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Examining technology literacy in the context of secondary school students in Turkey

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Abstract

As the technology integration becomes the new normal together with the effect of COVID-19 that forced educational institutions to carry out all or most of the educational practices online, students at all levels have been required to adapt this process quickly. The use of technology has already been common in daily life of these learners which didn't necessarily mean that they would easily benefit from online learning. That's why this study investigates if personal factors like gender, grade, having a PC/tablet computer, using social media, and playing online games all of which are supposed to be common in the daily life of secondary school students in Turkey bring differences in terms of technology literacy that might affect the success of adapting and benefiting from the more technology integrated education. In this survey study, the data was collected from 148 secondary school students in Aksaray city of Turkey. The results show that the sample have mostly intermediate to high level of technology literacy level while gender, grade and having a PC/tablet computer variables do not put any significant difference in terms of technology literacy. It is important to note that using social media brings meaningfully better technology literacy and participants who play online games have significantly higher technology literacy in terms of communication. Accordingly, it can be suggested that secondary school students should be encouraged to use the social media and play online games, of course within the monitoring of families and teachers.

Keywords: technology literacy, secondary school students, social media, online gaming, communication

Introduction

Technology, today, has been playing a crucial role in all areas of life including communication, transportation, socialization and so on. Probably, one of the most indisputable impact of technology is on education which unarguably has provided more accessible learning for each individual and led to enhanced learning experiences. However, it is vital to be digitally literate to get in return for benefiting from the opportunities that it has enabled.

It is difficult to give a precise definition of digital literacy as it is multifaceted and comprehensive in nature (Akyazi, 2022) ^[1] which requires the simultaneous use of variety of skills to be able to negotiate effectively in the digital environment. A review of literature provides several definitions some of which are contradictory in nature because of the lack of agreement on the underlying components of the concept. In his extended, pioneering work on digital literacy, Gilster (2001, p. 1) defines digital literacy as "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers" (as cited in Nelson, Courier, & Joseph, 2011) ^[15]. In fact, it could be argued that Gilster confines digital literacy to computer literacy only but computer literacy has far broader meaning and stands as an umbrella term and incorporates the use of variety of complex skills as technical, cognitive, motoric, sociological and emotional as suggested by (Yoram, 2004) ^[27].

Digital literacy is of utmost importance especially in education in today's constantly evolving digital era which drives the use of digital resources and communication tools in all stages of school education (Kong, 2014) ^[12].

In line with this, institutions and officials are striving to integrate technology into the classrooms and create learning environments that are equipped with the latest technology in order to provide unique online experiences. To be able to efficiently applicate into use, students need to retrieve and select among the vast variety of digital materials and judge its reliability on the basis of their learning needs (Kong, 2014; Padilla, 2010) ^[12, 10] which requires further cognitive skills such as information literacy and critical thinking skills as suggested by Kong (2014) ^[12]. This raises doubts about the preparedness of students as well as teachers in digitally enhanced learning environments.

The unexpected emergence of Covid-19 period which caused a comprehensive transformation in education as a result of the shift from traditional, face-to face classroom to online digital learning environments brought certain pedagogical challenges in educational settings because of the emergent, rapid and incautious digitalization of education. However, it was observed that the process also provided important findings in terms of revealing the digital literacy level of the fundamental components of education, students and teachers namely. In their extensive study, Altınsoy and Boyraz (2022) ^[5] investigated the research studies in Turkish educational context during Covid-19 crisis and revealed that one major pedagogical challenge of the process was the limited digital literacy of the learners and suggested fostering digital skills of the students in order to ease adaptation into the digitally enhanced classrooms (Altınsoy & Boyraz, 2022, p. 555) ^[5]. In a similar vein, Covid-19 rooted online education period also exposed inadequate digital literacy of the teachers and instructors as well in various education contexts (Boyraz & Altınsoy, 2022; Li & Yu, 2022; Sánchez-Cruzado, Campi3n, & Sánchez-Compa3a, 2021) ^[5] which has raised concerns over digital literacy level of the teachers.

A number of research has been conducted on the digital literacy of students but the studies generally centred on assesing the digital competences of preservice teachers. Of the few studies intended to investigate the digital literacy of K-12 students, Pala and Bařıby3y3k, (2020) ^[17] examined the digital literacy of fifth grade students and aimed to observe the relationship between the digital literacy level of the students and certain demographic variables. The findings revealed that the participating students have high level of digital competence which differs depending on settlement, number of siblings, parent's occupation and technological facilities. In a similar study, 3st3ndađ (2021) ^[24] aimed to reval digital literacy level of 237 secondary school students aged between 12-15 during Covid-19 emergency remote teaching process. As a result of the research, it was observed that the participants had medium level of digital literacy and the participants' digital literacy level differs on the basis of gender, age and class level. 3elik and Kılı3ođlu (2022) in their

extensive study with 632 students from different socioeconomic status enrolled at 5th, 6th and 7th grades in 5 different schools aimed to observe digital literacy skills of the participating students and reached similar findings with the existing studies suggesting that digital literacy levels of the students differs on the basis of certain variables as gender, grade, internet connection availability, availability of computer and frequency of internet connection. In his Master's thesis, Aydođdu (2022) ^[5] revealed that the digital literacy of the secondary school students was above the average in general for all participating students and it was observed that there was a positive correlation between digital literacy level and the number of siblings, mothers' profession, internet connection and their surroundings.

Within this perspective, the present study aims to investigate the digital literacy level of secondary students and observe if Covid-19 rooted emergency remote teaching process has caused an impact on their digital competences. The study further seeks to reveal if certain variables as gender, grade, owning a computer/tablet, udin social media, and playing online games makes a significant difference in the digital competence of the participating students.

Research Problem and Sub-questions

The research problem was formed as follows: What is the current level of digital literacy of secondary school students? Following this problem, sub-problems were formed as:

- Does the level of level of digital literacy of secondary school students differ significantly in terms of their gender?
- Does the level of level of digital literacy of secondary school students differ significantly in terms of their grade?
- Does the level of level of digital literacy of secondary school students differ significantly in terms of their having a PC/tablet computer?
- Does the level of level of digital literacy of secondary school students differ significantly in terms of their using social media?
- Does the level of level of digital literacy of secondary school students differ significantly in terms of their playing online games?

Method

This research employed quantitative design and descriptive survey model which intends to identify the specific qualities of a sample (Hocaođlu & Akkuř-Baysal, 2019). This model was preferred as it fit the aim of the research which was to put forward the current situation of secondary school students in terms of technology literacy and find out if some personal or socio-economic qualities cause difference in technology literacy.

Sample

Table 1: Demographics of Participants

Gender	n	%	Owning a PC/Tablet Computer	n	%
Female	69	46,6	Yes	106	71,6
Male	79	53,4	No	42	28,4
Total	148	100,0	Total	148	100,0
Grade			Playing Online Games		
5th grade	39	26,4	Yes	114	77,0
6th grade	44	29,7	No	34	23,0
7th grade	43	29,1	Total	148	100,0
8th grade	22	14,9	Use of Social Media (SM)		
Total	148	100,0	Yes	95	64,2
			No	53	35,8
			Total	148	100,0

The sampling method was convenient sampling which intends to reach the closest sample in order to use the time and resources most effectively (Şahin & Karakuş, 2019) [22]. The sample included 148 secondary school students studying at a state school in Aksaray city of Turkey. While there were 79 male students (53,4%), the number of female students was 69 (46,6%). The distribution of the sample according to their grade was as follows: 39 (26,4%) at 5th, 44 (29,7%) at 6th, 43 (29,1%) at 7th and 22 (14,9%) at 8th grade. Most of the students (n=106; 71,6%) have either a PC or tablet computer while the others (n=42; 28,4%) do not. The use of social media is common with 95 (64,2%) of the participants having at least one social media account compared to those 53 (35,8%) not using it at all. The situation is similar in terms of playing online games with 114 (77%) participants having the habit while a relatively low number of participants (n=34; 23%) do not play online games.

Data Collection, Reliability and Validity

The data was collected by using the digital literacy scale developed by (Pala & Başbüyük, 2020) [17]. The data collected in this research was first subjected to construct validity and then reliability analysis. The construct validity analysis revealed four-subdimensions (KMO: ,824; Bartlett's test of sphericity: ,000-p< ,05) with explaining 53,695 of the total variance. This structure fits with the original research

(Pala & Başbüyük, 2020) [17] containing info-process, communication, security, and problem-solving sub-dimensions that can be concluded as providing a valid construct structure. It was followed by reliability analysis and Cronbach's Alpha for the whole scale with 21 items was, 881 which indicated a high validity. The validity scores for the sub-dimensions changed between, 726 and, 767 that indicated an acceptable value as well.

Findings

Table 2: Technology Literacy Level of Participants

	F	%
Low	4	2,7
Intermediate	52	35,1
High	92	62,2
Total	148	100,0

The overall scores of participants were grouped into three categories as follows: low (scores between 21-48), intermediate (scores between 49-77), and high (scores between 78-105). According to this categorization, there were four participants (2,7%) at low level, 52 participants (35,1%) at intermediate level, and 92 participants (62,2%) at high level of technology literacy.

Table 3: Technology Literacy in terms of Gender

	Gender	N	Mean Rank	Sum of Ranks	U	p
Info-process	Female	69	74,94	5171,00	2695,000	,906**
	Male	79	74,11	5855,00		
	Total	148				
Communication	Female	69	71,25	4916,50	2501,500	,388**
	Male	79	77,34	6109,50		
	Total	148				
Security	Female	69	74,81	5162,00	2704,000	,934**
	Male	79	74,23	5864,00		
	Total	148				
Problem Solving	Female	69	70,93	4894,50	2479,500	,342**
	Male	79	77,61	6131,50		
	Total	148				
Technology Literacy	Female	69	73,89	5098,50	2683,500	,872**
	Male	79	75,03	5927,50		
	Total	148				

**p>, 05

In info-process subdimension mean rank was 74,94 and sum of ranks was 5171,00 for female participants. For males,

mean rank was 74,11 and sum of ranks was 5855,00. In communication subdimension mean rank was 71,25 and sum

of ranks was 4916,50 for female participants. For males, on the other hand, mean rank was 77,34 and sum of ranks was 6109,50. In security subdimension mean rank was 74,81 and sum of ranks was 5162,00 for female participants. For males, mean rank was 74,23 and sum of ranks was 5864,00. In problem solving subdimension mean rank was 70,93 and sum of ranks was 4894,50 for female participants. For males, on the other hand, mean rank was 77,61 and sum of ranks was

6131,50. When it comes to the whole scale results, mean rank was 73,89 and sum of ranks was 5098,50 for female participants. For males, mean rank was 75,03 and sum of ranks was 5927,50. The Mann-Whitney U analysis carried out to reveal if technology literacy and its four sub-dimensions differ significantly in terms of gender revealed no significant difference ($p > .05$) between two groups in any of the sub-dimensions and the whole scale.

Table 4: Technology Literacy in terms of Grade

	Grade	N	Mean Rank	X ²	df	p
Info-process	5th grade	39	68,00	1,890	3	,595**
	6th grade	44	80,69			
	7th grade	43	73,29			
	8th grade	22	76,00			
	Total	148				
Communication	5th grade	39	65,15	2,570	3	,463**
	6th grade	44	78,78			
	7th grade	43	77,40			
	8th grade	22	76,84			
	Total	148				
Security	5th grade	39	76,19	2,026	3	,567**
	6th grade	44	79,50			
	7th grade	43	73,21			
	8th grade	22	64,02			
	Total	148				
Problem Solving	5th grade	39	78,35	,481	3	,923**
	6th grade	44	74,19			
	7th grade	43	72,14			
	8th grade	22	72,91			
	Total	148				
TL	5th grade	39	71,14	,386	3	,943**
	6th grade	44	76,83			
	7th grade	43	75,30			
	8th grade	22	74,23			
	Total	148				

**p>, 05

The participants were compared depending on their grades then using non-parametric Kruskal-Wallis test. In info-process sub-dimension mean rank for 5th grade (n=39) was 68,00, and it was 80,69 for 6th grade (n=44), 73,29 for 7th grade (n=43), and 76,00 for 8th grade (n=22). In communication sub-dimension mean rank for 5th grade was 65,15, and it was 78,78 for 6th grade, 77,40 for 7th grade, and 76,84 for 8th grade. When it comes to security sub-dimension, mean rank for 5th grade was 76,19, and it was

79,50 for 6th grade, 73,21 for 7th grade, and 64,02 for 8th grade. In the fourth sub-dimension which is problem solving, mean rank for 5th grade was 78,35, and it was 74,19 for 6th grade, 72,14 for 7th grade, and 72,91 for 8th grade. In terms of the whole scale results, mean rank for 5th grade was 71,14, and it was 76,83 for 6th grade, 75,30 for 7th grade, and 74,23 for 8th grade. Kruskal-Wallis test results revealed no significant difference ($p > .05$) in any sub-dimension or the whole scale results depending on the grade.

Table 5: Technology Literacy in terms of Owning a PC/Tablet Computer

	Owning a PC/Tablet Computer	N	Mean Rank	Sum of Ranks	U	p
Info-process	Yes	106	71,58	7587,00	1916,000	,186**
	No	42	81,88	3439,00		
	Total	148				
Communication	Yes	106	72,18	7651,00	1980,000	,294**
	No	42	80,36	3375,00		
	Total	148				
Security	Yes	106	71,74	7604,50	1933,500	,212**
	No	42	81,46	3421,50		
	Total	148				
Problem Solving	Yes	106	74,34	7880,50	2209,500	,944**
	No	42	74,89	3145,50		
	Total	148				
TL	Yes	106	71,98	7630,00	1959,000	,256**
	No	42	80,86	3396,00		
	Total	148				

**p>, 05

When the participants were grouped into two as those who have a personal computer or tablet computer and those who do not have, in the info-process subdimension, the mean rank of those with a PC/tablet (n=106) was 71,58 and sum of ranks was 7587,00 while the mean rank of those without a PC/tablet (n=42) was 81,88 and sum of ranks was 3439,00. In the communication sub-dimension, the mean rank of those with a PC/tablet was 72,18 and sum of ranks was 7651,00 while the mean rank of those without a PC/tablet was 80,36 and sum of ranks was 3375,00. In the security sub-dimension, the mean rank of those with a PC/tablet was 71,74 and sum of

ranks was 7604,50 while the mean rank of those without a PC/tablet was 81,46 and sum of ranks was 3421,50. In the problem solving sub-dimension, the mean rank of those with a PC/tablet was 74,34 and sum of ranks was 7880,50 while the mean rank of those without a PC/tablet was 74,89 and sum of ranks was 3145,50. In terms of the whole scale results, the mean rank of those with a PC/tablet was 71,98 and sum of ranks was 7630,00 while the mean rank of those without a PC/tablet was 80,86 and sum of ranks was 3396,00. The Mann-Whitney u test results indicate no significant difference ($p > ,05$) between two groups, though.

Table 6: Technology Literacy in terms of Social Media Use

	Use of Social Media	N	Mean Rank	Sum of Ranks	U	p
Info-process	Yes	95	78,27	7436,00	2159,000	,150**
	No	53	67,74	3590,00		
	Total	148				
Communication	Yes	95	87,17	8281,50	1313,500	,000*
	No	53	51,78	2744,50		
	Total	148				
Security	Yes	95	79,73	7574,50	2020,500	,046*
	No	53	65,12	3451,50		
	Total	148				
Problem Solving	Yes	95	79,68	7569,50	2025,500	,048*
	No	53	65,22	3456,50		
	Total	148				
TL	Yes	95	82,48	7836,00	1759,000	,002*
	No	53	60,19	3190,00		
	Total	148				

* $p < ,05$; ** $p > ,05$

The participants were grouped into two again, this time in terms of having at least one social media account or not. The number of participants with at least one social media account was 95 and those without any social media account was 53. In the info-process subdimension, the mean rank of those with a social media account was 78,27 and sum of ranks was 7436,00 while the mean rank of those without a social media account was 67,74 and sum of ranks was 3590,00. In the communication subdimension, the mean rank of those with a social media account was 87,17 and sum of ranks was 8281,50 while the mean rank of those without a social media account was 51,78 and sum of ranks was 2744,50. In the security subdimension, the mean rank of those with a social media account was 79,73 and sum of ranks was 7574,50 while the mean rank of those without a social media account

was 65,12 and sum of ranks was 3451,50. In the last sub-dimension, problem solving, the mean rank of those with a social media account was 79,68 and sum of ranks was 7569,50 while the mean rank of those without a social media account was 65,22 and sum of ranks was 3456,50. In terms of the whole scale results, the mean rank of those with a social media account was 82,48 and sum of ranks was 7836,00 while the mean rank of those without a social media account was 60,19 and sum of ranks was 3190,00. The Mann-Whitney u test results indicate no significant difference ($p > ,05$) between two groups in the info-process sub-dimension while there is a statistically significant difference between two groups in the communication, security, problem solving subdimensions and the whole scale ($p < ,05$) in favor of those with a social media account.

Table 7: Technology Literacy in terms of Playing Online Games

	Playing Online Games	N	Mean Rank	Sum of Ranks	U	p
Info-process	Yes	114	76,01	8665,00	1766,000	,431**
	No	34	69,44	2361,00		
	Total	148				
Communication	Yes	114	80,59	9187,00	1244,000	,002*
	No	34	54,09	1839,00		
	Total	148				
Security	Yes	114	76,02	8666,00	1765,000	,429**
	No	34	69,41	2360,00		
	Total	148				
Problem Solving	Yes	114	75,85	8647,00	1784,000	,481**
	No	34	69,97	2379,00		
	Total	148				
TL	Yes	114	77,64	8851,50	1579,500	,102**
	No	34	63,96	2174,50		
	Total	148				

* $p < ,05$; ** $p > ,05$

The scores of the participants were compared in terms of their playing online games or not. In the info-process sub-dimension, the mean rank of those playing online games (n=114) was 76,01 and sum of ranks was 8665,00 while the mean rank of those not playing online games (n=34) was 69,44 and sum of ranks was 2361,00. In the communication sub-dimension, the mean rank of those playing online games was 80,59 and sum of ranks was 9187,00 while the mean rank of those not playing online games was 54,09 and sum of ranks was 1839,00. When it comes to the security sub-dimension, the mean rank of those playing online games was 76,02 and sum of ranks was 8666,00 while the mean rank of those not playing online games was 69,41 and sum of ranks was 2360,00. In the problem-solving sub-dimension, the mean rank of those playing online games was 75,85 and sum of ranks was 8647,00 while the mean rank of those not playing online games was 69,97 and sum of ranks was 2379,00. In terms of the whole scale results, the mean rank of those playing online games was 77,64 and sum of ranks was 8851,50 while the mean rank of those not playing online games was 63,96 and sum of ranks was 2174,50. While there is not a statistically significant difference ($p > ,05$) in the info-process, security and problem solving sub-dimensions and the whole scale results, the difference is significant ($p < ,05$) in the communication sub-dimension.

Results and Discussion

The results of this research that intended to find out the digital literacy level of secondary school students represent that a great majority of the participants is at a high or intermediate level while only a limited number is at low level. This makes sense as Turkish educational curricula claim to support digital literacy to some extent at all levels (Altun & Alpan, 2021). However, it was also found out in another research in Turkey that secondary school students were at intermediate level in terms of digital skills and didn't have a remarkable positive attitude towards it (Peker Ünal, 2017). This contradictory finding dates back to the pre COVID era in which education at all levels were carried out through online systems in Turkey, so the improvement in digital skills might be attributed to the COVID era online education.

The literature provides much research investigating the effect of some variables such as gender, age and so on over the digital literacy with contradictory findings (Peng & Yu, 2022). The gender is not an effective variable in terms of digital literacy according to the results of this research and there are other studies in Turkish context with similar findings (Aydoğdu, 2022) ^[5] (Erdoğan, 2021). This result is understandable as schooling rate in K-12 of genders in is nearly equal in Turkey (TUIK, 2021), so, at least at school, they have equal opportunities to develop digital skills and literacy. However, another research in Turkey represents that female students have higher digital literacy level (Üstündağ, 2021) ^[21].

Another variable examined in this research to find out if it causes difference at digital literacy is the grade or age as grades in this research include age groups from 11 to 14. Overall digital literacy levels or its sub-dimensions do not differ significantly depending on the grade. However, in Turkish educational context, it is also found out the grade effects digital literacy and it mostly increases in upper grades at secondary school (Çelik & Kiliçoğlu, 2022) (Metin, 2022). These conflicting results might be attributed to contextual factors in research contexts.

It is notable that there is not a significant difference at digital literacy skills of participants who have a PC or tablet computer and who do not. This might imply that those participants without a PC/tablet computer whose rate is relatively low use and improve their digital literacy skills especially in the distance education process caused by lockdowns in COVID-19 outbreak in other ways such as parents' smart phones, friends' devices, etc. or through the facilities and opportunities that their school provides. On the other hand, another research that dates back to pre-COVID-19 era puts forward that owning a PC brings better digital literacy (Bilge & Kılcan, 2020). So, it can be concluded that the mandatory distance education process brought many challenges to learners but also forced them to improve digital literacy skills that they will need in the future.

Use of social media that requires at least some basic digital literacy skills is really common at all ages in Turkey (We Are Social, 2022), and that is why it is questioned in this study if use of social media causes meaningful difference in the digital literacy of participants. It is notable that the participants that use social media have meaningfully higher digital literacy skills in communication, security problem solving sub-dimensions and at the whole scale while the difference is not meaningful only in the info-process sub-dimension. This result is understandable as social media is mostly used for communication and it requires to take necessary precautions such as hiding personal information to be secure in the digital environment. It should be investigated more into detail how and why use of social media can result in better digital literacy skills in terms of problem solving. Maybe the difference between users of social media and others is not meaningful in terms of info-process sub-dimension as social media is intended to be used for retrieving information about selected content that does not require processing.

Finally, playing online games which is common nearly at all ages has been used as a variable and it has been found out that participants who play online games have significantly better digital literacy skills in terms of only communication sub-dimension. This result may not be surprising as online gaming has the potential of fostering communication (Kim, Huang-Isherwood, Zheng, & Williams, 2022). This might mean that supporting online gaming whose content, duration, etc. are controlled by families and teachers can result in higher digital literacy at least in terms of communication sub-dimension.

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