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Teachers' Views on Digital Literacy and Barriers

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Abstract

This study aimed to examine teachers' views on digital literacy and its barriers. A mixed methods approach including both quantitative and qualitative data together was used. In the quantitative part, the Digital Literacy Scale developed by Ng (2012) and adapted to Turkish by Hamutoğlu et al. (2017) was used to determine the digital literacy levels of teachers. In the qualitative part, a semi-structured interview form developed by the researcher was used to collect data on digital literacy barriers. While 653 teachers participated in the quantitative part of the study, 36 teachers participated in the qualitative part. Mean values of digital literacy of the teachers who participated in the quantitative part of the study reflected a level of agreement, and no significant difference was found when the digital literacy levels of the teachers were compared with the variables of attitude, technical, cognitive and social factors and gender, department and educational status. However, a significant difference was found between the social factor and the variables of professional experience and time spent on digital platforms. When teachers' views on the barriers to digital literacy were analyzed in terms of the attitude factor, the majority of teachers emphasized the barriers of not liking and being interested in using technology and not being able to learn technology easily. When analyzed in terms of the technical factor dimension, the majority of teachers emphasized the barriers of lack of knowledge about technology and inability to use technology. When analyzed in terms of the cognitive factor, the majority of the teachers emphasized their lack of technology knowledge.

Keywords: education, educational technologies, literacy, digital literacy, digital literacy barrier

Öğretmenlerin Dijital Okuryazarlığı ve Engellerine İlişkin Görüşleri

Öz

Bu çalışmada öğretmenlerin dijital okuryazarlığı ve engellerine ilişkin görüşlerinin incelenmesi amaçlanmıştır. Araştırmada nicel ve nitel birlikte kullanıldığı için karma yöntem kullanılmıştır. Nicel kısımda öğretmenlerin dijital okuryazarlık düzeylerini belirlerken Ng (2012) tarafından geliştirilip Hamutoğlu vd. (2017) tarafından Türkçeye uyarlanan Dijital Okuryazarlık Ölçeği kullanılmıştır. Nitel kısımda dijital okuryazarlık engellerine ilişkin verilerinin toplanması için araştırmacı tarafından geliştirilen yarı yapılandırılmış görüşme formu kullanılmıştır. Nicel kısımda araştırmaya 653 öğretmen katılırken nitel kısımda 36 öğretmen katılmıştır. Araştırmanın nicel kısmına katılan öğretmenlerin dijital okuryazarlık ortalama değerleri "katılıyorum" düzeyindedir. Ayrıca öğretmenlerin dijital okuryazarlık düzeyleri; tutum, teknik, bilişsel ve sosyal faktörleri ile cinsiyet, branş, eğitim durumları değişkenleri karşılaştırıldığında anlamlı bir farklılık bulunmamıştır. Ancak, sosyal faktör ile mesleki deneyim ve dijital platformlarda geçirilen süre değişkenleri arasında anlamlı bir farklılık vardır. Öğretmenlerin dijital okuryazarlık engellerine ilişkin görüşleri; tutum faktörü açısından incelendiğinde, öğretmenlerin çoğunluğu "teknolojiyi kullanmayı sevmeme ve ilgi duymama" ile "teknolojiyi kolay öğrenememe" engelleri üzerinde durmuştur. Teknik faktörü açısından incelendiğinde, öğretmenlerin çoğunluğu "teknoloji hakkında bilgi eksikliklerinin, teknolojiyi kullanma yetersizliği yönündeki engelleri" üzerinde durmuştur. Bilişsel faktörü açısından incelendiğinde, öğretmenlerin çoğunluğu "teknoloji hakkında bilgi yetersizliği" üzerinde durmuştur

Anahtar kelimeler: eğitim, eğitim teknolojileri, okuryazarlık, dijital okuryazarlık, dijital okuryazarlık engelleri

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INTRODUCTION

Include the background information and a review of the literature in this section. You may dedicate another separate section for the literature review. Include the background information and a review of the literature in this section. You may dedicate another separate section for the literature review. Include the background information and a review of the literature in this section. You may dedicate another separate section for the literature review. Include the background information and a review of the literature in this section. You may dedicate another separate section for the literature review. Include the background information and a review of the literature in this section. You may dedicate another separate section for the literature review.

Every day a new technology is encountered. Especially with the internet, there are technological devices that exist in our daily lives enable individuals to achieve different goals and make people's lives easier. For this reason, the use of the internet and technology by individuals has increased recently (Hamutoğlu, et al., 2017). These changes that occur sometimes benefit and sometimes harm the lives of individuals. For this reason, every individual should be digitally literate. Individuals need to use technological equipment consciously within this framework. At this point, teachers who raise the young generations of the future are expected to be equipped with digital literacy (Yaman, 2019). Every aspect of our lives has changed due to technological developments. One of these changes is the concept of literacy. Traditionally, the term literacy is expressed as the ability to read and write. However, as technology and humanity develop, different types of literacy have started to emerge. Today, due to the development of technology, the importance of the concept of digital literacy has increased. Therefore, it is very important to know how to use digital and technological devices such as computers or mobile phones correctly for the individual to live a healthy life. For this reason, the concepts of digital literacy and digital skills have become increasingly important and various research on these concepts have gradually increased. (Rodríguez-de-Dios, Igartua & Gonzalez Vázquez, 2016). We need to train students in digital skills because we need to educate digitally literate individuals as a means of preventing the risks, challenges, and obstacles brought by digital technologies today. Therefore, for individuals to spend their lives healthily with the rapidly developing and advancing technology today, individuals need to get used to this developing and changing technology and what it brings. Digital literacy is one of the skills brought by these developing technologies. Individuals and students can become digital literate and gain these skills only with the training and guidance of teachers.

In short, changes and transformations are inevitable in the lives of students with rapidly developing technology. As a result of this change, it is inevitable that students gain knowledge and skills and have certain characteristics. Students now blend different learning and digital life. Students are expected to develop technical, cognitive, and social skills in order to fulfil the tasks in digital environments. The effect of teachers and institutions that provide education is very important in terms of providing individuals with these characteristics and preparing them for life (Günüç, Odabaşı & Kuzu, 2013). Being an individual who can access, analyze, understand, interpret information and use technology effectively are some of the competencies required for literacy. In order to achieve all these competencies, one should be a good digital literate. In our digital age, the process of education and training has a very important effect on the progress of societies. For this reason, making people become digitally literate means encouraging creativity, training them to see things from new perspectives, giving them a voice, and demonstrating how to deal with difficult situations. This development is ensured only by the educators who carry out the education of the young generation that holds the future in their hands and in the hands of educational institutions. According to Ministry of Education Teacher Qualifications Book (2017), in order for teachers to be able to use technology in the best way and apply it in their profession, it was emphasized that they should have digital competences. Therefore, training plans the aim is to raise individuals with digital literacy skills. All in order to achieve these, many studies have been carried out on teacher training (Arslan, 2019).

In the literature, there are many studies on digital literacy. When these studies are examined, it is seen that there are many studies on the digital literacy of teachers or students. Competences were discussed and suggestions were made for improvement. The majority of research on this area has been conducted with students or teachers or with a specific group of students or prospective teachers' department as case studies. Unlike previous studies, this study was conducted all across Turkey.

Digital Literacy

Today, such rapid developments in communication and information technologies have led to significant changes in individual and social life. These changes have led to the emergence of behavioral habits and patterns in different ways. All individuals in society exhibit behaviors specific to this new lifestyle as a requirement of today's age and try to live in today's world. The contemporary world now has unprecedentedly equal and open

mass information-sharing opportunities (Chatfield, 2013). Such developments in technologies have led to the proliferation of literacy concepts and types, and have led to the emergence of new literacy concepts that complement each other. One of the most important of these concepts is the concept of digital literacy.

The concept of digital literacy has evolved and changed over the years and today this concept is still expressed in different ways by many academics (Bawden, 2008; Martin, 2008). In the early days, the concept of digital literacy was to have instrumental hardware and software knowledge. If an individual knew how to use a computer, he was considered digitally literate (Bawden, 2001). Gilster (1997), who first introduced the concept of digital literacy, defined digital literacy as the ability to understand, evaluate, integrate and use messages from different electronic sources. Digital literacy is defined by Martin (2005) as attitude, awareness, and the ability to manage, evaluate, analyze, and combine digital tools effectively. In addition, it is expressed as a combination of behaviors and skills such as creating new information by synthesizing digital resources, communicating with individuals and their environment, and reflecting constructive behaviors in social life. Eshet-Alkalai (2004), on the other hand, defines it as a combination of motor, cognitive, emotional, and social skills that are needed efficiently in digital environments by those who use devices and software in addition to using digital software or devices. According to Van Dijk (2005), it is important to have the necessary skills to evaluate, select, and reuse the content we encounter on the internet. Another researcher Wan Ng (2012) emphasized that digital literacy consists of three basic factor dimensions: technical, cognitive, and social. The technical factor of being digitally literate means having functional and technical skills. The cognitive factor of being digitally literate is related to the ability to process this information with research, critical thinking, and evaluation. The social factor of being digitally literate includes behaviors such as using appropriate and respectful communication language as in face-to-face communication, protecting the privacy and security of personal data by keeping personal information confidential enough, not disclosing more personal data than necessary, being aware of digital threats and coping with these threats.

Digital literacy, in the most general sense, is the reading and writing of digital tools by individuals. However, when the definitions are examined, it is seen that the concept of digital literacy is much more than reading and writing activities using digital products. As the common point of digital literacy definitions, the skills and knowledge of using digital products are particularly emphasized. It is emphasized that the information is synthesized by the individual with digital literacy skills and the basis for the creation of new ideas and opinions is formed. In addition, the sociological and emotional dimension of digital literacy shows that the concept of digital literacy is a way of life (Öztürk, 2020). As can be understood from all these researches, digital literacy includes awareness, attitudes, and abilities for people to identify, access, and use digital tools effectively, as well as integrating, managing, analyzing, synthesizing information, creating new information, evaluating, enabling the sociality of the individual with the society, and communicating with the environment and society.

Digital Literacy Barriers

The world is in continuous development and transformation. Societies have changed along with it, and significant development differences have emerged day by day. While trying to reduce these development differences, the differences in technologies such as the internet, mobile phones, and computers have deepened and led to the digital divide. The digital divide, which refers to the differences between communities in the possession and utilization of information and communication technologies (ICT), has been perceived as an important problem to be overcome due to its negative effects. Today, societies with high levels of education and development use ICT intensively in all areas of life. On the other hand, societies with low levels of education and income cannot benefit from these technologies sufficiently. The basis of this situation is the digital divide and digital poverty (Kalaycı, 2013). It is a fact that a large number of individuals are still not digitally literate today. Certain factors prevent individuals from being digitally literacy. These factors are called digital literacy barriers (Semerci & Semerci, 2021).

The progress in the field of ICT has led to the expansion of traditional education and training techniques in recent years. First of all, the most important change has occurred in educational institutions, including the education of young people, their preparation for life, and the teaching of skills. To keep pace with these change, education needs to be equipped with certain skills, including the introduction of Internet technologies in education, qualitatively modernizing education, and developing a global information system to the advanced standards of modern society (Ling et al., 2020). However, there are certain barriers to the acquisition of these skills. The digital divide is at the forefront of these barriers. The digital divide arises from the fact that societies do not have the same opportunities to use ICT in the same way due to reasons such as lack of hardware or infrastructure, and lack of technical knowledge and skills. The digital divide is the differences between individuals, businesses, and geographical regions at different socioeconomic levels in terms of ICT internet usage and access opportunities

(Organisation for Economic Co-Operation and Development, 2001). In short, due to different cultural, geographical, economic, and social barriers, not all societies can benefit from developing technologies to the same extent. In other words, there is inequality in terms of having and utilizing the opportunities of developing technologies. According to Hargittai (2003), the digital divide is defined as the gap between those who have access to digital technologies and those who do not, or those who have the technology to use digital technologies and those who do not. He emphasized digital inequality as an inequality between segments of the population due to differences in various dimensions of technology access and use.

Another barrier resulting from the digital divide is digital poverty. The concept of digital poverty emphasizes minimum levels of ICT use, consumption and access. Barrantes (2007a), also identified the causes of digital poverty in his study. He stated that the lack of connection access, which is one of the ICT features, lack of demand, individuals with insufficient income and lack of use due to barriers such as age. In Figure 1, individual digital poverty levels prepared by Barrantes (2007b) are shown below.

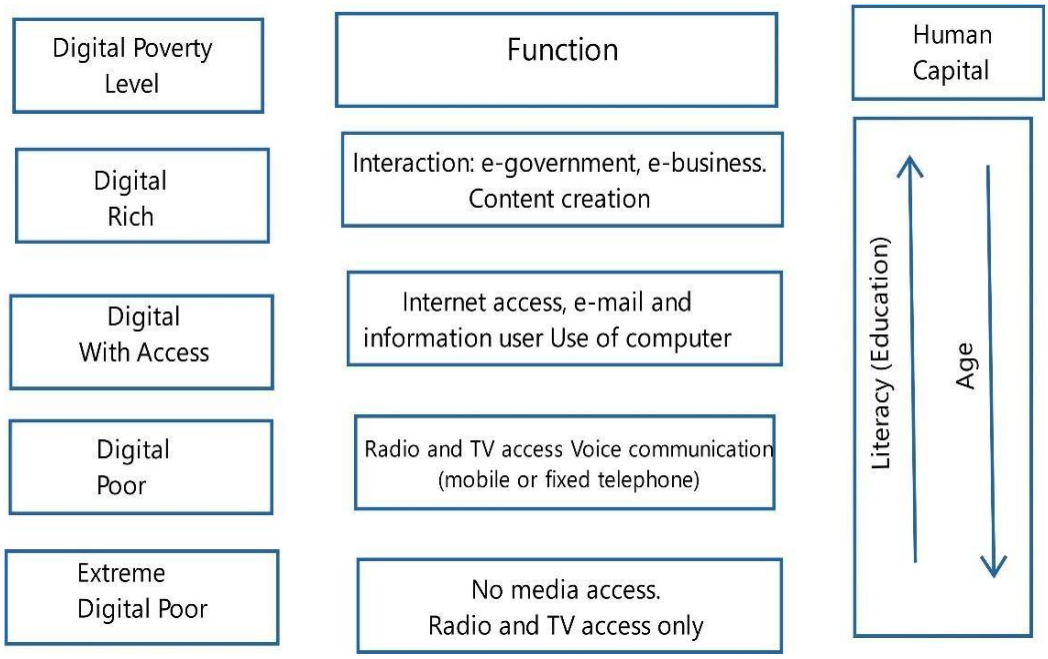

Figure 1. *Individual levels of digital poverty*

Depending on many factors, societies make minimum or no use of information and communication technologies. The emergence of digital poverty cannot be attributed only to income level. Along with the income level, it depends on factors such as insufficient and incomplete ICT infrastructure, lack of access to ICT products, lack of sufficient skills, knowledge, education and literacy to use ICT. As can be seen in the figure, digital poverty levels are shown. The digitally rich group utilizes all the possibilities of ICT and uses the Internet at every stage of life. While mobile or fixed telephone users are characterized as digital poor, individuals with only radio and TV usage are grouped as extreme digital poor. It is also observed that the increase in education level increases digital wealth, while the increase in age level increases digital poverty. In short, while the digital divide deals with inequalities in an individual's access to and use of ICT, digital poverty focuses on the access and use of information and communication technologies at the minimum level. According to another researcher Salinasa (2003), the digital divide is not only about people's access to computers and technology but also about certain factors related to people themselves. These factors are access to technology, hardware and software, individuals' ability to use technology, and individuals' interest, desire and attitudes towards technology.

When it comes to technology, the world is very different from how we lived in the past. New developments and inventions are happening every day. These developments change people's lives and the paths we follow. Education, like every field, is affected by this change. Through digital technologies such as video, internet, wireless ICT, education has changed teaching and learning processes and methods (Hooft, 2006). Many societies have experienced serious change towards the integration of new technologies into learning and have started to explore the digital advantage. The widespread use of ICT in more technologically advanced societies has already had a positive impact on many schools worldwide. Teachers and students are using these technologies to maximize ICT learning. From this perspective, ICT is an essential component of digital literacy skills (Garland, 2006). However,

not all societies succeed in developing digital literacy skills. There are certain factors and conditions that hinder ICT integration related to the acquisition of digital literacy skills (Brush & Hew 2007; Ertmer, 1999).

Analyzing these barriers, Hew and Brush (2007) found that the most frequently cited barriers to technology integration in schools in their study were (a) lack of or limited resources, (b) the organization (lack of vision or inconsistent views and leadership), (c) attitudes and beliefs, and (d) lack of or limited knowledge and skills. In addition to these factors, Ertmer (1999) categorizes barriers as first-order (organizational) or second-order (personal). First-order barriers are barriers at the organizational level, i.e. barriers related to technology integration. That is inadequate access to time, financial and human resources to technologies as well as inadequate resources for planning, cooperation, teamwork and reflection on teaching practices are among the first-order barriers (Ertmer, 1999). These are often district and school-level factors that involve inadequate or lack of access. They are barrier conditions such as access to technology resources, access, and technical support (Miranda & Russell, 2011). In addition, among the first barriers, school managers do not have the competence and the attitude to allow them to use the available resources effectively in case they do not have the knowledge or experience. As a result, inefficient use of both financial and human capital are negative conditions such as inadequate expenditures for digital technology equipment for school expenditures and insufficient training for teachers (Fullan, 2010; as cited in Hosseini, 2018). When analyzed from these perspectives, it is seen that the inability to gain digital literacy skills within the educational stages is influenced by the level of the digital divide in societies. Second-order barriers are personal barriers and include beliefs and attitudes about technology (Ertmer, 1999). Another second-order barrier to the acquisition of digital literacy skills in education is the inability of teachers and students to effectively integrate ICT into education. The reason for the lack of knowledge and skills to integrate these technologies is the inability to use technologies in educational practices (Hew & Brush, 2007). Second-order barriers can be associated with digital poverty in terms of being negative factors and conditions related to personal, beliefs and attitudes.

Purpose of the Study

According to Martin (2005), digital literacy is the ability of individuals to use digital tools and opportunities; identify, access, manage, and appropriately adapt digital resources, evaluation, analysis and synthesize, structure new knowledge, create media expressions and communicate with others, constructive social behavior in the context of private life situations. It is defined as the awareness, attitude, and ability to take action and reflect on this process. Digital literacy is defined as the ability to use a digital device or It should not be expressed in a limited framework as using software. Digital literacy is the cognitive necessary for individuals to work effectively in the digital environment, and complex, emotional, and sociological skills (Eshet, 2004). So technological tools not only cover the process of using the services offered to us, but also It include many processes such as analysis, synthesis, adaptation, and evaluation with the appropriate use of tools. To prepare the individual for the future, it can be said that teachers are at the forefront in terms of providing digital literacy skills to new generations. Therefore, examining the knowledge and skill levels of teachers about digital literacy and evaluating their views on barriers, is important at the point of digital literacy skills desired to be acquired by individuals are in operation. This research, is aimed to evaluate teachers' views on digital literacy and barriers. In this direction, the following sub-objectives were analyzed in terms of gender, education level, department, professional experience and time spent on digital platforms.

Research Questions

1. What are the opinions of teachers about the attitude sub-dimension related to digital literacy?
2. What are teachers' views on their technical skills related to digital literacy?
3. What are teachers' views on the cognitive dimension of digital literacy?
4. What are teachers' views on the social dimension of digital literacy?
5. What are teachers' views on the barriers related to digital literacy (attitude, technical, cognitive, managers' perspective and social domain)?

METHOD

Research Design

A mixed method was used in this research. The mixed method is "a research method based on collecting, analyzing and interpreting qualitative and quantitative data together to provide a better understanding of the research problem in a research process" (Leech & Onwuegbuzie, 2007). In this study, a sequential explanatory design was used. In this design, quantitative data are collected and analyzed first, and then qualitative data are collected and analyzed. Finally, the method is integrated into the findings and interpretation section (Creswell, 2003; as cited in Elaldı, 2013).

Population and Sample

Participants in the study consisted of teachers working in public or private schools across Turkey in the 2020- 2021 academic year. A total of 653 teachers, 455 women and 198 men, participated in the research, which was conducted voluntarily. In the quantitative dimension of the study, the convenient sampling method was used. "Convenient sampling is the sampling that results from the researcher's preference of the sample from easily accessible and applicable units due to the limitations that exist in terms of time, money and labor force for the researcher to select groups that can be easily applied" (Büyüköztürk et al. 2017).

In the qualitative dimension of the research, the voluntariness of the teachers determined as participants were taken as a basis, and criterion sampling, which is one of the forms of purposeful sampling, was used. Purposive sampling is a sampling that allows in-depth examination and study of situations that are thought to have rich information and data. In studies using criterion sampling, observation units consist of people, events, or situations with certain qualities (Büyüköztürk et al., 2018). The criteria were the willingness and volunteer status of the teachers, and the data of the teachers to be included in the qualitative study were paid attention to be different. The demographic characteristics of the teachers who participated in the research are given in Table 1.

Table 1. Demographic Characteristics of Teachers

Gender	N	Education Level	N	Department	N	Experience	N	Time Spent	N
Male	455	Undergraduate	575	Preschool	166	1-5	247	1-2	175
Female	198	Postgraduate	78	Class Teacher	136	6-10	97	3-4	312
				Maths	55	11-15	103	5-6	121
				Science	28	16+	206	7+	45
				Turkish	79				
				Social	32				
				English	39				
				Other	118				
Total	653								

Data Collection and Data Tool

In the quantitative part of the study, the Digital Literacy Scale developed by Ng (2012) was used, and in the qualitative part of the study, a semi-structured interview form on Digital Literacy Barriers developed by the researcher was used. The scale consists of 4 factors (attitude, cognitive, technical, and social) and 17 items. The scale validity and reliability study by Hamutoğlu et. al. (2017). Quantitative data were collected from teachers online via Google Form and the Digital Literacy Scale questionnaire, which was prepared due to the restrictions due to the COVID-19 pandemic in 2020-2021. Qualitative data were applied in a semi-structured interview form. Some of the interview forms were collected face-to-face by hand. Some of them were collected online from the internet due to the restrictions due to the Covid-19 pandemic in 2020-2021.

Research Ethics

All ethical procedures were completed in this study. Ethical permission for the research was approved by Bartın University Ethics Committee. The ethics committee document number is 2020-SBB-0190.

Analyzing the Data

Before analyzing the collected data, all surveys were numbered from 1 to 653. Afterwards, the data collected by looking at the sorted data were transferred with the electronic spreadsheet program. SPSS 22.0 software was used to evaluate the data collected in the research. Arithmetic averages were calculated to determine the factors of the digital literacy levels scale (attitude, technical, informatics, social). In the research, descriptive statistics (frequency, percentage, mean, SD), independent groups t-tests and one-way analysis of variance

(ANOVA) from parametric tests were used to examine the relationships between variables. The t-test was applied to determine whether teachers' perceptions of digital literacy competence showed a significant difference according to their gender and education level. One-way ANOVA was used to determine whether teachers' perceptions of digital literacy competence show a significant difference according to variables related to professional experience, department and time spent on digital platforms per day. The data obtained through the interview form collected in the qualitative part of the study were analyzed by descriptive analysis method using NVivo10 software and tables, figures and graphs were created. With this analysis method, the data collected are classified and explained by looking at the sub-dimensions. Teachers who participated in the qualitative part of the research were given codes up to T1, T2,……, T35, T36. In descriptive analysis, direct quotations are included to show the clear expressions of the interviewees participating in the study. The inclusion of direct quotations benefits the reliability of the qualitative study. As a result of descriptive analysis, raw data are processed, classified, and coded and results are reached with the interpretation of the researcher (Yıldırım & Şimşek, 2016). The questions in the interview form used in the research represent the factors in the sub-dimensions of the scale.

FINDINGS

Table 2. Significant Differences According to Demographic Characteristics of Teachers

	Attitude	**Technical**	**Cognitive**	**Social**
Gender	t651 =0,71; p>0,05	t651 =-1,14; p>0,05	t651 =0,21; p>0,05	t651 =-1,56; p>0,05
Education Level	t651 =0,30; p>0,05	t651 =-0,24; p>0,05	t651 =-0,46; p>0,05	t651 =-0,10; p>0,05
Department	F(3,649)= 0,62; p>0,05	F(3,649)= 1,85; p>0,05	F(3,649)= 0,99; p>0,05	F(7,645) =0,94; p>0,05
Experience	F(7,645) =1,01; p>0,05	F(7,645) =0,37; p>0,05	F(7,645) =1,71; p>0,05	F(3,649) =2,67; *p<0,05
Time Spent	F(3,649) =1,86; p>0,05	F(3,649) =2,43; p>0,05	F(3,649) =1,40; p>0,05	F(3,649) =3,66; *p<0,05

*p<0,05

There is no significant difference in the attitude, technical, cognitive and social dimensions of digital literacy according to gender, educational level and department. Furthermore, there is no significant difference in the attitude, technical and cognitive dimensions of digital literacy according to the experience and time spent, while a significant difference was found in the social dimension.

According to the results of the Least Significant Difference (LSD) test conducted to find out between which groups the differences between the professional experience groups of the teachers, it is seen that between 1-5 years and 6-10 years of experience in favor of 1-5 years group and between 1-5 years and 16+ years of experience in favor of 1-5 years group are more positive. At this point, the eta square (η^2) value was found to be 0.01. The social sub-variable of digital literacy explains approximately 1% of the total variance in the professional experience variable. This result shows that the effect value is small.

According to the results of Least Significant Difference (LSD) test conducted to find out between which groups the differences are, it is seen that the time spent by teachers on digital platforms in a day is more positive between 1-2 hours and 3-4 hours group in favor of 3-4 hours group and between 1-2 hours and 7+ hours group in favour of 7+ hours group. At this point, the eta square (η^2) value was found to be 0.02. The social sub-dimension of digital literacy explains approximately 2% of the total variance in the variable of time spent on digital platforms in a day. This result shows that the effect value is at a small level.

Findings on Digital Literacy Barriers

The interview form on digital literacy barriers developed by the researcher was based on the reviewed literatures and the sub-dimensions of the digital literacy scale applied in the quantitative part of the research; the sub-dimensions related to these barriers are shown in the figure below.

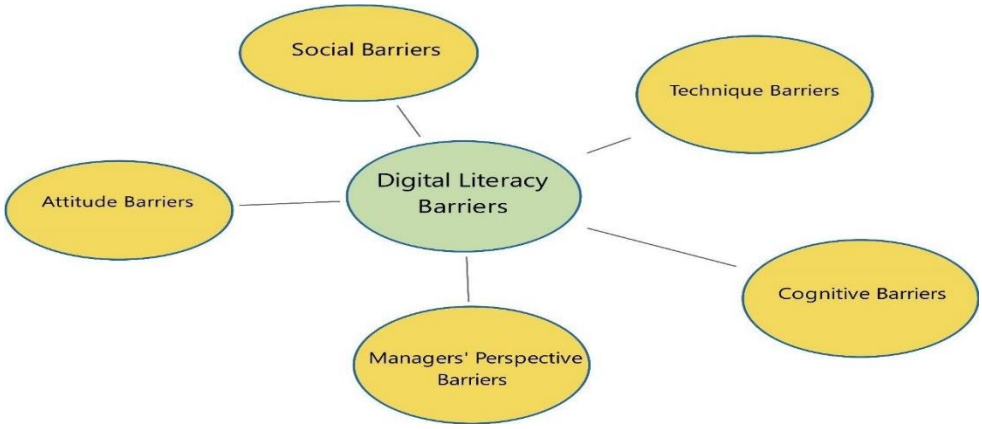

Figure 2. *Sub-dimensions of digital literacy barriers*

Digital literacy barriers consist of five sub-dimensions: attitude, technical, cognitive, manager perspective and social barriers. In this section, the views of 36 teachers on these sub-dimensions are given. Teachers who participated in the qualitative part of the research were given codes up to T1, T2……, T35, T36.

Attitude Barriers

The results of the analyses of the opinions and expressions of the teachers participating in the research on the attitude sub-dimension of digital literacy barriers are showed below.

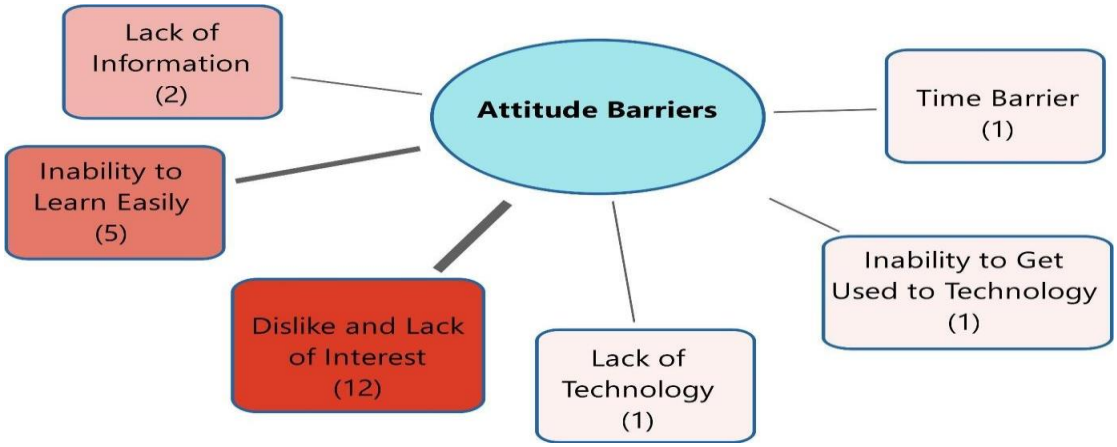

Figure 3. *Attitude barriers codes*

(**Note:** In the attitude sub-dimension disabilities, 4 people with no answer and 10 people with the statement "I have no disability" are not included in the figure).

The main codes that emerged from the opinions and statements of the teachers in the attitude sub-dimension of digital literacy barriers were grouped under 6 main headings: dislike and lack of interest in using, inability to learn easily, lack of technology, inability to get used to technology, lack of knowledge and time barrier.

T6, T8, T11, T13, T14, T16, T17, T23, T27, T30, T33 and T6 coded teachers stated that they did not like and were not interested in technology. T11; " I don't want to go into the details of the work, except to find and learn what I need.", T14; "I don't like to use it, but I have to", T16; "I don't have much interest in technology", T27; "I don't like it too much, I use it when I need it", they stated that not liking and not being interested in technology is an important barrier in the attitude sub-dimension in terms of digital literacy barriers. T1, T5, T10, T12 and T20 coded teachers stated that they could not learn technology easily. T1; "I generally like technology but I cannot learn it easily.", T5; "I use technology, but I get help from time to time. I have no difficulty in learning because technology is now both a need and a necessity. Education is necessary in every moment of life. I try my best to make it a life process.", T20; "We cannot learn very easily" and stated that they had difficulty in learning technology and that this was an important barrier in the attitude sub-dimension in terms of digital literacy barriers. T9 and T21 coded teachers stated that they lacked knowledge about technology and this was an important barrier in the attitude sub-dimension in terms of digital literacy barriers. T3 stated that she likes technology and uses it effectively, but she also stated that the lack of technology is an important barrier in terms of digital literacy barriers in the attitude sub-dimension. T3; "I like to learn and try new digital platforms, I like to do different studies

and I learn programs easily. For example, I can write a story with Adobe Photoshop program and I am trying to make an animation of it. However, there is not enough technological equipment in terms of discovering new programs and education, which forces me to produce new ones, and I think it would be better if there were a few examples." T32 coded teacher stated that he could not adapt to new things and that he could not adapt to technology in any way, which is an important barrier in the attitude sub-dimension in terms of digital literacy barriers. T32 expressed his opinion as follows; " I have a hard time adapting to new things, I had a great difficulty in sharing the applications in the Zoom in the upload part of the song". T24 stated that he wanted to improve himself in this subject but could not spare time and that this was an important barrier in the attitude sub-dimension in terms of digital literacy barriers. T24; " Time barrier due to my job, other than that, an area I want to improve myself"

Table 3. Answers According to Demographic Characteristics of Digital Literacy Disability Attitude Barriers

Digital Literacy Barrier	Gender		Experience (Year)			Time Spent (Hour)		
Attitude Barriers	Male	Female	1-5	6-10	16+	1-2	3-4	5-6
Lack of Information	1	1	0	1	1	0	1	1
Inability to Learn Easily	0	5	1	0	4	2	2	1
Dislike and Lack of Interest	5	7	1	0	11	3	6	3
Lack of Technology	0	1	1	0	0	0	0	1
Inability to Get Used to Technology	0	1	0	1	0	0	1	0
Time Barrier	0	1	0	1	0	0	1	0
Total	6	16	3	3	16	5	1	6

When the barriers of the attitude sub-dimension of digital literacy barriers were examined, the majority of the teachers participating in the qualitative research emphasized the expressions of not liking and not being interested in using technology, not being able to learn technology easily, and 10 teachers stated that they did not have any barriers in the attitude sub-dimension of digital literacy barriers, so they were not included in the attitude sub- dimension barriers. When the table is analyzed in terms of gender, 5 of the female teachers expressed the barrier of not being able to learn technology easily, while none of the male teachers mentioned such a barrier. When the table was analyzed in terms of years of professional experience, the majority of teachers with 16 + years of professional experience expressed the barriers of not liking and not being interested in using technology and not being able to learn technology easily, while very few of the teachers with 1-5 and 6-10 years of professional experience expressed these barriers. The majority of teachers who spent 1-2 and 3-4 hours on digital platforms in a day expressed the barriers of not liking and not being interested in using technology, which are among the barriers of the attitude sub-dimension of digital literacy barriers.

Technical Barriers

The results of the analyses of the opinions and expressions of the teachers participating in the research on the technical sub-dimension of digital literacy barriers with the NVivo software are shown below.

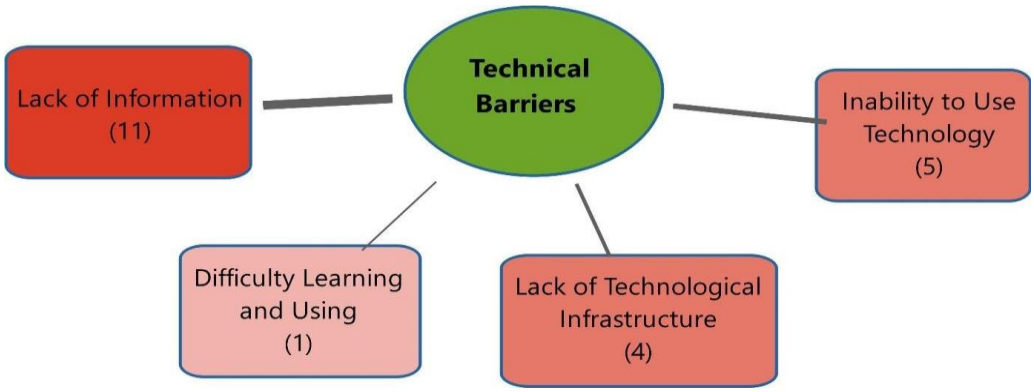

Figure 4. *Technical barriers codes*

(**Note:** In the technical sub-dimension barriers, 8 people who did not answer and 7 people who said they had no barriers are not included in the figure)

The main codes that emerged from the opinions and statements of the teachers in the technical sub-dimension of digital literacy barriers were grouped under 4 main headings: lack of knowledge about technology, inadequacy in using technology, lack of technological infrastructure, and difficulty in learning and using technology.

T3, T8, T10, T11, T12, T22, T26, T30, T32 and T33 coded teachers stated that they would create barriers in the technical sub-dimension of digital literacy barriers because they lacked knowledge about technology. T3; "I do not have enough knowledge about the computer freezing and renewing itself. I cannot correct the ready-made programs when they give errors. I do not have a problem as long as there is no barrier in a normal functioning", T10; "Lack of infrastructure and technical knowledge", T11; "Although I do not know all the technical issues, I do research in order to use what I need", T32, " You don't have much technical knowledge on issues like this, I usually try to get someone who knows the job done, I get support from the computer", T22, T26, T30 and T33 teachers stated that they had disabilities in the technical sub-dimension of digital literacy barriers due to their lack of technical knowledge about technology or incomplete and incorrect knowledge. T1, T3, T6, T16 and T20 coded teachers stated that they would create barriers in the technical sub-dimension of digital literacy barriers because they were inadequate in using technology. T1; "I am insufficient in using mobile technologies with technical skills." T3; "I don't have enough information about the computer freezing and refreshing itself. I can't fix ready-made programs when they give errors. I don't have a problem as long as it doesn't interfere with normal operation.", T6; "I cannot use digital teaching materials", T16; "I cannot solve some technical problems (drivers, package programs, etc.)" T20; "We cannot use mobile technologies much" and stated that being inadequate in using technology is a disability in the technical sub-dimension of digital literacy barriers. T13, T14, T23 and T35 coded teachers stated that the lack of technological infrastructure would be a barrier in the technical sub-dimension of digital literacy barriers. T13, T14, T23 and T35 coded teachers stated that the lack of technological and internet infrastructure in institutions is a barrier in the technical sub-dimension of digital literacy barriers. T27 coded teacher stated that having difficulty in learning and using technology would be a barrier in the technical sub-dimension of digital literacy barriers. T27 answered as "I have difficulty in using technological tools and learning programs." and stated that having difficulty in learning and using technology is a barrier in the technical sub-dimension of digital literacy barriers.

Table 4. Answers According to Demographic Characteristics of Digital Literacy Disability Technical Barriers

Digital Literacy Barrier	Gender		Experience (Years)			Time Spent (Hour)			
Technical Barriers	Male	Female	1-5	6-10	16+	1-2	3-4	5-6	7 +
Lack of Information	2	9	1	1	9	1	8	1	1
Difficulty in Learning and Using	0	1	0	0	1	0	1	0	0
Lack of Technological Infrastructure	3	1	1	0	3	1	2	1	0
Inability to Use Technology	0	5	2	0	3	2	1	2	0
Total	5	16	4	1	16	4	12	4	1

When the barriers of the technical sub-dimension of digital literacy barriers were examined, the majority of the teachers participating in the qualitative research emphasized the expressions of lack of knowledge about technology and inability to use technology. When the table is analyzed in terms of gender, 5 of the female teachers mentioned the barrier of inadequate use of technology, while none of the male teachers mentioned such a barrier. While 3 of the male teachers expressed the barrier of lack of technological infrastructure, only 1 of the female teachers expressed the barrier of lack of technological infrastructure. When the table was analyzed in terms of years of professional experience, the majority of teachers with 16+ years of professional experience mentioned the barrier of lack of knowledge about technology, while 1 person each from teachers with 1-5 and 1- 6 years of professional experience mentioned this barrier. Only 1 teacher with 16+ years of professional experience stated that they had difficulty in learning and using technology. When the table was analyzed in terms of the time spent on digital platforms in a day, 8 teachers who spent between 3-4 hours a day on digital platforms mentioned their lack of knowledge about technology, while 1 person each from teachers with 1-5, 1-6 and over 7 hours mentioned this barrier.

Cognitive Barriers

The results of the analyses of the opinions and expressions of the teachers participating in the research on the cognitive sub-dimension of digital literacy barriers with the NVivo software are shown below.

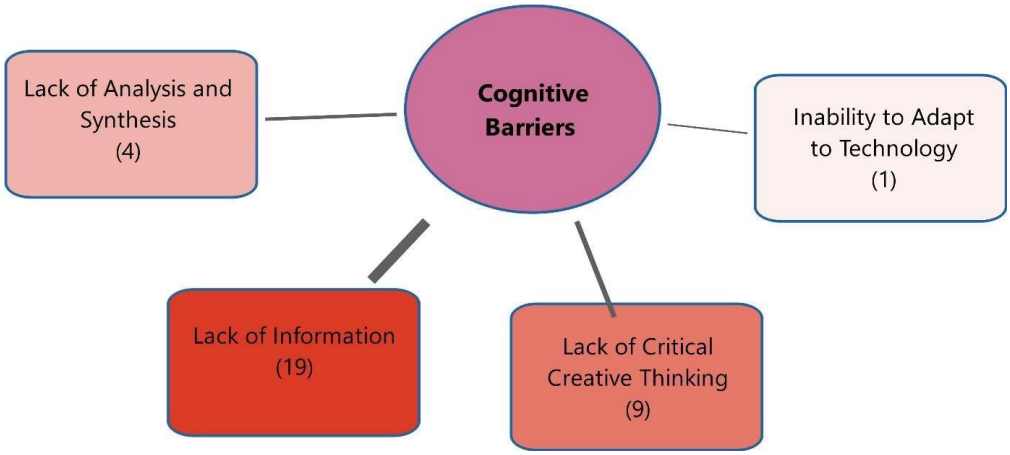

Figure 5. *Cognitive barriers codes*

(**Note:** In the cognitive sub-dimension disabilities, 5 people who did not answer and 6 people who said they had no disability are not included in the figure).

In the cognitive sub-dimension of digital literacy barriers, the main codes emerging from the opinions and expressions of the teachers were grouped under 4 main headings: lack of knowledge about technology, lack of critical and creative thinking in the use of technology, lack of analysis and synthesis in the use of technology, and inability to adapt to technology.

T1, T4, T6, T8, T9, T10, T11, T12, T14, T17, T19, T20, T21, T23, T24, T30, T31, T33 and T36 coded teachers stated that their lack of knowledge about technology would be an barrier in the cognitive sub-dimension of digital literacy barriers.", T14; "Information is incomplete and incorrect", T31; "Insufficient information and critical thinking inadequacy evaluation" and other teachers stated that they had barriers in the cognitive sub-dimension of digital literacy barriers because they had incomplete information about technology or they knew incorrectly. T7, T8, T22, T26, T30, T31, T33 and T35 coded teachers stated that the lack of critical and creative thinking in the use of technology would be a barrier in the cognitive sub-dimension of digital literacy barriers. T8, T13, T30 and T33 coded teachers stated that the lack of analyzing and synthesizing in the use of technology would be a barrier in the cognitive sub-dimension of digital literacy barriers. T5 coded teacher stated that not being able to adapt to technology would be a barrier in the cognitive sub-dimension of digital literacy barriers. T5; "In general, I cannot adapt to new activities quickly while using my problem." and stated that not being able to adapt to technology is a barrier in the cognitive sub-dimension of digital literacy barriers. It is also seen in the figure above that T8, T30, T31 and T33 coded teachers gave answers by emphasizing more than one barrier in the cognitive sub-dimension of digital literacy barriers.

Table 6. Answers According to Demographic Characteristics of Digital Literacy Disability Cognitive Barriers

Digital Literacy Barrier	Gender		Experience (Year)			Time Spent (Hour)			
Cognitive Barriers	Male	Female	1-5	6-10	16+	1-2	3-4	5-6	7 +
Lack of Analysis and Synthesis	1	3	0	0	4	0	4	0	0
Lack of Information	6	13	3	3	13	5	9	5	0
Lack of Critical Creative Thinking	2	7	1	1	7	1	6	1	1
Failure to Adapt to Technology	0	1	0	0	1	0	0	1	0
Total	9	24	4	4	25	6	19	7	1

When the cognitive sub-dimension barriers of digital literacy barriers were examined, the majority of the teachers who participated in the qualitative research emphasized the lack of knowledge about technology. 7 of the teachers with 16 years of professional experience or more emphasized the lack of critical and creative thinking in the use of technology, while only 1 of the teachers with 1-5 and 6-10 years of professional experience emphasized this barrier.

Social Barriers

The results of the analyses of the opinions and expressions of the teachers participating in the research on the social sub-dimension of digital literacy barriers with the NVivo software are shown below.

Figure 6. *Social barriers codes*

(**Note:** In the social sub-dimension barriers, 3 people who did not answer and 2 people who said they had no barriers are not included in the figure).

The main codes that emerged from the opinions and statements of the teachers in the social sub-dimension of digital literacy barriers were grouped under 7 main headings: economic barriers due to personal budgets, misuse and misuse of technology, not using and disliking technology socially, information pollution due to unnecessary information on the internet, political barriers due to the current political administration, distrust of the internet and inability to allocate time.

T4, T5, T8, T17, T21, T22, T23, T24, T25, T26, T30, T33 and T34 coded teachers stated that economic barrier due to personal budgets would be a barrier in the social sub-dimension of digital literacy barriers. T4; "Sometimes I find articles (education and social politics) but most of them are paid.", T5; "Budget and not participating in activities", T24; "Budget and access to security/personal data over the internet." and other teachers stated that economic barrier due to personal budgets is a barrier in the social sub-dimension of digital literacy barriers. T1, T6, S7, T13, T16, T19 and T36 coded teachers stated that the wrong and incorrect use of technology would create barriers in the social sub-dimension of digital literacy barriers. T1; "It is used more for entertainment purposes instead of conscious consumption." T6; " Writing comments without information ", T7; "Commenting on political issues without information", T16; "Very superficial information. False news. Insulting posts.", T16; "Very superficial information. False news.", T6; "Commenting on political issues without information", T7; "Commenting on political issues without information", T16; "Very superficial information. Teachers T5, T14, T28, T29, T31 and T35 stated that not using and liking technology socially would be a barrier in the social sub-dimension of digital literacy barriers. T14; "The virtual world feels cold.", T28; "In ability to use internet-based activities" and other teachers stated that not using and liking technology socially would be a barrier in the social sub-dimension of digital literacy barriers. T2, T3, T11, T16, T18 and T36 coded teachers stated that information pollution due to unnecessary information on the internet would cause barriers in the social sub-dimension of digital literacy barriers. T2; "Information pollution on the internet can cause difficulties in digital literacy.", T3; " Even people who do not know the social field can make all kinds of comments. I encounter unnecessary and unconscious comments while researching something" T16; "Very superficial information. False news. Insulting posts." and other teachers stated that information pollution due to unnecessary information on the internet would create a barrier in the social sub-dimension of digital literacy barriers. T8, T30 and T33 coded teachers stated that political barriers due to the current political administration would create barriers in the social sub-dimension of digital literacy barriers. T18 and T24 teachers stated that insecurity in the internet would be a barrier in the social sub-dimension of digital literacy barriers. T24 stated that insecurity in the internet would be a barrier in the social sub-dimension of digital literacy barriers with expressions such as "Budget and security over the internet/access to personal data.". T9 and T10 coded teachers stated that not being able to allocate time due to workload or lack of time would be a barrier in the social sub-dimension of digital literacy barriers. It is also seen in the figure above that T5, T8, T16, T18, T24, T30, T33 and T36 teachers gave answers by emphasizing more than one barrier in the social sub-dimension of digital literacy barriers.

Table 7. Answers According to Demographic Characteristics of Digital Literacy Disability Social Barriers

Digital Literacy Barrier	Gender		Experience (Year)			Time Spent (Hour)			
Social Barriers	Male	Female	1-5	6-10	16+	1-2	3-4	5-6	7 +
Information Pollution	3	3	2	0	4	2	2	1	1
Economic Barrier	5	8	1	2	10	1	7	4	1
Insecurity	1	1	0	1	1	0	2	0	0
Political Barrier	0	3	0	0	3	0	3	0	0
Social Disuse and Dislike	1	5	1	1	4	1	1	4	0
Not Making Time	1	1	0	0	2	0	2	0	0
Improper and Incorrect Use	3	4	2	0	5	2	2	3	0
Total	14	25	6	4	29	6	19	12	2

When the social sub-dimension barriers of digital literacy barriers were examined, many teachers emphasized economic barriers.

Manager Barriers

The results of the analyses of the opinions and expressions of the teachers participating in the research on the manager sub-dimension of digital literacy barriers with the NVivo software are shown below.

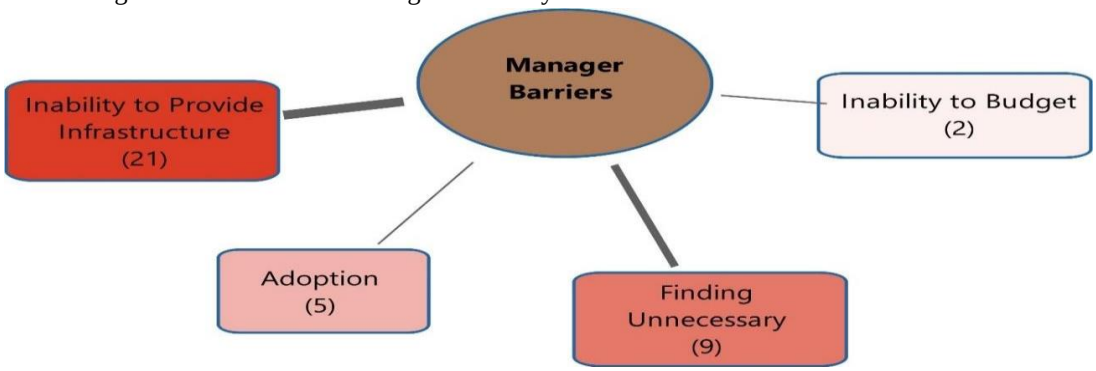

Figure 7. *Manager barriers codes*

(**Note:** 4 people who said that there is no barrier in the manager sub-dimension barriers are not included in the figure)

The main codes that emerged from the opinions and expressions of the teachers in the manager sub-dimension of digital literacy barriers were categorized under 4 main headings: inability to provide infrastructure, finding it unnecessary, not adopting it, and inability to provide budget.

T1, T2, T6, T9, T10, T11, T12, T13, T17, T18, T20, T21, T23, T25, T26, T28, T29, T31, T32, T34 and T36 coded teachers stated that managers' not providing technological infrastructure would be a barrier in the manager sub-dimension of digital literacy barriers. T2; "It cannot be unnecessary, but the lack of technological infrastructure may cause problems", T11; "Not creating resources and not believing in the necessity", and other teachers stated that the managers' failure or inability to provide technological infrastructure would create barriers in the manager sub-dimension of digital literacy barriers. T3, T4, T7, T11, T14, T16, T19, T22 and T35 coded teachers stated that managers' seeing technology as unnecessary would create barriers in the manager sub-dimension of digital literacy barriers. T3; "They want something more concrete than digital, they find digital platforms unnecessary", T4; " I think they should especially adopt the platform because it is more convenient and practical in terms of use.", T11; "Not creating resources and not believing in its necessity", T16; "They see it as a waste of time." With these expressions, other teachers stated that managers' seeing technology as unnecessary would be a barrier in the manager sub-dimension of digital literacy barriers. T4, T8, T30, T32 and T33 coded teachers stated that the managers' inability to adopt technology and their inability to adapt to it would constitute a barrier in the manager sub-dimension of digital literacy barriers. T32; "Those in the primary education organization where I work do not support these issues, they do not support them, they give importance to success-oriented things and support them in the following process.", and other teachers have stated that the inability of managers to adopt technology will be a barrier in the manager sub-dimension of digital literacy barriers. T18 and T32 coded teachers stated that the inability of managers to provide budget for technology would be a barrier in the manager sub-dimension of digital literacy barriers. It is also seen in the figure above that T4, T11, T18 and T32 teachers gave answers by emphasizing more than one barrier in the manager sub-dimension of digital literacy barriers.

Table 8. Answers According to Demographic Characteristics of Digital Literacy Disability Manager Barriers

Digital Literacy Barrier	Gender		Experience (Year)			Time Spent (Hour)			
Manager Barriers	Male	Female	1-5	6-10	16+	1-2	3-4	5-6	7 +
Failure to Provide Infrastructure	9	12	2	3	16	5	8	6	2
Non-adoption	1	4	1	1	3	0	5	0	0
Failure to Provide Budget	1	1	0	1	1	0	2	0	0
Finding Unnecessary	3	6	3	0	6	1	4	4	0
Total	14	23	6	5	26	6	19	10	2

When the barriers of the manager sub-dimension of digital literacy barriers were analyzed, the majority of the teachers emphasized that the managers did not provide technological infrastructure.

DISCUSSION & CONCLUSION

According to the results of the quantitative part of the research; teachers' digital literacy levels were analyzed using the "Digital Literacy Scale". Mean values of digital literacy of the teachers who participated in the quantitative part of the study reflected a level of agreement. Similarly, Kozan and Özek (2019), Yaman (2019), Arslan (2019), Öçal (2017), Korkmaz (2020), Cote and Milliner (2018), Waluyo (2019) et al. studies show similarities. No difference was found when teachers' digital literacy levels attitude, technical, cognitive and social factors were compared with the gender variable. This finding is similar to the results of Kozan and Özek (2019), Ocak and Karakuş (2019), Yaman (2019), Arslan (2019). Different situations were also found in similar field studies. In the studies of Çetin (2016), Özerbaş and Kuralbayeva (2018), Yeşildal (2018), it was determined that the Digital Literacy levels of male teachers were higher than female teachers. Today, developing technology and changing studies on digital literacy may have positively changed the digital literacy levels of female teachers, so there may be no difference in new studies.

No significant differences were found when the digital literacy levels of teachers were analyzed according to the attitude, technical, cognitive and social factors and department. Arslan (2019), Kozan (2018), Üstündağ, Güneş and Bahçivan (2017) found that numerical departments have higher digital literacy levels than other departments. Nowadays, the integration of each course with technology in the education programs of the Ministry of National Education and its association with the concept of digital literacy has positively reflected on the digital literacy levels of teachers in all departments, so there may be no difference on the basis of the department of the teachers in the new study.

While there was no significant difference between teachers' digital literacy levels, attitude, technical and cognitive factors and teachers' professional experience, there was a significant difference between teachers' professional experience and social factors. As the professional experience of teachers increases, their digital literacy levels in terms of social factors decrease. The digital literacy levels of newly appointed teachers are quite good because they are curious about the use of digital technologies, they have just graduated from university and use digital technology in every field. On the other hand, older teachers' late acquaintance with digital technology, their low use of digital technology in daily life, and the fact that they continue their education in their own way and use digital technology less in the lesson may have left their digital literacy levels behind in terms of social factor. Arslan (2019) found that junior teachers had higher social and technical digital literacy levels than senior teachers, but did not find a significant difference in terms of attitude and cognitive digital literacy levels. Similarly, Öçal (2017) found that teachers who are newer in their professional life are more competent in terms of digital literacy. In another study, Korkmaz (2020) found that digital literacy levels of classroom teachers decreased as their years of service in their profession increased.

No significant difference was found when the digital literacy levels of teachers were analyzed between attitude, technical, cognitive and social factors and educational status. This finding is similar to the findings of Arslan (2019), but different situations were encountered in similar field studies. Öçal (2017) and Korkmaz (2020) stated that digital literacy levels vary according to educational status, and that teachers with master's and doctoral degrees are more adequate in digital literacy level, and that teachers with postgraduate degrees have higher digital literacy levels than teachers with bachelor's degrees.

While there is no significant difference in the digital literacy levels of teachers in terms of attitude, technical and cognitive factors according to the time spent on digital platforms in a day, there is a significant difference in terms of social factor according to the time spent on digital platforms in a day. As the time spent on digital platforms in a day increases, digital literacy levels of teachers in terms of social factors also increase. Çetin (2016), Özerbaş and Kuralbayeva (2018), Arslan (2019), Öçal (2017) and Acar (2015) also found in their studies that

teachers' digital literacy levels increased as the time spent on computers and the internet increased. In these studies, they stated that as the time teachers spend on the computer and the internet increases in a day, their digital literacy levels are higher in terms of attitude and technique. However, Kozan (2018) concluded that the digital literacy levels of information technologies teachers did not differ according to the time they spent on the computer and the internet in a day.

In the qualitative dimension of the research, the results of the cognitive factor are remarkable. When the teachers' views on the barriers to digital literacy were analyzed in terms of the cognitive factor, the main codes that emerged were grouped under 4 main headings: lack of knowledge about technology, lack of critical and creative thinking in the use of technology, lack of analysis and synthesis in the use of technology, and in ability to adapt to technology. A great majority of the teachers participating in the qualitative research emphasized the lack of knowledge about technology. While 7 of the teachers with 16 years or more of professional experience emphasized the inability to think critically and creatively in the use of technology, only one of the teachers with 1-5 and 6-10 years of professional experience emphasized this barrier.

One of the ways for individuals to acquire and gain digital literacy skills is to identify the barriers to having digital literacy skills and to eliminate these barriers through education and training programs. Unless these barriers to digital literacy are identified, it cannot be guaranteed that teaching digital literacy skills to individuals will take more time and a positive result will be obtained (Semerci & Semerci, 2021). It is expected that the results of this thesis will be used when developing training programs.

Statements of Publication Ethics

The ethics committee report of this research was obtained from Bartın University, social and human publication ethics committee (Date: 30/09/2020; Decision no:2020-SSB-0190). All participants who took part in the study provided informed consent.

Researchers' Contribution Rate

In this study, each of the authors contributed equally to each stage. This study is based on the master's thesis written by Mert SAĞ.

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion
Mert SAĞ	☒	☒	☒	☒	☒	☒
Çetin SEMERCİ	☒	☒	☒	☒	☒	☒

Conflict of Interest

The authors declare that there is not conflict of interest

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