

An Investigation of Digital Literacy Levels of Middle School Students in Terms of Various Variables: The Case of Mersin Province

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With the rapid evolution of technology, digital literacy skills are becoming increasingly critical. Digital literacy involves individuals' abilities to access, analyze, evaluate and creatively use information. These abilities include the capacity to use, understand and critically evaluate traditional information technologies as well as the capacity to use digital tools such as digital media, internet resources and social media platforms. This study aims to determine the digital literacy levels of secondary school students and to evaluate the factors that may affect these levels. The effects of important variables such as gender, daily social media usage time, social media tool used on students' digital literacy levels were examined. The sample of the study consisted of 80 students (40 female and 40 male) between the ages of 10 and 12 studying in a middle school in Mersin, Türkiye. Digital literacy level was assessed using personal information form and Digital Literacy Scale. According to the results of the study, it was determined that the digital literacy levels of female students were generally higher than male students. A significant relationship was found between the frequency of social media use and information processing skills, and it was observed that students using YouTube and Pinterest had higher digital literacy levels in communication and security skills. These findings suggest that factors such as gender, frequency of social media use, and the social media tool used should be taken into consideration when planning digital literacy education.

Introduction

Digital literacy refers to individuals' ability to access, analyze, evaluate and creatively use information (Arslan, 2019). Digital literacy is defined as the ability to use, understand and critically evaluate information technologies (Gilster, 1997). Digital literacy skills include traditional reading and writing skills as well as the ability to use digital tools such as digital media, internet resources and social media platforms (Prensky, 2001). As digital technologies have become a part of daily life, students' ability to access, critically think and share information has become increasingly important (Ekemen, 2022). Developing students' digital literacy skills can help them to participate more effectively in their future professional lives and society (Cansoy, 2018).

Digital literacy has become a fundamental part of the education system today. Especially the development of digital literacy skills of secondary school students is of great importance for

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the effective use of digital technologies in education and for students to gain the skills of accessing, processing, evaluating and sharing information in the digital world (Çelik & Kiliçoğlu, 2022). At this point, the role of teachers in the process of teaching digital literacy skills to students is critical (Çetin, 2016).

Digital literacy is extremely important at the secondary school level because today, access to information and communication is realized through digital platforms. Developing digital literacy skills of middle school students will support them to gain 21st century skills by enabling them to access, process, evaluate and share information effectively in the digital world (Hafiza et al., 2022). Moreover, digital literacy skills can also support students to make healthy decisions in the digital world and manage online risks (Neter & Brainin, 2012).

Various studies have examined the digital literacy levels of middle school students and have shown that they generally have high levels of digital literacy skills (Sarıkaya, 2019; Pala & Başibüyük, 2020; Çelik & Kiliçoğlu, 2022). This shows that students are competent in accessing, processing and communicating information in the digital world. It was also stated that digital literacy skills may differ according to age and grade level (Pala & Başibüyük, 2020).

The factors affecting digital literacy skills at the secondary school level are quite diverse, and understanding these factors is an important step for the development of these skills. Studies in the literature address the factors affecting digital literacy skills from various perspectives. For example, it is stated that factors such as students' ages, education levels, income levels, access to technology, cultural backgrounds, teachers' competencies in digital literacy, school culture and educational policies are effective on digital literacy skills (Özkan et al. (2022); Sogalrey et al., 2022; Kailani et al., 2021; Sari et al., 2022). These factors collectively shape students' proficiency in digital literacy, highlighting the need for a comprehensive approach to address the determinants of digital literacy.

There are various suggestions to increase students' digital literacy skills. First of all, it is important to establish a comprehensive curriculum on digital literacy in schools and to implement this curriculum effectively (Ilhami et al., 2021; Zhang, 2021). In addition, teachers need to strengthen their training in digital literacy and effectively integrate digital technologies into classroom activities (Nuroh & Liansari, 2018; Frydenberg, 2015). It is also important for parents to consciously encourage the use of technology to support children's digital literacy skills and guide their children in digital literacy (Hilyana et al., 2023). Because, digital literacy skills support students in making informed decisions and managing online risks, underscoring the critical role of digital literacy in secondary education.

Methods such as using game-based learning methods to increase digital literacy skills, integrating STEM (Science, Technology, Engineering, Mathematics) skills with digital literacy skills, and providing students with the skills to produce digital content and critically evaluate information are also recommended (Jan, 2018). In addition, measuring digital literacy skills and providing individual feedback to students based on these measurements are also important for improving skills (Kailani et al., 2021).

Digital literacy is the set of knowledge, skills and attitudes needed to participate in digital life, to live, learn and work in a digital society. Digital literacy enables students to develop competencies such as searching, evaluating, producing and sharing information in digital environments. Digital literacy also requires students to use recreational technologies such as

digital games critically and ethically. Digital games are interactive and motivating environments where students can develop their cognitive, affective and psychomotor skills. However, excessive and addictive use of digital games can harm students' physical, social and academic development.

Today, with the rapid development of technology, digital literacy skills have become even more important. Secondary school students, as active participants in this digital age, frequently use digital tools to access information and communicate. The main purpose of this study is to determine the digital literacy levels of middle school students and to evaluate the factors that may affect these levels. In this context, we aim to examine the effects of important variables such as gender, daily social media usage time, social media tool used on the digital literacy levels of middle school students. In this context, the research questions focus on the following:

- Is there a significant difference in digital literacy skills of secondary school students in terms of gender?
- Is there a significant difference in the digital literacy skills of middle school students in terms of social media usage time?
- Is there a significant difference in terms of the social media tool used in the digital literacy skills of middle school students?

Method

The research design of this study is designed as a cross-sectional study. Cross-sectional research is a type of research that examines the status, relationships or characteristics of individuals in a particular community at a particular time. This type of research is used to understand the relationships between different variables, to describe situations or to develop in-depth understanding of a particular issue. Cross-sectional research collects data, usually through surveys or observations, and evaluates this data through statistical analysis. Digital literacy measurement is often favored with cross-sectional research because such research can be used to determine the digital literacy levels of individuals at a given point in time.

The participants of this study consists of students studying at Mersin Mezitli Ahmet Hocaoglu Secondary School. The participants were selected based on their convenience and the ages of the student participants ranged from 10 to 12 years old. A total of 80 students, 40 female and 40 male, participated in the study. Information about the gender of the participants is given in Table 1.

Table 1. *Participants' gender distribution*

Gender	N	%
Man	40	50
Women	40	50
Total	80	100

Personal information form and Digital Literacy Scale (Başbüyük & Pala, 2020) were used to assess the level of digital literacy. Personal Information Form: The personal information form in the first part of the data collection tools was developed by the researchers. Through the personal information form, it was aimed to determine the gender of middle school students, the

social media application they use, the time spent on the internet and the purpose of internet use.

The Digital Literacy Scale (DLS) utilized in this study, developed by Başibüyük & Pala (2020), comprises 21 items and encompasses four fundamental sub-dimensions. These sub-dimensions are "Information Processing," "Communication," "Safety," and "Problem Solving". These are;

- Information Processing: The ability to search, select, organize and evaluate information in digital environments,
- Communication: The ability to effectively communicate messages and share information across a variety of digital platforms,
- Security: Personal information security in online environments, using secure passwords and being aware of online threats,
- Problem Solving: It is assessed as the ability to recognize, analyze and find quick solutions to problems in digital environments.

Participants rated each item on a five-point Likert-type scale (1=Never, 2=Rarely, 3=Sometimes, 4=Most of the Time, 5=Always). The reliability of the scale was evaluated as a result of the analyses conducted by the researcher. The Cronbach's Alpha internal reliability coefficient of the scale ranged between .71 and .79 for the sub-dimensions. The overall reliability coefficient of the scale was calculated as .88 when evaluated from a perspective including all items. Furthermore, the psychometric properties of the Digital Literacy Scale, including its factor structure, item discrimination, and item difficulty, should be rigorously evaluated to ensure its reliability and validity in measuring digital literacy among middle school students.

Data Analytics

Data Analytics was conducted using SPSS (Statistical Package for the Social Sciences) software. First, students' digital literacy scores were calculated. Then, the relationship between these scores and other variables was analyzed.

Results

In this section, statistical analyses to answer the research questions of the study and the findings and interpretations obtained as a result of these analyzes are given. Students' digital literacy level was evaluated using the Digital Literacy Scale (Başibüyük & Pala, 2020). Students' digital literacy level according to gender variable is presented in Table 2.

Table 2. Digital Literacy Level of Students According to Gender Variables

	Male				Female			
	<i>N</i>	<i>Mean</i>	<i>SS</i>	<i>p</i>	<i>N</i>	<i>Mean</i>	<i>SS</i>	<i>p</i>
Information Processing	40	14.20	3.44	0.478	40	14.85	4.64	0.479
Contact	40	17.53	4.30	0.187	40	18.83	4.43	0.187
Security	40	15.23	3.90	0.073	40	17.03	4.89	0.073
Problem Solving	40	14.40	4.21	0.008	40	17.05	4.53	0.008
Total	40	61.35	10.42	0.010	40	67.75	11.37	0.010

The data does not show a significant deviation from a normal distribution except for problem-solving skills and total scores. According to the results of the independent sample t-test conducted on the total score, a significant difference was found between genders at the level of digital literacy skills ($t=-2.625$, $df=78$, $p=0.010$). However, independent sample t-test results for information processing skills showed that there was no significant difference between genders ($t=-0.712$, $df=71.894$, $p=0.479$). Similarly, the results of the independent sample t-test on communication skills and safety revealed that there was no significant difference between genders (communication: $t=-1.332$, $df=77.938$, $p=0.187$; safety: $t=-1.820$, $df=74.311$, $p=0.073$). However, independent sample t-test results in terms of problem solving skills showed that there was a significant difference between genders ($t=-2.710$, $df=77.591$, $p=0.008$). Students' digital literacy level according to the frequency of social media use is presented in Table 3.

Table 3. *Digital Literacy Level of Students According to Frequency of Social Media Use*

Group	<i>n</i>	<i>M</i>	<i>Mean Rank</i>
Information Processing	1 hour	26	45,38
	1-2 hours	39	37,22
	2-3 hours	12	33,04
	4 hours	3	70,67
	Total	80	
Contact	1 hour	26	39,88
	1-2 hours	39	38,05
	2-3 hours	12	50,08
	4 hours	3	39,33
	Total	80	
Security	1 hour	26	42,58
	1-2 hours	39	35,76
	2-3 hours	12	46,50
	4 hours	3	60,17
	Total	80	
Problem Solving	1 hour	26	42,35
	1-2 hours	39	37,05
	2-3 hours	12	42,00
	4 hours	3	63,33
	Total	80	
Total	1 hour	26	44,67
	1-2 hours	39	34,86
	2-3 hours	12	44,79
	4 hours	3	60,50
	Total	80	

Significant differences were observed in information processing skills related to the frequency of social media use, but no significant deviation from normal distribution in other areas. A statistical analysis was conducted to examine the relationship between the frequency of social media use and various aspects of digital literacy skills. The results indicated no significant difference in total digital literacy skills based on different durations of social media use ($p > 0.05$). However, a statistically significant difference was observed in information processing skills ($p = 0.040$) concerning the frequency of social media use. Specifically, the Information Processing skills varied significantly across different durations of social media use. The mean rank for Information Processing skills was highest for the '1 hour' group (Mean Rank = 45.38) and gradually decreased for the '1-2 hours' (Mean Rank = 37.22) and '2-3 hours' (Mean Rank = 33.04) groups. The '4 hours' group exhibited a notably higher mean rank (Mean Rank = 70.67), indicating a significant improvement in information processing skills with increased internet usage duration. On the other hand, there were no significant differences found in Communication, Security, and Problem Solving skills based on the frequency of social media use ($p > 0.05$). The mean ranks for these skills showed no consistent pattern across the different usage durations. The level of digital literacy according to the social media tools used by the students is given in Table 4.

Table 4. *Digital Literacy Level According to Students' Instagram Usage Status*

	Mann-Whitney U	Z	p
Information Processing	382.000	0.352	0.725
Contact	369.000	-0.527	0.598
Security	281.000	-1.716	0.086
Problem Solving	399.500	-0.115	0.909
Total	359.000	-0.661	0.509

Data does not indicate a significant deviation from a normal distribution. A Mann-Whitney U test was conducted to examine the association between Instagram usage status and digital literacy skills across different domains. The results revealed that there were no significant differences in information processing ($U = 382.000$, $Z = 0.352$, $p = 0.725$), communication ($U = 369.000$, $Z = -0.527$, $p = 0.598$), and problem-solving skills ($U = 399.500$, $Z = -0.115$, $p = 0.909$) based on Instagram usage status. However, a statistically significant difference was found in security skills ($U = 281.000$, $Z = -1.716$, $p = 0.086$), indicating that individuals with distinct Instagram usage statuses exhibited varying levels of security skills. Overall digital literacy skills, as measured by total points, also did not significantly differ ($U = 359.000$, $Z = -0.661$, $p = 0.509$) between groups. The digital literacy level of students according to their Twitter usage status is given in Table 5.

Table 5. *Digital Literacy Level According to Students' Twitter Usage Status*

	Mann-Whitney U	Wilcoxon W	Z	p
Information Processing	178.500	206.500	-1.317	0.188
Contact	173.500	201.500	-1.401	0.161
Security	234.500	2935.500	-0.359	0.720

Problem Solving	211.500	239.500	-0.751	0.453
Total	180.000	208.000	-1.287	0.198

Does not show a significant deviation from a normal distribution. Digital literacy skills were examined in relation to students' Twitter usage status using a Mann-Whitney U test, as detailed in Table 5. The results indicated no significant differences in information processing ($U = 178.500$, $W = 206.500$, $Z = -1.317$, $p = 0.188$), communication ($U = 173.500$, $W = 201.500$, $Z = -1.401$, $p = 0.161$), security ($U = 234.500$, $W = 2935.500$, $Z = -0.359$, $p = 0.720$), problem-solving ($U = 211.500$, $W = 239.500$, $Z = -0.751$, $p = 0.453$), and total digital literacy skills ($U = 180.000$, $W = 208.000$, $Z = -1.287$, $p = 0.198$) based on Twitter usage status. Students' digital literacy level according to their Facebook usage status is given in Table 6.

Table 6: Digital Literacy Level According to Students' Facebook Usage Status

	Mann-Whitney U	Wilcoxon W	Z	p
Information Processing	219.000	2847.000	-1.111	0.266
Contact	216.500	252.500	-1.151	0.250
Security	222.000	258.000	-1.062	0.288
Problem Solving	234.000	2862.000	-0.868	0.385
Total	262.000	2890.000	-0.417	0.676

The data does not show a significant deviation from a normal distribution. Digital literacy skills in relation to Facebook usage status were assessed using a Mann-Whitney U test, as outlined in the provided table. The results revealed no statistically significant differences in information processing ($U = 219.000$, $W = 2847.000$, $Z = -1.111$, $p = 0.266$), communication ($U = 216.500$, $W = 252.500$, $Z = -1.151$, $p = 0.250$), security ($U = 222.000$, $W = 258.000$, $Z = -1.062$, $p = 0.288$), problem-solving ($U = 234.000$, $W = 2862.000$, $Z = -0.868$, $p = 0.385$), and total digital literacy skills ($U = 262.000$, $W = 2890.000$, $Z = -0.417$, $p = 0.676$) based on Facebook usage status. The digital literacy level of the students according to their Youtube usage status is presented in Table 7.

Table 7: Digital Literacy Level According to Students' Youtube Usage Status

	Mann-Whitney U	Wilcoxon W	Z	p
Information Processing	496.500	2449.500	-0.712	0.477
Contact	326.000	497.000	-2.683	0.007
Security	372.500	2325.500	-2.143	0.032
Problem Solving	529.000	2482.000	-0.335	0.738
Total	549.500	720.500	-0.098	0.922

The data, except for contact and security, does not show a significant deviation from a normal distribution. Digital literacy skills were scrutinized in relation to YouTube usage status using a Mann-Whitney U test, as detailed in the provided table. The results indicated no statistically significant differences in information processing ($U = 496.500$, $W = 2449.500$, $Z = -0.712$, $p =$

0.477) and problem-solving skills ($U = 529.000$, $W = 2482.000$, $Z = -0.335$, $p = 0.738$), as well as total digital literacy skills ($U = 549.500$, $W = 720.500$, $Z = -0.098$, $p = 0.922$), based on YouTube usage status. However, a significant relationship was observed between YouTube usage status and communication skills ($U = 326.000$, $W = 497.000$, $Z = -2.683$, $p = 0.007$) and safety skills ($U = 372.500$, $W = 2325.500$, $Z = -2.143$, $p = 0.032$). The digital literacy level of students according to their Pinterest usage status is presented in Table 8.

Table 8: Digital Literacy Level of Students According to Pinterest Usage Status

	Mann-Whitney U	Wilcoxon W	Z	p
Information Processing	205.000	241.000	-1.337	0.181
Contact	265.000	2893.000	-0.370	0.711
Security	111.000	147.000	-2.847	0.004
Problem Solving	236.500	2864.500	-0.828	0.408
Total	253.000	289.000	-0.562	0.574

Except for security skills, does not show a significant deviation from a normal distribution. The digital literacy levels of students in relation to their Pinterest usage status were investigated using a Mann-Whitney U test, as presented in the provided table. The results revealed no statistically significant differences in information processing ($U = 205.000$, $W = 241.000$, $Z = -1.337$, $p = 0.181$) and communication skills ($U = 265.000$, $W = 2893.000$, $Z = -0.370$, $p = 0.711$), as well as total digital literacy skills ($U = 253.000$, $W = 289.000$, $Z = -0.562$, $p = 0.574$), based on Pinterest usage status. However, a significant relationship was observed between Pinterest usage status and security skills ($U = 111.000$, $W = 147.000$, $Z = -2.847$, $p = 0.004$), indicating that students with different Pinterest usage statuses exhibited varying levels of security skills. Conversely, no significant difference was found in problem-solving skills ($U = 236.500$, $W = 2864.500$, $Z = -0.828$, $p = 0.408$) based on Pinterest usage status.

Discussion and Conclusion

Understanding the factors affecting digital literacy skills and implementing various strategies to increase these skills will support middle school students to gain 21st century skills by enabling them to access, process, evaluate and share information effectively in the digital world. That is why, digital literacy plays a critical role in equipping students with the essential skills to thrive in the digital age. Understanding the diverse factors influencing digital literacy skills, addressing gender-based differences, and implementing targeted strategies are crucial for enhancing students' digital literacy skills. By considering the multifaceted influences on digital literacy and implementing effective educational approaches, educators can empower students to become proficient and responsible users of digital technologies, ensuring their preparedness for the digital era.

This study evaluated the digital literacy levels of middle school students based on the variables of gender, frequency of social media use and social media tool used. By analyzing the findings, several important points emerged.

In terms of gender, it was determined that the digital literacy levels of female students were generally higher than male students. This result is in line with previous studies that found

gender-based differences in areas such as digital literacy, media literacy, internet and technology use (Kaya, 2020; Üstündağ, 2021; Özerbaş & Kuralbayeva, 2018; Öztürk, 2020). Customized educational programs and resources that take gender-based differences into account can be developed to improve students' digital literacy skills. It is also important for teachers to plan classroom activities and provide individualized support to students, taking into account gender-based differences. These approaches can help improve the digital literacy skills of all students by reducing gender-based inequalities.

The impact of frequency of social media use on digital literacy is an important issue in today's digital age. Social media greatly affects individuals' access to information, communication and interaction. The significant difference between the frequency of social media use and information processing skills, one of the sub-dimensions of digital literacy skills, shows that students' digital literacy levels can be affected by social media use. At this point, the need for further research on how social media interactions among students affect the level of digital literacy emerges.

Another important finding of our study is that students who use YouTube and Pinterest have higher digital literacy skills in the communication and safety sub-dimensions. This indicates that certain social media platforms can make positive contributions to students' digital literacy skills. YouTube's ability to offer visual and audio content can provide students with interactive learning experiences. Pinterest, on the other hand, is thought to improve safety skills by encouraging working with visual materials.

In conclusion, digital literacy skills are essential for students to thrive in the digital age. Understanding the multifaceted factors influencing digital literacy and implementing targeted strategies are imperative for educators to effectively enhance students' digital literacy skills, ensuring their preparedness for the digital era. This study examined various factors affecting middle school students' digital literacy levels. It was found that variables such as gender, frequency of social media use, and the social media tool used were effective on students' digital literacy levels. These findings suggest that these factors should be taken into consideration when planning digital literacy education. In future research, it will be possible to understand these relationships in more depth by working with larger sample groups and participants with different demographic characteristics.

In light of these findings, it is important to consider factors such as gender, frequency of social media use and the social media tool used when planning digital literacy education. Educational programs need to be customized according to these variables and effective strategies should be implemented to improve digital literacy skills. Additionally, it is recommended that teachers plan classroom activities and provide individualized support to students by taking these differences into account. These approaches can help improve the digital literacy skills of all students by reducing gender-based inequalities.

Limitations

Limitations of this study include limitations in sample selection and the difficulty of generalizing data from only one middle school in Mersin, Türkiye. In addition, the exclusion of age groups other than 10-12-year-old students and students from different geographical regions, which is the focus of the study, limits the general validity of the findings. In social media analysis, the focus on specific platforms and the exclusion of other popular social media

tools may lead to an incomplete reflection of general social media interactions. Given the limitations of the cross-sectional design, longitudinal perspectives are needed to assess developments in digital literacy levels and changes over time. Furthermore, the limitations of measurement instruments should also be considered, as different results may be obtained when using different measurement tools. In future research, studies should be conducted with larger and more diverse sample groups, and different social media platforms and age groups should be evaluated comprehensively.

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