications on the internet, and know how and when to use the skills they have for a solution when faced with a problem. The expectation here is how the acquired knowledge will be assimilated, evaluated and then used (Pool, 1997; Lankshear & Knobel, 2006). In addition to all these technological and cognitive abilities, the digitally literate individual should also consider some ethical rules such as the correct and controlled use of social media, avoiding cyberbullying behaviors and respecting the private rights of the person and act accordingly (Canberk & Sağıroğlu, 2007; Ocak & Karakuş, 2019). In other words, individuals should know how to protect their own security and privacy by keeping their personal information confidential, they should be knowledgeable about keeping personal information confidential, protecting personal security, and how to deal with this threat (Okumuş & Atılgan, 202; Öztürk & Budak, 2019).

Despite the indisputable importance of digital literacy skills today, there is still a digital gap in many places and

at age levels. Lack of digital literacy is recognized as one of the major problems facing the digital society. The fact that information, communication, daily work and many social functions are increasingly being done on the internet puts individuals with digital literacy deficiency at a disadvantage in this process. In order to reduce this gap, the need for digital literacy education is increasing. Digital literacy education aims to support students' knowledge and skill building processes through education and practices to improve their digital literacy (Lee, 2014). At this point, an essential responsibility is placed on those who prepare the curriculum in educational institutions around the world and the teachers who are the executives of these curriculums.

In Turkey, it is seen that the rapid changes in science and technology directly affect the changing needs of the individual and society, and the Turkish education system aims to raise individuals with the knowledge, skills and behaviors integrated with competencies. The Turkish Qualifications Framework, which is a national qualifications framework, has been prepared for these purposes. Based on this framework, various updates were made in primary, secondary and higher education programs (Millî Eğitim Bakanlığı [MEB], 2018; Mesleki Yeterlilikler Kurumu, 2015). One of the programs based on this national framework is the 2018 Social Studies Curriculum. It is seen that digital competence, which is one of the competences determined in the Turkish Qualifications Framework, is included in this curriculum. Digital competence refers to "basic skills such as using computers for accessing and evaluating, storing, producing, presenting and exchanging information and accessing information, as well as participating in and communicating in public networks via the Internet "(MEB, 2018, s.5). Digital literacy has a different and broader meaning than the concept of digital competence. Digital competence refers to the abilities to use digital tools to achieve various purposes while in addition to these competencies, digital literacy is a sociological concept that includes cognitive and emotional-social-moral dimensions, has elements of critical thinking and understanding digital culture (Kuş, 2021). Digital literacy, which is the focus of the research, is a skill that is expected to be developed by students within the scope of the learning field of "Science, Technology and Society" in the social studies curriculum. This course, which aims to raise digital citizens by increasing their digital literacy skills, plays an important role in the Turkish education system with its updated curriculum. Within this context, the purpose of the research was to determine the digital literacy levels of middle school students in terms of various variables and to evaluate student views on digital literacy in the context of social studies course. Based on this purpose, the following questions were answered:

1. Do middle school students' digital literacy levels significantly differ by their gender, grade level, book-reading duration, digital technology used, internet time, and purpose of using digital technologies?
2. What are middle school students' opinions about digital literacy?

MATERIALS AND METHOD

Model

Convergent parallel design, one of the mixed-method designs, was used in the study. In the convergent research design, the researcher applies the qualitative and quantitative stages simultaneously (Creswell & Clark, 2011). In the research, qualitative and quantitative data were obtained simultaneously and equal priority was given to the methods. Quantitative part involved survey while qualitative part included case-study model. The data analysis was conducted separately and general conclusions were tried to be combined during interpretation. Within this scope, a scale was administered with the participants for the quantitative part while interviews were simultaneously conducted using semi-structured interview form for the qualitative part.

Implementation Process

The research process took four weeks in 2021-2022 spring semester. The participants were composed of 5th, 6th, and 7th graders studying at a middle school in Kırşehir city center. In the quantitative part, "Digital Literacy Scale", which was developed by Pala and Başıbüyük (2020b) for children of 10-12 ages, was used to collect data from 367 students. For the qualitative part, interview questions were generated based on literature review and expert opinions. After obtaining the required permissions, the data were collected through the interviews with 12 students for two weeks using voice recording device. After transcription, data were analyzed separately, and quantitative and qualitative findings were summarized and interpreted. The research process was based on the flowchart of a design proposed by Creswell and Clark (2011), which was presented in Figure 1.

Study Group

Participants in the quantitative part was composed of 367 middle school students in Kırşehir. Multistage sampling was used and sampling was conducted in two stages. In the first stage of the sampling process, it was decided to conduct the study with homogeneous sampling method in a secondary school where students from similar socio-economic families studied. In the second stage, the instrument was applied to the students in four groups from each grade level determined by random method in this middle school (Büyüköztürk et al., 2014, p. 91). In the qualitative dimension, in which the participants were determined according to typical sampling, one of the purposive sampling

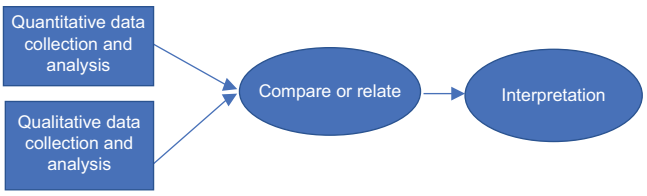

Figure 1. Convergent parallel design (Creswell & Clark, 2011, p.78)

methods, the participants involved 12 students from this middle school. Table 1 and Table 2 present information about participants.

As can be seen in Table 1, 51% (n=187) of the participants were male students and 49% (n=180) were female students while 33% (n=121) were 5th graders, 34% (n=125) were 6th graders, and 33% (n=121) were 7th graders. While 6% (n=22) of students reported no reading activity, 46% (n=169) read 15-30 minutes, 34% (n=126) for 31-60 minutes, 10% (n=35) for 61-90 minutes, and 4% (n=15) read for 91 minutes or more daily. 66% (n=242) of students preferred using smartphone more often while 21% (n=76) preferred computer and 13% (n=49) preferred tablet. 24% (n=90) of students used internet for 15-30 minutes, 41% (n=149) used it for 31-60 minutes, 22% (n=81) used it for 61-90 minutes, and 13% (n=47) used it for 91 minutes or more. Students' purposes of using digital technologies were study (21%, n=77), research (31%, n=114), communication (13%, n=47), and entertainment (35%, n=129).

As Table 2 shows, 58% (n=7) of participants were female while 42% (n=5) were male students. 25% (n=3) were 5th graders, 33% (n=4) were 6th graders, and 42% (n=5) were 7th graders.

Table 1. Data of quantitative participants

Variable	N	%
Gender		
Male	187	51
Female	180	49
Grade Level		
5th grade	121	33
6th grade	125	34
7th grade	121	33
Daily book reading duration		
0 minute	22	6
15-30 minutes	169	46
31-60 minutes	126	34
61-90 minutes	35	10
91 minutes and more	15	4
Digital Technology Used		
Smartphone	242	66
Computer	76	21
Tablet	49	13
Daily internet duration		
0- minute	0	
15-30 minutes	90	24
31-60 minutes	149	41
61-90 minutes	81	22
91 minutes and more	47	13
Purpose of Using Digital Technologies		
Study	77	21
Research	114	31
Communicate	47	13
Entertainment	129	35
Total	367	100

Table 2. Data of qualitative participants

Variable	N	%
Gender		
Male	7	58
Female	5	42
Grade Level		
5th grade	4	33.3
6th grade	4	33.3
7th grade	4	33.3
Total	12	100

Data Collection Tools and their Validity and Reliability

Different data collection tools were used for quantitative and qualitative sections during data collection process of the study.

Quantitative data

The quantitative data were collected using "Digital Literacy" scale which was developed by Pala and Başıbüyük (2020b) for 10-12 years-old students. The 5-point Likert scale was composed of two parts. The first part involved demographics and the second part included 21 scale items. Cronbach alpha coefficient was .87. In the current study, Cronbach alpha was used to determine reliability. It was found .81. A reliability score of.70 and higher indicates the instrument is reliable (Büyüköztürk et al., 2014).

Qualitative data

The qualitative data were collected using a semi-structured interview form developed by the researchers. As indicated by Yıldırım and Şimşek (2016), semi-structured interview form might involve predetermined questions and alternative questions that can be used to get more detailed information during interviews. Following the literature review on digital literacy, interview questions were developed based on the dimensions of the scale. These questions were revised based on expert opinions and these 6 items were used to pilot-test with two students from each grade levels including 5th, 6th, and 7th grades. No problem was encountered and interviews including 6 questions were conducted with 12 students in periods ranging from 13 to 18 minutes. These interviews were conducted with four students from each grade level. Semi-structured interview form included questions related to the definition of digital literacy, appropriate use of digital technologies, the purpose of using digital technologies, language/content/environment encountered in digital resources, precautions to threats encountered in digital environments, and the contribution of social studies course to digital literacy level.

Data Analysis

For the quantitative data, descriptive statistics (percentage, frequency, mean, standard deviation) as well as t-test and one-way ANOVA were used through SPSS 25 since the data demonstrated normal distribution. Findings regarding the normal distribution of the data have been presented in Table 3.

According to Büyüköztürk (2014), the main thing in the analyses is that the scores do not deviate excessively from the normal. The fact that the skewness coefficient was within the limits of -1 and +1 can be interpreted as the scores did not show an important deviation from the normal distribution. According to George and Mallery (2010, p. 409), skewness and kurtosis values between +2 and -2 are sufficient for the normal distribution of the data. When the skewness (-.016) and kurtosis (-.350) values of the digital literacy scale were examined, it was seen that the data demonstrated a normal distribution.

Based on these findings, parametric hypothesis tests were used in the analyses. In this context, independent samples t-test was used to analyze the variables with two groups, and one-way analysis of variance (ANOVA) was used to analyze the variables with three or more groups. The source of the difference was examined with the Tukey test. Another statistic in the interpretation of test results is the effect size. Within the scope of the study, the eta-square correlation coefficient was used to calculate the effect size of the significant difference. Values of .01, .06, and .14 for eta-square are interpreted as small, medium, and large effect sizes, respectively (Büyüköztürk, 2014).

The answers given by the students for the items in the scale are in five-point Likert type and the following formula was used to determine the group value range of assessment scale; "a = Range / Group Number" (Taşdemir, 2003). Accordingly, assessment scale was as follows in Table 4.

For the qualitative data, the voice recordings of the face-to-face interviews were deciphered and analyzed through content analysis technique using MAXQDA 2020 qualitative data analysis software. the purpose of this analysis was to reach concepts that can explain the collected data and find relationships among them. Six themes emerged by combining codes into common categories. Participants were coded while presenting direct quotations from them. For example, a code "6K7Ö" represents the 6th female 7th grader. In the study, triangulation and participant confirmation strategies were used to improve validity and reliability. Triangulation strategy involves the variation of data sources, methods, and researchers while participant confirmation was provided by confirmation of results by data sources (participants) (Yıldırım & Şimşek, 2016).

Table 3. Findings of normal distribution of data

	Skewness	Kurtosis
Overall		
Statistic	-0.016	-0.350
Standard error	0.127	0.254
Information Processing Dimension		
Statistic	-0.342	-0.354
Standard error	0.127	0.254
Communication Dimension		
Statistic	-0.121	-0.627
Standard error	0.127	0.254
Security Dimension		
Statistic	-0.558	-0.198
Standard error	0.127	0.254
Problem-Solving		
Statistic	-0.368	-0.513
Standard error	0.127	0.254

RESULTS

In this section, quantitative and qualitative findings of the study were presented, respectively.

Quantitative Findings

Quantitative findings of the study are given in Tables 5-11 and interpreted.

Table 5 demonstrates that students digital literacy levels were at *mostly* level in overall score (M=3.88), information processing (M=4.02), communication (M=3.45), problem-solving (M =3.68) dimensions while it was at *always* level in security (M=4.30) dimension. These findings can be interpreted that students had a high level of digital literacy.

The results of t-test conducted to reveal whether their digital literacy levels differed significantly by gender were presented in Table 6.

Table 6 demonstrates that overall mean score of male students was M=3.94 while mean score of female students was M =3.83. It was observed that significant differences in overall score (t=-1.976; p<.05) and problem-solving dimension (t=-4.734; p<.05) were in favor of male students. The effect size of the significant difference in overall scale was small (η^2=.01) while it was medium in problem-solving dimension (η^2=.05).

When the information processing dimension was examined, it was found that female students (M=4.03) had higher mean scores than male students (M =4.01) while male students had higher mean scores in communication (M=3.46) and security (M=4.31) dimensions than female students. With respect to these findings, it can be stated that male students had higher digital literacy levels than female students. Moreover, it can be expressed that male students could solve

Table 4. Digital literacy scale weight groups

Weights	Group	Limit
5	Always	4.20-5.00
4	Mostly	3.40-4.19
3	Sometimes	2.60-3.39
2	Rarely	1.80-2.59
1	Never	1-1.79

Table 5. Students' levels of digital literacy

	M	SD	Level
Overall	3.88	0.534	Mostly
Information Processing	4.02	0.598	Mostly
Communication	3.45	0.922	Mostly
Security	4.30	0.484	Always
Problem-Solving	3.68	0.893	Mostly

Table 6. T-test results of digital literacy levels by gender

	Gender	N	*M*	SD	t	p	Effect Size
Overall	Female	180	3.83	0.515	-1.976	0.049	0.011
	Male	187	3.94	0.549			
Information Processing Dimension	Female	180	4.03	0.541	0.380	0.704	
	Male	187	4.01	0.649			
Communication Dimension	Female	180	3.43	0.874	-0.318	0.751	
	Male	187	3.46	0.968			
Security Dimension	Female	180	4.29	0.469	-0.415	0.679	
	Male	187	4.31	0.498			
Problem-Solving	Female	180	3.47	0.922	-4.734	0.000	0.058
	Male	187	3.89	0.813			

Table 7. ANOVA results of digital literacy levels by grade level

Source of Variance	n	M	SD	F	p	Source of Difference	Effect Size
Overall							
5th Grade	121	3.79	0.458	10.238	0.000	7>5	0.053
6th Grade	125	3.81	0.575			7>6	
7th Grade	121	4.06	0.522				
Information Processing Dimension							
5th Grade	121	3.86	0.595	10.608	0.000	7>5	0.055
6th Grade	125	4.00	0.558			7>6	
7th Grade	121	4.20	0.595				
Communication Dimension							
5th Grade	121	3.32	0.845	11.393	0.000	5>7	0.059
6th Grade	125	3.26	0.985			6>7	
7th Grade	121	3.77	0.851				
Security Dimension							
5th Grade	121	4.28	0.466	0.706	0.494		
6th Grade	125	4.28	0.492				
7th Grade	121	4.34	0.494				
Problem-Solving							
5th Grade	121	3.60	0.787	4.035	0.018	7>5	0.022
6th Grade	125	3.58	0.981			7>6	
7th Grade	121	3.87	0.876				

problems in digital technologies more effectively than female students.

One-way variance analysis (ANOVA) was used to reveal whether the differences in digital literacy levels of students by their grade levels were significant and the results were presented in Table 7.

Examination of Table 7 shows that there were significant differences among groups in overall score (F=10.238, p<.05), information processing dimension (F=10.608, p<.05), communication dimension (F=11.393, p<.05), and problem-solving dimension (F=4.035, p<.05). The effect size of differences in overall (η^2=.05), information processing (η^2=.055), and communication (η^2=.05) was medium while the effect size of differences in problem-solving (η^2=.02) was small. For the overall scale, the significant differences were between 5th and 7th graders and between 6th and 7th graders in favor of 7th graders while the significant differences in information processing, communication, and problem-solving dimensions were between 5th and 7th graders and between 6th and 7th graders in favor of 7th graders. Accordingly, grade level can be expressed as an effective variable on digital literacy and 7th graders' digital literacy was high. On the other hand, no significant difference was found in security dimension by grade levels (F=.706, p>.05).

One-way variance analysis (ANOVA) was used to reveal whether the differences in digital literacy levels of students by their book-reading duration were significant and the results were presented in Table 8.

Examination of Table 8 shows that there were significant differences among groups in overall score (F=13.133, p<.05), information processing (F=2.997, p<.05), security (F=2.985, p<.05), and problem-solving dimension (F=1.468, p<.05). The effect size of differences in overall (η^2=.03), information processing (η^2=.03), security (η^2=.03), and problem-solving dimension (η^2=.01) was small. The significant differences in overall score between students with 15-30 and 61-90 minutes of book-reading was in favor of those with 61-90 minutes of book reading. The significant difference was in favor of students with 91 and above minutes of book-reading between 15-30 and 91 and above minutes of book-reading. Finally, the

Table 8. ANOVA results of digital literacy levels by book-reading duration

Source of Variance	n	M	SD	F	p	Source of Difference	Effect Size
Overall							
0	22	3.97	0.583	3.133	0.015	61-90>15-30	0.033
15-30	169	3.80	0.514			91+above>15-30	
31-60	126	3.90	0.531			91+above>31-60	
61-90	35	4.01	0.543				
91 and above	15	4.21	0.537				
Information Processing Dimension							
0	22	4.09	0.692	2.997	0.019	61-90>15-30	0.032
15-30	169	3.93	0.595			91+above>31-60	
31-60	126	4.03	0.590				
61-90	35	4.25	0.534				
91 and above	15	4.26	0.527				
Communication Dimension							
0	22	3.61	1.030	1.148	0.334		
15-30	169	3.37	0.927				
31-60	126	3.46	0.888				
61-90	35	3.50	0.974				
91 and above	15	3.84	0.842				
Security Dimension							
0	22	4.34	0.510	2.985	0.019	61-90>15-30	0.032
15-30	169	4.24	0.451			91+above >15-30	
31-60	126	4.31	0.521			91+above>31-60	
61-90	35	4.44	0.479				
91 and above	15	4.61	0.343				
Problem-Solving							
0	22	3.77	0.800	1.468	0.211	91+above>15-30	0.016
15-30	169	3.58	0.912				
31-60	126	3.74	0.862				
61-90	35	3.77	0.888				
91 and above	15	4.06	1.024				

Table 9. ANOVA results of digital literacy levels by preferred digital technology

Source of Variance	n	M	SD	F	p	Source of Difference	Effect Size
Overall							
Smartphone	242	3.83	0.535	7.017	0.001	Computer>Smartphone	0.037
Computer	76	4.09	0.529			Computer>Tablet	
Tablet	49	3.84	0.468				
Information Processing Dimension							
Smartphone	242	3.99	0.603	3.876	0.022	Computer>Smartphone	0.021
Computer	76	4.18	0.598			Computer>Tablet	
Tablet	49	3.92	0.533				
Communication Dimension							
Smartphone	242	3.39	0.909	3.936	0.020	Computer>Smartphone	0.021
Computer	76	3.71	0.890				
Tablet	49	3.33	0.979				
Security Dimension							
Smartphone	242	4.26	0.489	2.288	0.103		
Computer	76	4.39	0.482				
Tablet	49	4.35	0.449				
Problem-Solving							
Smartphone	242	3.59	0.904	6.223	0.002	Computer>Smartphone	0.033
Computer	76	4.00	0.854				
Tablet	49	3.66	0.799				

significant difference was in favor of students with 61-90 minutes book-reading between 31-60 and 61- 90 minutes of book-reading.

Examination of significant differences in information processing dimension revealed that it was in favor of students with 61-90 minutes of book-reading between

Table 10. ANOVA results of digital literacy levels by internet time

	Source of Variance	n	M	SD	F	p	Source of Difference	Effect Size
Overall	15-30	90	3.75	0.481	4.171	0.006	91+above>15-30	0.033
	31-60	149	3.87	0.540				
	61-90	81	3.95	0.532				
	91 and above	47	4.06	0.564				
Information Processing Dimension	15-30	90	3.93	0.534	1.901	0.129		
	31-60	149	4.00	0.629				
	61-90	81	4.08	0.550				
	91 and above	47	4.16	0.670				
Communication Dimension	15-30	90	3.14	0.907	8.286	0.000	61-90>15-30	0.064
	31-60	149	3.40	0.875			91+above>15-30	
	61-90	81	3.63	0.920			91+above>31-60	
	91 and above	47	3.87	0.897				
Security Dimension	15-30	90	4.32	0.436	0.557	0.644		
	31-60	149	4.31	0.486				
	61-90	81	4.32	0.486				
	91 and above	47	4.22	0.561				
Problem-Solving	15-30	90	3.49	0.875	2.861	0.037	91+above>15-30	0.023
	31-60	149	3.71	0.904				
	61-90	81	3.70	0.879				
	91 and above	47	3.95	0.866				

Table 11. ANOVA results of digital literacy levels by the purpose of using digital technologies

	Source of Variance	n	M	SD	F	p	Source of Difference	Effect Size
Overall	Study	77	3.81	0.512	0.932	0.425		
	Research	114	3.93	0.550				
	Communication	47	3.91	0.514				
	Entertainment	129	3.87	0.541				
Information Processing Dimension	Study	77	3,98	0.554	0.369	0.775		
	Research	114	4,07	0.581				
	Communication	47	3,99	0.680				
	Entertainment	129	4,01	0.610				
Communication Dimension	Study	77	3,29	0.847	1.246	0.293		
	Research	114	3,44	0.973				
	Communication	47	3,60	0.862				
	Entertainment	129	3.50	0.937				
Security Dimension	Study	77	4.25	0.493	2.658	0.048	Research>Study	0.021
	Research	114	4.40	0.448				
	Communication	47	4.30	0.433				
	Entertainment	129	4.24	0.516				
Problem-Solving	Study	77	3.62	0.951	0.289	0.833		
	Research	114	3.74	0.870				
	Communication	47	3.69	0.847				
	Entertainment	129	3.67	0.902				

15-30 and 61-90 minutes of book-reading and it was in favor of students with 91 and above minutes of book-reading between 31-60 and 91 and above minutes of book-reading. In the dimension of security, significant differences between the students with 15-30 and 61-90 minutes of book-reading, between the students with15-30 and 91 and above minutes of book-reading, and between the students with 31-60 and 91 and above minutes of book-reading were in favor of students with 61-90, 91 and above, and 91 and above minutes of book-reading, respectively. In the problem-solving dimension, the significant difference between the students with 15-30 and 91 and above minutes of book-reading was in favor of those with 91 and above minutes of book-reading. With reference to these findings, it can be stated that as the duration of book-reading increased, students' digital literacy levels increased as well. In the communication dimension, there was no significant difference among groups ($F=1.148$, $p>.05$).

One-way variance analysis (ANOVA) was used to reveal whether the differences in digital literacy levels of students

by the preferred digital technology were significant and the results were presented in Table 9.

According to findings in Table 9, there were significant differences among groups in overall score (F=7.017, p<.05), information processing (F=3.876, p<.05), communication (F=3.936, p<.05), and problem-solving dimension (F=6.223, p<.05). The effect size of differences in overall (η^2=.03), information processing (η^2=.02), communication (η^2=.02), and problem-solving dimension (η^2=.03) was small. The significant differences in overall score were in favor of students preferring computer between smartphone and computer and between tablet and computer.

In the information processing dimension, the significant difference was in favor of those preferring computer compared with the groups using smartphone and tablet. In the communication and problem-solving dimensions, the significant difference was in favor of students preferring computer between the groups using smartphone and computer. These findings can be interpreted that students preferring computer had higher levels of digital literacy.

One-way variance analysis (ANOVA) was used to reveal whether the differences in digital literacy levels of students by the internet time were significant and the results were presented in Table 10.

According to findings in Table 10, there were significant differences among groups in overall score (F=4.171, p<.05), communication (F=8.286, p<.05), and problem-solving dimension (F=2.861, p<.05). The effect size of differences in overall (η^2=.03) and problem-solving (η^2=.02) was small while it was medium in communication (η^2=.06). The significant difference between the students using internet for 91 and above minutes daily and students using internet for 15-30 minutes was in favor of those using internet for 91 minutes and above.

In the communication dimension, the significant difference was in favor of those using internet for 61-90 minutes when compared with those using internet for 15-30 minutes; it was in favor of students using internet for 91 minutes and above compared with 15-30 minutes of use; it was in favor of students using internet for 91 minutes and above when compared with 31-60 minutes of internet use. In the problem-solving dimension, the significant difference was in favor of students using internet for 91 minutes and above compared with students using internet for 15-30 minutes, daily. Based on these findings, it can be expressed that as the internet use time of students increased, their digital literacy level increased as well.

One-way variance analysis (ANOVA) was used to reveal whether the differences in digital literacy levels of students by the purpose of using digital technologies were significant and the results were presented in Table 11.

Examination of Table 11 demonstrates that students' purpose of using digital technologies was not an effective variable on their digital literacy levels in overall score (F=.932,>.05).

The findings showed that there were no significant differences in communication and problem-solving dimensions (p>.05); however, there was a significant difference in security dimension (p<.05). The effect size of significant difference in security dimension was small (η^2=.02). The significant difference in security dimension was in favor of students who used digital technologies for research compared with those who used them for study purposes. Students' purposes of using digital technologies did not change their digital literacy levels. In the security dimension, students who used digital technologies for research was specifically had higher digital literacy levels.

Qualitative Findings

As a result of the analysis of the data obtained from interviews with students, six different themes emerged. These themes were the definition of digital literacy, appropriate use of digital technologies, the purpose of using digital technologies, language/content/environment encountered in digital resources, precautions to threats encountered in digital environments, and the contribution of social studies course to digital literacy level. These six themes were illustrated in Figure 2.

Definition of digital literacy

The participants were asked "in your opinion, what is digital literacy?" to determine their views of the definition of digital literacy. The findings were presented under the theme of definition of digital literacy in Figure 3.

As can be seen in Figure 3, the theme of definition of digital literacy was composed of five categories. These categories were technology (6), profession (5), course (2), occupation (1), and getting to know digital world (1).

In the technology category, digital literacy was expressed as reading-writing-using technology, communicating technology, and computer literacy. One of the participants, 6K7Ö stated her opinions about digital literacy as reading and writing by "*In fact, digital literacy is the work of understanding the technology in our daily life, that is, reading and producing something there, developing a content, creating, that is, writing."* While some participants viewed digital literacy as a profession based on the opinions in profession category. One of the participants, 5E7Ö expressed his opinions about digital literacy being a profession as "*I think digital literacy is the name of a job. It is the job of writing a book in digital environments. The person who does this job is called a "digital literate individual".*".

Appropriate use of digital technologies

In order to determine whether the participants used digital resources correctly, they were asked "do you think that you use digital resources correctly?" The findings were presented under the theme of "Appropriate use of digital technologies" in Table 12.

As can be seen in Table 12, the theme of appropriate use of digital resources was composed of two categories: "yes" and "no". In the "yes" category, the participants expressed that they used digital resources appropriately and stated that they did not allocate much time to use digital resources (f=6),

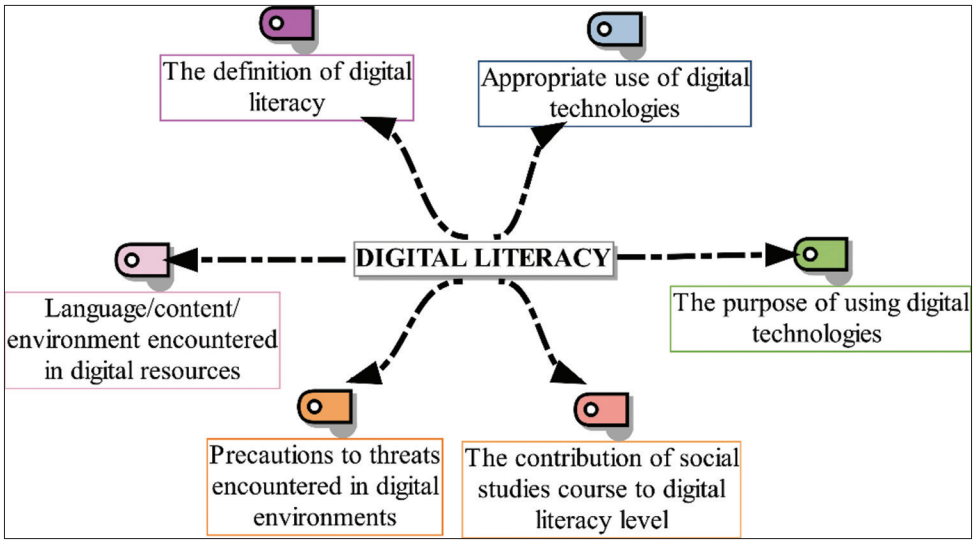

Figure 2. Hierarchical code-subcode model of themes

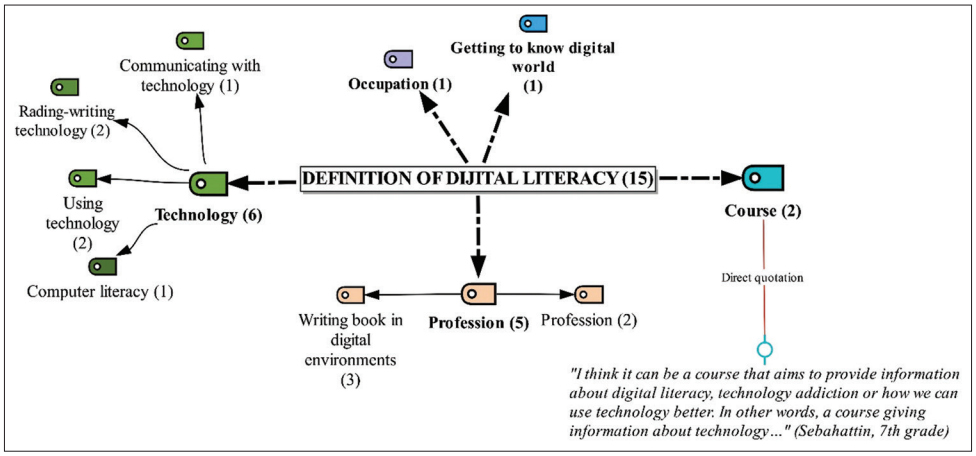

Figure 3. Hierarchical code-subcode model of the definition of digital literacy

Tablo 12. Code-matrix results of appropriate use of digital technologies

	Code System	5th grade	6th grade	7th grade	Total
Appropriate Use of Digital Technologies	No	2	1		3
	Yes	3	6	7	16
	Total	5	7	7	19

used reliable platforms/websites/search engines (f=6), did not share their personal information (f=2), did not share inappropriate content and provided feedback (f=2), and were trained to use digital resources appropriately (f=1). Examination of Table 12 demonstrates that most of the participants expressed that they used digital resources appropriately. Especially at 7th grade, the majority of students expressed that they used them appropriately. One of the participants, 9E6Ö expressed his opinions about using reliable platforms/websites in digital resources as *"Yes, I think that I use digital resources appropriately/correctly because I enter reliable things in digital sources, namely sites/platforms. For example, if there is a lock sign in the corner, I enter that site and search, but if there is an exclamation mark, I see that it is dangerous, I do not enter that site. I search mostly on sites with lock marks."*

In the "no" category, the participants expressed that they did not use digital resources appropriately and stated that they allocated much time (f=2), became addicted to digital resources (f=1), and used them to play games mostly (f=1). One of the participants, 6K4Ö expressed her opinions about allocating too much time for digital resources as *"I spend a lot of time using my computer or phone. I don't even understand how time passed when I started using it. Apart from the time spent at school, almost all of my time is spent using the computer or the phone."*

The purpose of using digital technologies

The participants were asked "for what purposes do you use digital resources?" to determine their motives of using them.

Findings were presented under the theme of purpose of using digital resources in Table 13.

As can be seen in Table 13, participants' purposes of using digital technologies were classified under four categories. These categories were study/homework, communication, research, and entertainment. The findings show that participants in all grade levels used digital technologies for entertainment purposes mostly.

Under the entertainment category, participants expressed that they used digital resources to play games (f=7), watch videos (f=6), browse social media (f=2), have fun (f=2), and watch movies (f=1). Then, they stated that they used social media for study/homework (f=9), research (f=9), and communication.

One of the participants, 8E7Ö expressed his opinions about entertainment purposes as "*As an answer to this question, I can say that I am using it for entertainment purposes. Because when I pick up my phone or computer, sometimes I play games and sometimes I watch interesting videos."* while 6K9Ö stated her views on study/homework as *"I use these types of resources to solve different types of questions when my teacher gives homework or when I need to study for any lesson."*

Language/content/environment in digital resources

In order to determine participants' awareness about the appropriate or inappropriate language, content, and environment in digital resources, they were asked "What kind of language/content/environment do you encounter while using digital resources?" Findings were presented under the theme of language/content/environment in digital resources in Figure 4.

As can be seen in Figure 4, the theme of language/content/environment in digital resources was composed of two categories: content and language. Participants criticized language (f=18) mostly in this theme.

In the language category, participants expressed that they mostly encounter abusive (f=15) and slang (f=3) language. One of the participants, 5E7Ö expressed his opinions about the use of abusive language *"Much of what we watch uses abusive language. Every two or three sentences involve curses. Moreover, this is transferred to the other party, that is to us, as if it was a very normal thing."* while 3K5Ö stated her views about the inappropriate content shared by social media celebrities as "*I'm running into some very weird stuff. Recently, a celebrity that I did not know before appeared on social media, which could not be distinguished whether it was a male or female and shared that she gave birth to a baby. I think for kids in our age group this was a huge deal and it was confusing. Then it got a lot of backlashes. A celebrity like this set a wrong example for us."*

Precautions to threats in digital technologies

The participants were asked *"What kind of measures do you take when the security of your personal data is threatened?"* to determine precautions of participants against the threats in digital technologies. Findings were presented under

Table 13. Code-matrix results of the purpose of using digital technologies

	Code System	5th grade	6th grade	7th grade	Total
Purpose of Using Digital Technologies	Study/Homework	3	3	3	9
	Communication	1	1	2	4
	Research	2	6	1	9
	Entertainment	6	7	5	18
	Total	12	17	11	40

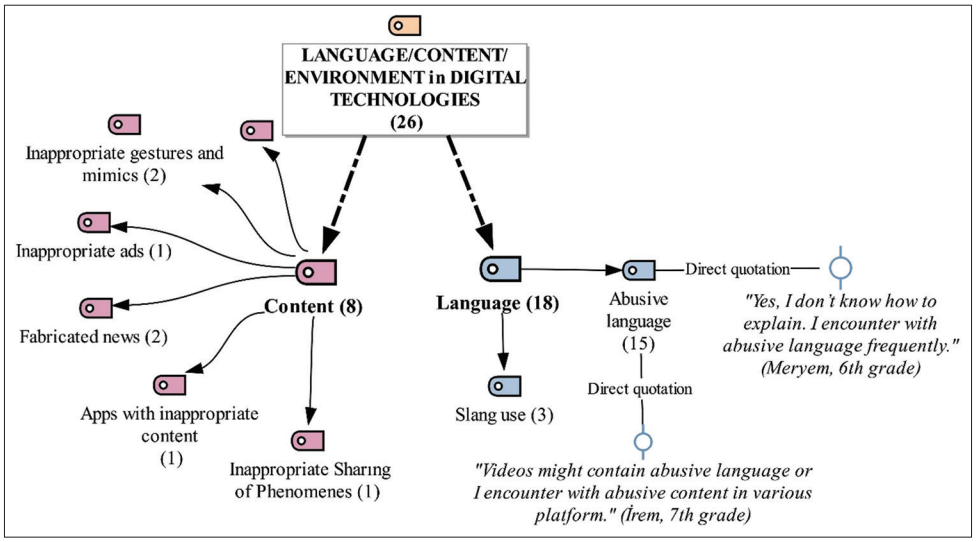

Figure 4. Hierarchical code-subcode model of the language/content/environment in digital resources

the theme of precautions to threats in digital resources in Figure 4.

As can be seen in Figure 5, the theme of precautions to threats in digital technologies were composed of four categories: taking digital measures, informing close people, appealing to relevant units, and ensuring the security of personal data. Participants stated that they take digital measures most (f=21) when they encountered threats in digital resources. At the same time, they expressed that they shared the threat with their family (f=14).

In the digital measures category, participants expressed that they provided feedback (f=8) and left the application/website/webpage (f=6) when encountered with threats in digital resources. One of the participants, 6K7Ö expressed her opinions about feedback as *"In such a case, a pop-up emerges stating allow sending notifications. On the screen that appears, click on permission appears. Report appears and when you click on it, report your complaint appears. When I click on it, options appear, such as abusive content. I choose one of the options and send it back."* while 7E7Ö stated his opinions about sharing with close people as "*Let's say I gave my personal data and something like this happened to me, I am threatened. I will tell my parents about this situation and they will do what is necessary."*

Contribution of social studies course

In order to determine the contributions of social studies course to participants' digital literacy, they were asked *"Does social studies course contribute to your digital literacy?"*. Findings were presented under the theme of contribution of social studies course in Figure 6.

As can be seen in Figure 6, the theme of the contribution of social studies course was composed of four categories including contribution to internet use (f=25), contribution to protecting personal data (f=8), contribution to technology use (f=8), and contribution to research. Participants expressed that social studies course contributed to internet use (f=25) mostly.

In the category of the contribution to internet use, participants expressed that they were able to distinguish secure

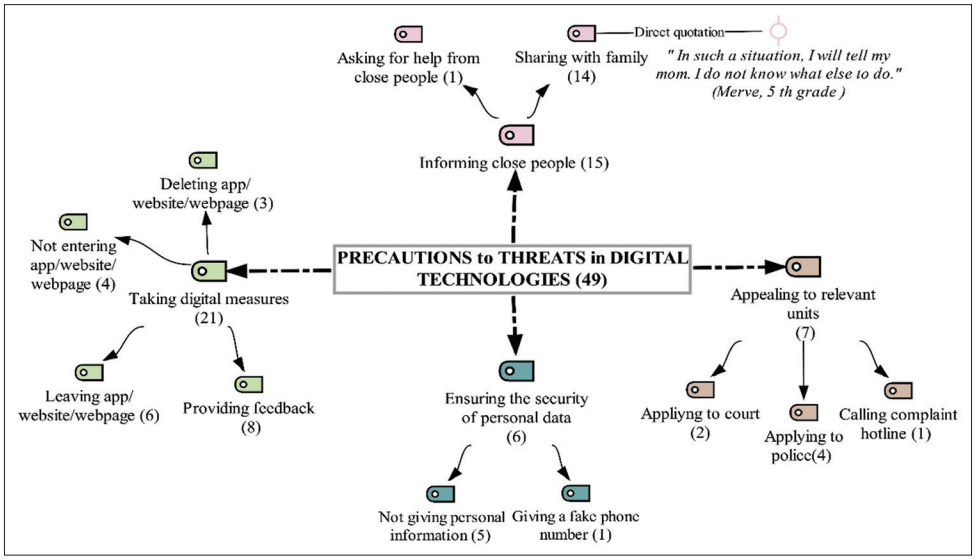

Figure 5. Hierarchical code-subcode model of the precautions to threats in digital technologies

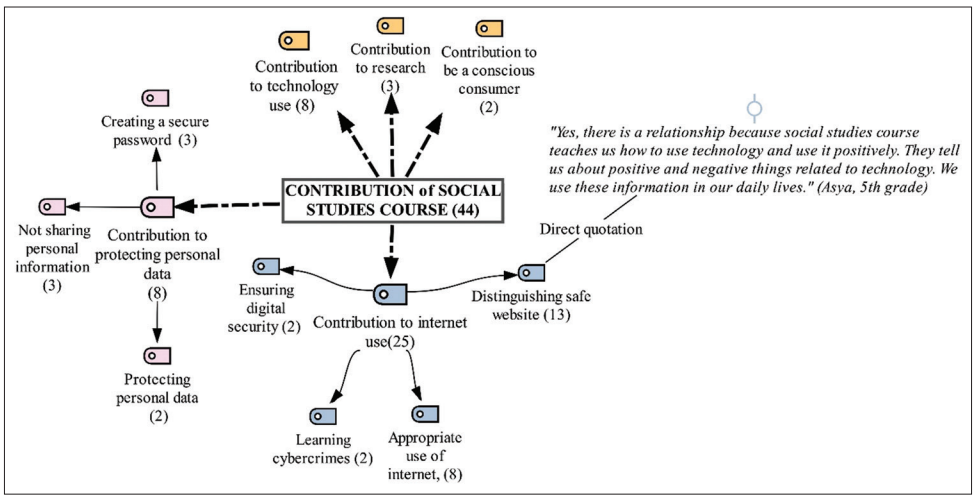

Figure 6. Hierarchical code-subcode model of the contribution of social studies course

websites (f=13), use internet appropriately (f=8), ensure their digital security (f=2), and learn about cybercrimes (f=2) thanks to the contributions of social studies course. One of the participants, 7E8Ö expressed his opinions about distinguishing safe websites as *"With what I learned in the social studies course, I can now distinguish between a secure site and an unsafe site or page. For example; if there is an exclamation point (!) at the end of the bar with the link address, I do not enter that site. I learned this and similar information in social studies class."* while 6E6Ö stated his views on contribution to technology as *"Of course, our digital literacy level increases with the social studies course. This course teaches us what we should or should not do when using technology, how we should use technology in a positive way, and we use this information while using technology in our daily lives."*

DISCUSSION

In the digitalized world, one of the skills that individuals should have in the face of the rapid change of technology and its increasing importance in people's daily lives has been digital literacy. A digitally literate individual is an individual who can use digital technologies effectively, has knowledge of applications, and knows how and when to use them, as well as having the necessary skills for the problems they encounter in digital environments. Individuals can have these characteristics through education and courses. It is important for individuals to have these characteristics at an early age. Social studies course in Turkey is one of the courses that contribute to this skill. For this reason, it is important to determine the digital literacy levels of students at an early age and to evaluate their views on the contribution of social studies course to this skill.

In this direction, when the findings obtained from the study were interpreted, it was determined that the students' digital literacy level scores were high in general. This situation can be explained by factors such as the frequent presence of digital technologies in students' lives and the fact that courses are given via distance education, especially during the pandemic process. Similar studies have shown that students' digital literacy status (Dönmez, 2019) and technology use skills (Yıldırım, 2015) are at a good level. Despite the high digital literacy scores in this study, the lack of knowledge of the participants about the concept of digital literacy shows that there is no consistency between the quantitative and qualitative results of the research because it shows that the participants do not have sufficient knowledge about this concept since they explained the concept of digital literacy in general as technology, work, course, profession and getting to know the digital world, respectively. Similar to this result of the research, Kuru (2019) reached the conclusion that the concept of literacy was misinterpreted as "reading stories and novels from the internet and reading activities on the internet"; On the other hand, Çoşkun et al. (2013) determined that the knowledge level of teacher candidates regarding the concept of digital literacy is insufficient.

It was determined that the digital literacy levels of the students differed significantly by gender in favor of male students. There are also studies supporting this result of the research (Göldağ, 2021; Markauskaite, 2005; Çam & Kyici, 2017; Ocak & Karakuş, 2018; Özerbaş & Kuralbayeva, 2018; Yontar, 2019). In the study of Pala & Başıbüyük (2020a), in which gender was determined as a variable and conducted with secondary school students, it was concluded that students' digital literacy scores did not differ significantly by gender. In the study, male students think that they can solve most of the problems that arise in digital technologies better than female students. This can be explained by the fact that male students have more confidence and less anxiety about using digital technologies (Tsai et al., 2001).

The digital literacy levels of the students differed significantly by grade level variable. Compared to other grade levels, 7th grade students' digital literacy levels were found to be high. This situation can be associated with the change in the number of objectives in the learning area of "Science, Technology and Society" according to grade levels. Turan and Avcı (2018) examined the social studies course curriculum in the context of digital citizenship and concluded that 8 objectives in the field of "Science, Technology and Society" at the 7th grade level were associated with digital citizenship and that digital citizenship was tried to be developed in different degrees depending on grade levels. This situation is also in line with the qualitative results of the research. Qualitative results showed that the 7th graders among the participants stated that they used digital technology correctly. They justified this by stating that they can use technological devices, search engines and reliable sites. At the same time, they also stated that they do not spend much time using them and do not share their personal information. Onursoy (2018) and Kardeş (2020) also support this result in their studies with university students and teacher candidates. Significant differences seen in the overall scale, information processing, and communication dimensions had a medium effect size, while the significant difference in the problem-solving dimension had a small effect size. When the relevant studies were examined, it was observed that Özerbaş and Kuralbayeva (2018) concluded that the grade level was an effective variable in their study with pre-service teachers, while on the contrary to this result, Öçal (2017) concluded that the grade level was not effective on digital literacy.

Students' digital literacy levels differed significantly according to the variable of reading duration. The significant differences in the overall scale and the dimensions of information processing, security, and problem solving had a small effect size. It was observed that the students thought that their digital literacy levels increased as the reading time increased. This shows that there is a positive correlation between the skills such as comprehension and interpretation required for digital literacy and the reading and writing activities in daily life (Tour, 2017).

The digital literacy levels of the students differed significantly by the preferred digital technology. Significant differences in the overall scale and the dimensions of information processing, security, and problem solving had small

effect size. It has been determined that the students who use computers had a higher level of digital literacy. In this respect, the study is consistent with the studies in the literature (Göldağ, 2021; Arslan, 2019; Yaman, 2019).

Students' digital literacy levels differed significantly according to the variable Internet time. It was seen that the effect size seen in the overall scale and in the problem-solving dimension was small, and the effect size in the communication dimension was medium. The significant difference between the students using internet for 91 and above minutes daily and students using internet for 15-30 minutes was in favor of those using internet for 91 minutes and above. It was concluded that the students stated that their digital literacy levels increased as the duration of their stay on the Internet increased. In other words, students think that the duration of their stay on the Internet is effective on their digital literacy levels and that their digital literacy levels increase as this period increases. Öçal (2017) similarly concluded in a study that students spend more time in digital environments, allowing them to gain more experience about digital environments. In other studies, it has been observed that technology use skills of students who use the internet frequently increase compared to students who use the internet less (Yıldırım, 2015; Ocak & Karakuş, 2018). In addition to similar results in studies conducted with teacher candidates and parents (Özerbaş & Kuralbayeva, 2018; Çetin et al., 2012), Kul (2020) and Öztürk and Budak (2019) found that there is a positive relationship between digital literacy level and internet use.

The digital literacy levels of the students did not differ significantly according to the variable of the purpose of using digital technologies. A significant difference was found only in the security dimension, and this difference had a small effect size. It was seen that the significant difference in security dimension was in favor of studies with research purposes compared with those with study purposes. In the security dimension, it was observed that especially students who conducted research thought that their digital literacy was at a higher level. This can be explained by the high level of digital data security awareness of students who conduct research in digital environments (Göldağ, 2021). This quantitative result of the study is partially consistent with the qualitative result. In the qualitative stage, it was seen that the participants stated that they use digital technologies mostly for entertainment purposes. They mostly focused on activities such as playing games, watching videos, movies and surfing social media for the purpose of entertainment. Similarly, in the studies of Kabali et al. (2015) and Özaydın and Kumral (2021), it was concluded that children mostly use digital technologies to play games and watch videos. Contrary to this result, Bayrak (2013) found that participants mostly use digital technologies to do homework and research.

On the other hand, there was consistency between the items in security dimension including "I know that I should not share my personal information on the internet because I am aware that my identity information may be stolen" and "I can use passwords to protect my devices such as computers, smartphones, tablets" and the statements found in qualitative findings including the digital measures and taking measures to protect their personal data. There are various studies on the importance of having digital literacy skills against the threats and dangers encountered in digital environments (Göldağ & Kanat, 2018; Kuru, 2019). Okumuş and Atılgan (2021), on the other hand, in their study with university students, revealed that as the level of digital literacy increases, the perception of digital privacy increases.

When another qualitative result was examined, it was determined that the participants used critical statements more about language/content and environment and then the content in digital technologies. Participants stated that while using digital technologies, they mostly encountered a language containing profanity and slang, but they did not encounter discriminatory expressions such as racism. This aspect of the research is consistent with the research of Özaydın and Kumral (2021).

All of the participants agree that the social studies course contributes to their digital literacy. In particular, they stated that they could obtain information about their use of the internet from this course. Participants stated that with the contribution of the social studies course, they were able to distinguish safe internet sites, use the internet correctly, ensure their digital security, and obtain information about cybercrime. From this point of view, it can be said that the inclusion of digital literacy skills and activities aimed at gaining this skill in the social studies program is effective. In similar studies, it is concluded that as the success of the social studies course increases, the digital literacy scores also increase (Pala & Başıbüyük, 2020a) and the level of benefitting from information technologies increases as the grades of the students increase (Özmusul, 2008). In general, it can be said that having digital literacy skills contributes positively to the learning of different lessons and subjects and helps to increase learning motivation (Ng, 2011). In fact, this is seen by Shopova (2014) as an important condition for successful performance and better results in the learning process.

CONCLUSION

As a results of the research, despite the high digital literacy scores of the students, as a result of in-depth qualitative analysis, it was seen that they did not have sufficient knowledge about the concept of digital literacy. Additionally, according to the quantitative results, the digital literacy level scores of the students who use digital technologies for research purposes in the security dimension are higher than those who use digital technologies for study purposes, while according to the qualitative results, it has been determined that the students use digital technologies mostly for entertainment purposes. It has been determined that students' digital literacy levels differ significantly in terms of gender, class level, reading time, time spent on the internet. However, all of the students agree that the social studies course contributes to their digital literacy levels.

According to the general results of the research, the following suggestions can be developed:

1. Various activities can be organized in computer laboratories that will contribute to the digital literacy skills of female students, thereby contributing to the development of female students' digital literacy skills.
2. The number of objectives aimed at improving digital literacy skills at the 5th and 6th grades in the social studies curriculum can be increased.
3. Qualitative or mixed studies can be designed on the positive relationship of students' digital literacy levels with reading and internet time.
4. Information that will contribute to students' digital literacy in social studies textbooks can be expanded.

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