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The Relationship Between Cognitive Absorption and Digital Literacy Skills among Secondary School Students

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This study aimed to reveal the effects of secondary school students' cognitive absorption levels on their digital literacy. In line with this purpose, the correlational method was used in the study. The study group of the research consisted of 455 secondary school students. The data were collected from students studying in different state schools in Sakarya, Turkey in the 2019-2020 academic year. The data collection tools employed in the study are as follows: the personal information form developed by the researchers, "Cognitive Absorption Scale", and "Digital Literacy Scale". In the study, the relationship between the variables of digital literacy and cognitive absorption was investigated through simple correlation and multiple linear regression analyses. In the present study conducted in line with these indicators, the effect of the cognitive absorption levels of secondary school students on their digital literacy was investigated in terms of cognitive absorption factors (curiosity, pleasure, attention, and time). As a result of the analyses performed in the study, it was determined that the variables of curiosity in the first place, pleasure in the second place, and attention in the third place statistically significantly predicted students' digital literacy status. It was also found that the time variable had no effect on the digital literacy.

Introduction

An individual who acquired basic reading, writing and calculation skills was regarded as literate in the early 1900s; however, in recent years, education systems require all learners to form a wider array of literacy by using and developing these basic skills. Learners are expected to acquire competence in the fields of science, technology, and culture as well as

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gaining a comprehensive understanding of knowledge and all types of knowledge (Burkhardt, Monsour, Valdez, Gunn, Dawson, Lemke, Couglin, Thadani & Martin, 2003). This understanding is carried out through digital technologies in the present day. The technical, cognitive, and social-emotional reflection of the knowledge accessed and produced through digital technologies appears in the individuals as digital literacy (Ng, 2012) and becomes a "vital skill" (Alkali & Amichai-Hamburger, 2004). Among these skills, the ability to quickly adapt to new and developing technologies, the ability to regulate one's literacy skill in line with one's own interests and needs, the ability to identify one's deficiencies, and the ability to exhibit an open attitude to change along with new learnings are included. In the last few years, the necessity of digital literacy has been magnified by numerous events that demanded greater technological competency, critical and ethical thinking, and sense of digital citizenship (Tham, Burnham, Hocutt, Ranade, Misak, Duin & Campbell, 2021). For example, with the global epidemic in 2019, distance education has become compulsory and digital literacy has been emphasized as a needed skill. Despite its positive sides, distance learning through the internet leads to some online risks for users, primarily children. According to researchers, it is necessary to have a high level of digital literacy to overcome these risks (Helsper, & Smahel, 2020; Purnama, Ulfah, Machali, Wibowo, & Narmaditya, 2021; Sonck, Livingstone, Kuiper & de Haan, 2011).

Digital literacy is defined as the awareness, attitude, and skill for the individuals to use digital tools, resources and opportunities appropriately in order to have access to digital resources, to manage, integrate, evaluate, analyze and synthesize them, so as to form new information, to create media expressions, and to cooperate and communicate with others, as well as acquiring the ability to understand how and when to use digital technologies in the best way in order to support these processes (Hague & Payton, 2010; Martin, 2005). In addition to these, Fu and Pow (2011: 59) add the awareness, attitude and ability to use digital technology (including digital tools, opportunities and resources) appropriately (legally, ethically, safely, and responsibly) to the concept of digital literacy.

It is necessary to explain what the concept of digital literacy is as well as what it is not. Digital literacy includes cognitive, technical, sociological, and emotional skills as a diverse and complicated term which the users need to function in digital environments rather than a skill to use a software or a digital tool (Alkali & Amichai-Hamburger, 2004; Eshet, 2004; Ng, 2012). Indeed, digital literacy means more than only physical competence in operating computer programs. "It covers various competences called computer literacy, IT literacy, information literacy, and media literacy, and it is defined as accessing, managing, understanding, integrating, communicating, evaluating, and creating information skill in a safe and appropriate way through digital technologies for a good job, employment, and entrepreneurship (Law, Woo, Torre & Wong, 2018:6)." In the digital literacy process, individuals need to realize their mental actions in accordance with their purpose and to use cognitive processes effectively as well.

The concepts of digital competence and digital literacy focus not only on technological skills, but also on the cognitive and behavioral components of personality (Rambousek, Stipek & Vankova, 2016). Digital literacy is an action that necessitates the active use of cognitive processes. That is, digital literacy expresses the diversity of cognitive thinking strategies used by digital information consumers, and it is generally accepted as a measure of the users' ability to carry out tasks in digital environments (Jones & Flannigan, 2006). It is predicted that cognitive absorption, which is the state of deep involvement experienced in carrying out tasks in digital environments will affect digital literacy.

Cognitive absorption is a mental absorption state in which the users highly enjoy themselves while using digital technologies, they are totally involved in this interaction process, they focus all their attention, their curiosity is triggered, and time is rendered relative according to the person (Esen, 2017). The basic structure of Cognitive Absorption theory is based on absorption (Tellegen, 2008; Tellegen & Atkinson, 1974), the state of flow (Csikszentmihályi, 1990), and cognitive engagement (Webster & Ho, 1997) theories. Based on a deep interest in object experience, Tellegen and Atkinson (1974) created the elements of absorption and shaped interest as "the total sum of interests that necessitate full involvement with usable perceptive, motor, creative and intellectual resources in order to fully exhibit the interest in the object" (Tellegen & Atkinson, 1974: 274). Agarwal and Karahanna (2000) state that absorption affects the whole experience that an individual has with an object. One of the basic constructs of absorption, the state of flow is defined as a special state in which individuals focus on the object so as to forget about time and exhaustion and think about nothing but what they are doing (Csikszentmihályi & Larson, 2014:230). Csikszentmihályi and Larson (2014:137) examined the 'flow' experience under 6 elements, which are conjoining of awareness and action, locus of attention, forgetting about one's own existence, control of the action and the environment, action demands and open feedback, and the autotelic nature of the flow (having a target within). The notion of cognitive engagement, which is one of the basic constructs of cognitive absorption, was expressed by Corno and Mandinach (1983) as a factor that affects the level of effort shown while an individual is carrying out a task. In the light of these theories and notions, Agarwal and Karahanna (2000) thought that individuals' beliefs and opinions about technology significantly affected the way they used technology, and they proposed the cognitive absorption theory. It is thought that cognitive absorption is a variable associated with intrinsic motivation, and that this variable is an important part of technology use behaviors. This concept consists of five factors, which are time (the state of not being able to understand how the time has passed while interacting with the technology), locus of attention (total experience of engagement where all other attention requirements are ignored), pleasure (being absorbed with the hedonistic aspects of the interaction), control (being absorbed by the perception that the user is responsible for the interaction), and curiosity (the individual's cognitive curiosity and personal senses being increased by the level of experience) (Agarwal & Karahanna, 2000; Malone, 1981).

When the literature is examined, it is seen that there are numerous studies conducted on cognitive absorption (Agarwal & Karahanna, 2000; Chandra, Srivastava & Theng, 2012; Dursun & Çuhadar; 2015; Kurt Vural, 2007; Leong, Ho & Zhang, 2005; Lin, 2009; Roca, Chiu & Martínez, 2006; Saade & Bahli, 2005; Wakefield & Whitten, 2006). In these studies, it is seen that cognitive absorption is important in the use of digital technologies. Recent studies have discussed cognitive absorption in different areas of technology. For example, a recent study revealed the effect of artificial intelligence applications on human-machine interactions and the effect of human-human interactions on cognitive absorption (Balakrishnan & Dwivedi, 2021). Another study revealed the relationship between cognitive absorption, smartphone addiction, and social network services (Barnes, Pressey, & Scornavacca, 2019). Jumaan, Hashim & Al-Gahazali (2020) have found that cognitive absorption plays an important role in explaining continuous intentions to use mobile internet. Occa and Morgan (2022) investigated the role of cognitive absorption in the persuasiveness of multimedia messages.

Technology Acceptance Model (TAM), which is an information systems theory that spreads the stages to be followed by information seekers and students in the acceptance, suggestion and use of new technology in order to acquire digital literacy skills, tries to explain the

relationship between humans and technology through Perceived Usefulness (PU) and Perceived Ease of Use (PEU) (Durodolu, 2016) and includes digital literacy indicators. In some studies conducted (Reychar & Wu, 2015; Saadé & Bahli, 2005), it was observed that cognitive absorption had a positive effect on perceived learning, perceived usefulness of technology, and perceived ease of use, and it was emphasized that cognitive absorption was the precursor of perceived usefulness and perceived ease of use (Agarwal & Karahanna, 2000). This situation shows that cognitive absorption affects deep involvement, educational outcomes, and digital literacy skills of the individuals using the technology.

A previous study proving that digital literacy has a direct and positive relationship with students' online information search strategies (Kurt & Emiroğlu, 2018), and information about the low-level positive correlation determined between online information search strategies and students' cognitive absorption levels (Atoy, Garcia, Cadungog, Cua, Mangunay, & de Guzman, 2020) are indicators of the relationship between digital literacy and cognitive absorption. Moreover, the cognitive dimension of the Digital Literacy Model (Ng, 2012) is related to the ability to critically think, evaluate and produce the cycle of using digital information. Accordingly, it is believed that individuals' cognitive processes, experiences, and cognitive absorption levels will affect their digital literacy skills as well. With regards to this context, it is aimed in this study, to reveal the effect of the cognitive absorption levels of secondary school students on their digital literacy, in terms of the following cognitive absorption factors: curiosity, pleasure, attention, and time. Before examining the relationship between digital literacy and cognitive absorption, it would be appropriate to examine these two concepts in terms of some variables to see their effect on secondary school students.

In line with this purpose, the following research problems were created:

- Do secondary school students' cognitive absorption levels differ according to sex, grade, whether they have their own smartphones or tablets, time restriction for internet use, and average daily time spent on the internet?
- Do secondary school students' cognitive absorption levels differ according to sex, grade, whether they have their own smartphones or tablets, time restriction for internet use, and average daily time spent on the internet?
- Do secondary school students' cognitive absorption levels have an impact on their digital literacy skills?

This research derives its novelty in terms of examining the beliefs and thoughts of secondary school students in internet environments and their digital literacy skills. It is functional in that it is an informative study for researchers who try to increase students' performance, satisfaction and digital literacy level as well as examining the student behaviors. It is unique because it examines students' cognitive immersion and digital literacy levels together. It is a necessary study in terms of examining the effects of students' cognitive immersion on their digital literacy, revealing the variables to increase students' digital literacy levels, and leading the next activities.

Method

The study aimed to reveal the effects of secondary school students' cognitive absorption levels on their digital literacy. In line with this purpose, the correlational method was used in the study. Correlational studies are research designs aiming to determine whether

there is a relationship between two or more variables and/or to identify the degree of the relationship (Erkuş, 2011; Fraenkel & Wallen, 2006; Karasar, 1999).

Study Group

The study group consisted of 455 secondary school students reached by the convenience sampling method. While forming the study group, we preferred central schools in Sakarya with similar characteristics and ease of access. Due to the importance of the concepts of digital literacy and cognitive absorption, especially in the distance education system, and the importance of determining students' levels at the beginning of the education stage, we thought it would be appropriate to work with younger age groups instead of adults. Secondary school students were chosen as the study group because primary school students will not yet have obtained abstract thinking skills.

The data were collected from students studying in different state schools in Sakarya province in the 2019-2020 academic year. 46.6% of the participants were female, and 53.4% were male. In addition, 134 (29.5%) of the participants were 6th grade students, 175 (38.5%) 7th grade students, and 146 (32.1%) 8th grade students. While 258 (56.7%) of the participants had their own smart phones, 197 (43.3%) did not have a smart phone, and 236 (51.9%) owned a tablet PC, while 219 (48.1%) did not have one. While 307 (67.5%) of the participants stated that they used the Internet at certain times, 148 (32.5%) expressed that they use the Internet without any time restrictions. Also, 69 (15.2%) of the participants stated that they spent time on the Internet for less than an hour, 180 (39.6%) between 1-3 hours, 134 (29.4%) between 3-5 hours, and 72 (15.8%) more than 5 hours a day.

Data Collection Tool

As data collection tool in the study, personal information form developed by the researchers, "Cognitive Absorption Scale", and "Digital Literacy Scale" were employed.

Personal Information Form: The form developed by the researchers aims to obtain demographic information about the participants. In this context, it consists of six questions, which inquire about gender, grade level, average time spent on the Internet a day, whether there is restriction on the Internet use at home, and whether they have a personal smart phone and tablet PC.

Digital Literacy Scale: Digital Literacy Scale (DLS) was developed by Ng (2012) and adapted to Turkish by Hamutoğlu, Canan Güngören, Kaya Uyanık & Gür Erdoğan (2017). The scale is a 5-point Likert type scale consisting of 17 items. It is scored between (1) strongly disagree and (5) strongly agree. The original scale and the adapted scale have four subdimensions, which are attitude, technical, cognitive and social subdimensions. The adapted scale explains 65.78% of the total variance, and the fit indexes were determined as $\chi 2$=268,45 (n=113, p=0.00), RMSEA=0.071, GFI=0.93, AGFI=0.91, CFI=0.98, NFI=0.96, NNFI=0.97 and SRMR=0.05. The reliability of the scale was calculated through Cronbach's alpha coefficient. The obtained values were 0.93 for the total scale, 0.88 for the attitude subdimension, 0.89 for the technical subdimension, 0.70 for the cognitive subdimension, and 0.72 for the social subdimension. The sample of the scale adapted was university students. In order to use the scale in this study conducted on secondary school students, invariability of the scale was checked. In order to examine the invariability of the scale, a multiple group confirmatory factor analysis was performed, and in line with the results obtained, it was determined that the adapted Digital Literacy Scale showed a sufficient fit for the sample

consisting of secondary school students (Formal, RMSEA< 0.08; CFI > 0.90; NNFI > 0.90; metric, RMSEA < 0.08; CFI > 0.90; NNFI > 0.90; ΔCFI = 0.01) Scalar, RMSEA<0.08; CFI <0.90; NNFI<0.90; ΔCFI = 0.01; solid, RMSEA<0.08; CFI>0.90; NNFI>0.90; ΔCFI = 0.01). In addition, the reliability coefficient for the study was found to be 0.91 for the total scale, 0.86 for the attitude subdimension, 0.85 for the technical subdimension, 0.72 for the cognitive subdimension, and 0.74 for the social subdimension.

Cognitive Absorption Scale: Cognitive Absorption Scale (CAS) was developed by Agarwal and Karahanna (2000) and was adapted to Turkish by Usluel and Vural (2009). The 10-point Likert type scale (1- Strongly Disagree, 10 – Strongly Agree) consists of five factors, which are curiosity, control, locus of attention, pleasure, and time. In the adaptation of the original scale which consisted of 20 items, it was decided to exclude the control factor from the scale as a result of basic components analysis, and the scale was made up of 17 items. The fit indexes of the adapted the scale were calculated as $\chi 2$=341.13 (n=106, p=0.00), RMSEA=0.064, GFI=0.93, AGFI=0.90, CFI=0.98 and NFI=0.97. Cronbach's alpha reliability coefficients of the scale were calculated as 0.923 for the total scale, 0.88 for the time dimension, 0.90 for the curiosity dimension, 0.82 for the locus of attention dimension, and 0.90 for the pleasure dimension. Usluel and Vural (2009) carried out the adaptation study of the scale over teacher candidates, and Tanrıverdi (2017) adapted the scale for secondary school students. In Tanrıverdi's (2017) adaptation study of Cognitive Absorption Scale, the scale explained 59.1% of the total variance, and Cronbach's alpha coefficient was found to be 0.897 for the total scale.

Data Analysis

In the study, digital literacy and cognitive absorption variables were examined in terms of gender, grade level, average daily time spent on the internet, whether there is a restriction in internet use, and whether there is a personal phone and tablet. In addition, the level of relationship between these two variables was investigated. The problems of the study were answered by t-test, ANOVA, and regression analysis. SPSS 24 package program was used for all analyses.

Findings

The main purpose of the study was to examine the effect of the time, attention, pleasure and curiosity variables, which are the subdimensions of the Cognitive Absorption Scale, on digital literacy skill. The variables were examined for normality, and Kolmogorov-Smirnov significance value was found to be higher than 0.05 for all variables. In accordance with this result obtained, findings were carried out with parametric analyses.

Findings on the Digital Literacy Variable

In this study, which was conducted with secondary school students, the digital literacy status of the participants was examined in terms of gender, grade level, average daily time spent on the Internet, whether there are restrictions on internet use, and whether they have a personal phone and tablet. Table 1 shows the results of the t test, which examines whether there is a difference in the digital literacy levels of the students in terms of gender, whether there is a restriction in internet use, and whether there is a personal phone and tablet.

Table 1. T-test results of digital literacy scores according to gender, whether there are restrictions on internet use and whether they have a personal phone or tablet

Variables		N	$\bar{X}$	SD	df	t	p
Gender	Female	212	60,78	10,642	453	1,429	0,154
	Male	243	62,31	12,020			
Restrictions on internet use	Yes	307	61,42	11,806	453	-0,463	0,644
	No	148	61,95	10,576			
Personal phone	Yes	258	62,54	11,600	453	2,024	0,044
	No	197	60,36	11,068			
Personal tablet	Yes	236	63,85	11,717	453	2,470	0,026
	No	219	61,32	11,317			

According to the information in Table 1, digital literacy levels of secondary school students do not differ according to gender (($t_{(453)}$ =1.429 p>0.05) and whether there is a time restriction in internet use (($t_{(453)}$ =-0.463 p>0.05). On the other hand, students' digital literacy levels differ depending on whether they have their own smartphones ($t_{(453)}$ =2.024 p<0.05) and tablet ($t_{(453)}$ =2,470 p<0.05). When this difference is examined, it is seen that the digital literacy scores of the secondary school students who have a personal phone and tablet are higher than those who do not.

The digital literacy levels of the participants were examined by ANOVA in terms of their grade level and the time they spent on the internet. Table 2 shows the descriptive statistics of the participants for these variables.

Table 2. Descriptive statistics of digital literacy scores on grade level and time spent on the Internet variables

Variables		N	$\bar{X}$	SD
Grade level	6. Grade	134	59,93	12,130
	7. Grade	175	61,81	11,006
	8. Grade	146	62,88	11,097
Time, spent on the internet	(1) < 1 hour	69	56,25	11,173
	(2) 1-3 hour	180	61,53	9,977
	(3) 3-5 hour	134	61,89	12,088
	(4) >5 hour	72	66,11	11,822

When Table 2 is examined, it is seen that 134 participants are sixth grade students, 175 participants are seventh grade students, and 146 participants are eighth grade students. When the digital literacy averages were examined according to the class levels, it was seen that the average increased as the class level increased. In addition, when the data is analyzed in terms of time spent on the Internet, 69 people reported that they spent less than 1 hour, 180 people spent at least 1 and no more than 3 hours, 134 people spent at least 3 at most 5 hours, and 72 people spent more than 5 hours. When the digital literacy score averages are examined according to the time spent on the Internet, it is observed that the digital literacy score increases as the time increases. Whether this difference was statistically significant was analyzed by ANOVA. Table 3 shows the ANOVA results regarding whether the digital literacy mean scores of the participants differ according to the grade level and the time spent on the Internet.

Table 3. ANOVA results of grade level and time spent on the internet variables

	Source of Variance	SS	Df	MS	F	p	Significant diffrence
Grade level	Between groups	621,162	2	310,581	2,400	0,092	-
	Within groups	58500,429	452	129,426			
	Total	59121,591	454				
Time, spent on the internet	Between groups	3458,510	3	1152,837	9,341	0,000	1-2
	Within groups	55663,081	451	123,421			
	Total	59121,591	454				1-3
							1-4

When the ANOVA results in Table 3 were examined, it was concluded that the difference between the digital literacy mean scores of the students according to the grade level was not statistically significant ($F_{(2,452)}$=2,400 p>0.05). However, it is seen that there is a statistically significant difference between the digital literacy mean scores of secondary school students according to the time spent on the Internet ($F_{(2,451)}$=9,341 p<0.05). Scheffe test was used to find out between which groups the digital literacy mean score differs according to the time spent on the internet. According to the results, it was seen that there is a statistically significant difference between the students who spend less than 1 hour on the Internet and those who spend more time, and the digital literacy scores of those who spend less than 1 hour are lower than the others. There was no significant difference in digital literacy scores between those who spent at least 1, at most 3 hours on the Internet and those who spent 3-5 hours and more than 5 hours.

Findings on the Cognitive Absorption Variable

The cognitive absorption status of secondary school students was examined in terms of variables such as gender, grade level, average daily time spent on the internet, whether there are restrictions on internet use, and whether they have a personal phone or tablet. Table 4 shows the results of the t test, which examines whether there is a difference between the cognitive absorption scores of the students in terms of gender, whether there is a restriction in internet use, and whether there is a personal phone and tablet.

Table 4. T-test results of cognitive absorption scores according to gender, whether there are restrictions on internet use, and whether they have a personal phone or tablet.

Variables		N	$\bar{X}$	SD	df	t	p
Gender	Female	212	107,35	31,512	453	1,289	0,198
	Male	243	111,21	32,122			
Restrictions on internet use	Yes	307	111,09	32,417	453	1,625	0,105
	No	148	105,92	30,492			
Personal phone	Yes	258	110,88	31,227	453	1,130	0,259
	No	197	107,48	32,655			
Personal tablet	Yes	236	109,30	31,746	453	-0,075	0,940
	No	219	109,53	32,059			

According to the information in Table 4, the cognitive absorption scores of secondary school students do not differ according to gender ($t_{(453)}$ =1,289 p>0,05), whether there is a time restriction in internet use ($t_{(453)}$ =1,625 p>0,05), and whether they have their own smartphones

($t_{(453)}$ =1,130 p>0,05) and tablets ($t_{(453)}$ =-0,075 p>0,05).

Cognitive absorption scores of the participants were analyzed by ANOVA in terms of grade level and time spent on the Internet. Table 5 shows the descriptive statistics of the participants for these variables.

Table 5. Descriptive statistics of cognitive absorption scores on grade level and time spent on the internet variables

Variables		N	$\bar{X}$	SD
Grade level	6. Grade	134	108,67	32,686
	7. Grade	175	107,11	29,517
	8. Grade	146	112,84	33,682
Time, spent on the internet	(1) < 1 hour	69	94,86	33,549
	(2) 1-3 hour	180	106,11	30,415
	(3) 3-5 hour	134	112,28	31,397
	(4) >5 hour	72	126,28	26,406

When Table 5 is examined, it is seen that 134 participants are sixth grade students, 175 participants are seventh grade students, and 146 participants are eighth grade students. When the mean of cognitive involvement according to grade levels was examined, it was seen that the mean of the sixth and seventh grades was close to each other, while the mean of the eighth grades was higher. In addition, when the data is analyzed in terms of time spent on the Internet, 69 people reported that they spent less than 1 hour, 180 people spent at least 1 and no more than 3 hours, 134 people spent at least 3 at most 5 hours, and 72 people spent more than 5 hours. When the average of cognitive suspense scores according to the time spent on the Internet was examined, it was observed that the cognitive absorption score increased as the time increased. Whether this difference was statistically significant was analyzed by ANOVA. Table 6 shows the ANOVA results regarding whether the participants' mean scores of cognitive absorptions differ according to grade level and time spent on the Internet.

Table 6. ANOVA results of cognitive absorption scores on grade level and time spent on the internet variables

	Source of Variance	SS	Df	MS	F	p	Significant difference
Grade level	Between groups	2708,644	2	1354,322	1,336	0,264	-
	Within groups	458197,321	452	1013,711			
	Total	460905,965	454				
Time, spent on the internet	Between groups	38169,192	3	12723,064	13,574	0,000	1-3 / 1-4
	Within groups	422736,773	451	937,332			
	Total	460905,965	454				2-4/ 3-4

When the ANOVA results in Table 6 were examined, it was concluded that the difference between the students' cognitive absorption mean scores by grade level was not statistically significant ($F_{(2,452)}$=1.336 p>0.05). However, it is seen that there is a statistically significant difference between the mean scores of secondary school students' cognitive absorption according to the time spent on the Internet ($F_{(2,451)}$=13.574 p<0.05). Scheffe test was used to find out between which groups the difference in the mean score of cognitive absorption according to the time spent on the Internet. According to the results obtained, if the time spent on the Internet is less than 1 hour, the cognitive absorption of these people was found to be lower than those who spent 3-5 hours and more than 5 hours. In addition, it was observed that

the students who spent more than 5 hours on the Internet had higher cognitive absorption scores than the others.

Findings on the Relationship Between Digital Literacy and Cognitive Absorption

The relationship between the Digital Literacy Scale scores of the 455 secondary school students participating in the study and all subdimensions of the Cognitive Absorption Scale was analyzed through simple correlation analysis. In Table 7, descriptive statistics about the variables examined and correlation values of the variables are presented.

Table 7. Arithmetic Mean and Standard Deviation Values of the Scores Obtained from Digital Literacy and Cognitive Absorption Scales, and Correlation Values Showing the Relationships Between the Variables

	$\bar{X}$	SD	Digital Literacy	Time	Attention	Pleasure	Curiosity
Digital Literacy	61.60	11.412					
Predictor Variables							
Time	33.02	13.095	0.185**				
Attention	22.62	9.374	0.285**	0.205**			
Pleasure	29.41	10.509	0.386**	0.503**	0.340**		
Curiosity	24.27	11.286	0.395**	0.292**	0.306**	0.563**	

**p<0,01

When Table 7 was examined, it was seen that there was a relationship between digital literacy and the time, attention, pleasure, and curiosity subdimensions of the Cognitive Absorption Scale. Digital literacy was found to have a positive and low relationship with the time subdimension ($r=0.185$, $p<0.01$), a low and positive relationship with attention subdimension ($r=0.285$, $p<0.01$), a positive and moderate relationship with pleasure subdimension ($r=0.386$, $p<0.01$) and a positive and moderate relationship with curiosity subdimension ($r=0.395$, $p<0.01$). When the size of the relationships was examined, the highest relationship was found between digital literacy and the curiosity subdimension of the Cognitive Absorption Scale, which was followed by pleasure, attention, and time subdimensions, respectively.

In order to examine whether digital literacy was predicted by all subdimensions of the Cognitive Absorption Scale, multiple linear regression analysis was used. In multiple regression analysis, statistically significant correlations between the independent variables and the dependent variable, and the relationship between the independent variables being higher than 0.80 provide evidence that a regression analysis can be performed over these variables (Büyüköztürk, 2006). The findings included in Table 7 show that multiple regression analysis can be performed for the study. Besides, in order to test multicollinearity assumption, which is among basic assumptions of multiple regression analysis, Variance Inflation Factor (VIF) and Tolerance Value, and Condition Index (CI) values were examined. The results obtained are presented in Table 8.

Table 8. Coefficients Table for Multicollinearity Assumption

	Variance Inflation Factor (VIF)	Tolerance Value	Condition Index (CI)
Constant			1,000
Time	1.342	0.745	9.983
Attention	1.158	0.864	8.848
Pleasure	1.851	0.540	6.391
Curiosity	1.496	0.669	6.275

For multicollinearity assumption, the Variance Inflation Factor (VIF) value is expected to be lower than 10, the tolerance value to be higher than 0.10, and Condition Index (CI) to be lower than 30 (Hair, Black, Babin, Anderson & Tatham, 2006; Tabachnick, Fidell, & Osterlind, 2001; Uyanık & Güler, 2013). When the values included in Table 8 were examined within the scope of these limits, it was seen that the data set used in the study did not have a multicollinearity problem, and that the data were suitable for multiple linear regression analysis.

The effect of predictor variables on digital literacy was examined by using stepwise regression technique in the multiple regression analysis in order to determine the power of the secondary school students' status in the "time, attention, pleasure, and curiosity" subdimensions of the Cognitive Absorption scale predicting their digital literacy scores. Considering the relationship size between the subdimensions of cognitive absorption and digital literacy in the stepwise regression, predictor variables were included in the model, and the results are presented in Table 9.

Table 9. The Level of Cognitive Absorption Scores Predicting Digital Literacy

Model	Predictor Variables	B	Standard Error	β	t
1	Constant	51.912	1.168		44.439**
	Curiosity	0.399	0.044	0.395	9.141**
		R=0.395	R^2=0.156	F=83.554	p=0.000
2	Constant	47.555	1.470		32.356**
	Curiosity	0.262	0.052	0.259	5.083**
	Pleasure	0.261	0.055	0.240	4.707**
		R= 0.442	R^2= 0.195	F=54.808	p=0.000
3	Constant	45.333	1.615		28.079**
	Curiosity	0.238	0.052	0.235	4.608**
	Pleasure	0.223	0.056	0.205	3.969**
	Attention	0.174	0.055	0.143	3.177**
		R= 0.461	R^2=0.213	F=40.639	p=0.000
4	Constant	45.594	1.718		26.544**
	Curiosity	0.238	0.052	0.236	4.606**
	Pleasure	0.234	0.062	0.216	3.794**
	Attention	0.175	0.055	0.144	3.190**
	Time	-0.019	0.042	-0.022	-0.449
		R=0.462	R^2=0.213	F=30.476	p=0.000

Dependent Variable: Digital Literacy, **p<0.01

When the findings obtained in Table 9 were examined, it was seen that the regression model (Model 4) including all subdimensions of cognitive absorption in order to determine their power of predicting digital literacy was statistically significant [F=30.476, p<0.01]. According to the stepwise regression analysis, four steps were included in the multiple regression analysis. The predictor variable of curiosity functioning in the first step of the regression analysis could explain 15% of the total variance related to digital literacy (R=0.395, R^2=0.156). In the second step of the regression analysis, the variable of pleasure

was included in the model in addition to the curiosity subdimension. The variables of curiosity and pleasure could together explain 19% of digital literacy (R=0.442, R^2=0.195). In this case, it can be stated that the curiosity variable made a contribution to the equation by 4%. All other variables being constant, Beta coefficient of the curiosity variable was calculated as 0.259, and Beta coefficient of the pleasure variable was found to be 0.240. It was determined that the t values of both variables were statistically significant (t=5.083, t=4.707, respectively). In the third step of the regression analysis, in addition to the variables of curiosity and pleasure, the attention variable was included in the model. The variables of curiosity, pleasure, and attention could together explain 21% of the total variance related to digital literacy (R=0.461, R^2=0.213). Accordingly, it can be stated that the attention variable contributed to the regression equation by 2%. In this step, Beta coefficient of the curiosity variable was calculated as 0.235, Beta coefficient of the pleasure as 0.205, and Beta coefficient of the attention variable as 0.143, respectively. In the final step of the regression analysis, all subdimensions of the Cognitive Absorption scale were included in the model. All subdimensions could explain 21% of the total variance of digital literacy (R=0.462, R^2=0.213). Hence, it can be stated that the time variable included in the model in the final step contributed to the regression equation by 0.1%. Beta coefficients calculated for the variables were 0.236, 0.216, 0.144, and -0.022 for the variables of curiosity, pleasure, attention and time, respectively. While the t values of curiosity, pleasure, and attention variables were statistically significant (t=4.606, t=3.794, t= 3.190 $p<0.01$, respectively), the t value of the time variable was not statistically significant (t=-0.449, $p>0.05$).

When the Beta coefficients and R^2 values of the variables of curiosity, pleasure, attention and time were examined, it was determined that the curiosity variable in the first place, the pleasure variable in the second place, and the attention variable in the third place statistically significantly predicted the digital literacy status of the students. It was seen that the time variable had no effect on digital literacy. According to the regression analysis performed, the regression equation for the prediction of the secondary school students' digital literacy scores is as follows:

Digital Literacy=45.594 + 0.238* (Curiosity) + 0.234* (Pleasure) + 0.175* (Attention) – 0.019* (Time)

Discussion and Conclusion

In this study, in which the effect of secondary school students' cognitive absorption levels on their digital literacy was investigated, the correlational method was used. 455 secondary school students studying in Sakarya participated in the research and the data obtained were tested by t-test, ANOVA, and regression analysis.

As a result of the analyses made with the digital literacy variable, it was found that although digital literacy levels of secondary school students differ depending on whether they have their own smartphones and tablet and the time spent on the Internet, students' digital literacy levels do not differ according to gender, whether there is a time restriction in internet use and the grade level. With the research, it has been concluded that the digital literacy scores of the secondary school students who have a personal phone and tablet are higher than those who do not. Moreover, according to the results, the digital literacy scores of the students who spend less than 1 hour are lower than the others. Researches (Arslantas & Gul, 2022; Ongel, Yavuz & Tatli, 2022) support the findings that daily internet use and being ready for technology positively affect the level of digital literacy.

As a result of the analyses made with the cognitive absorption variable, it was found that although cognitive absorption levels of secondary school students differ depending on the time spent on the Internet, students' cognitive absorption levels do not differ according to gender, grade level, whether they have their own smartphones and tablet and whether there is a time restriction in internet use. According to the results obtained, if the time spent on the Internet is less than 1 hour, the cognitive absorption of these people was found to be lower than those who spent 3-5 hours and more than 5 hours. In addition, it was observed that the students who spent more than 5 hours on the Internet had higher cognitive absorption scores than the others. In the study conducted by Jumaan, Hashim and Al-Gahazali (2020), it was found that cognitive absorption is the strongest predictor of intention to continue using the Internet, as it provides in-depth information about continuous internet use. This finding explains the differentiation of cognitive absorption level according to the time spent on the Internet.

This research examines how digital literacy is affected by the subdimensions of cognitive absorption and is thus limited to the subscales of the CAS. As a result of the analyses about the relationship between digital literacy and cognitive absorption performed in the study, it was determined that the variables of curiosity in the first place, pleasure in the second place, and attention in the third place statistically significantly predicted students' digital literacy status. It was also found that the time variable had no effect on digital literacy. Unsal and Eksioğlu (2019) found the highest CAS scores for the pleasure and time subscales. Kurt and Emiroğlu (2018) reported that students received the highest scores in the subscale of pleasure, followed by curiosity. Hence, students' feelings of pleasure and curiosity were triggered as they spent time with technology.

It is stated that digital information literacy, which is a component of digital literacy, involves online information creation and sharing skill in the forums created by the user and social network sites (Meyers, Erickson, & Small, 2013). In this context, in the study conducted by Brooks and Longstreet (2015), it was emphasized that locus of attention and pleasure variables, which are the sub-factors of cognitive absorption, had a direct effect on the level of social network use. This finding supports the finding obtained in the present study that digital literacy was predicted by the pleasure and attention variables of cognitive absorption.

In addition, in the study conducted by Kurt Vural (2007), it was determined that the curiosity subdimension predicted the perceived ease of use and web technologies where individuals intensely use and exhibit their digital literacy skills. This finding supports the finding in the present study that the curiosity subdimension predicted digital literacy status in the first place. Pace (2003) also emphasized that the person does not want to let go of everything that interests him or her. Again, another finding obtained in the study by Kurt Vural (2007) showing that the pleasure subdimension of cognitive absorption predicted perceived benefit of web technologies the most coincides with the results of the present study. In addition, in the study conducted by Kurt Vural (2007), it is stated that increasing the level of knowledge and skill on internet use increases the level of cognitive absorption. Cognitive absorption has a stronger effect on satisfaction and intention to continue than perceived usefulness (Jumaan, Hashim & Al-Gahazali, 2020). The cognitive absorption component that affects whether and how long an individual will use technology is pleasure (Gaines, Chen & Shaw, 1997). Pleasure dimension is a cognitive absorption component that predicts digital literacy in this context.

It is seen that digital literacy differs according to the use of technology and the time spent on

the Internet. Similarly, cognitive absorption is also affected by the time spent on the Internet. Although the time spent on the Internet is considered important in terms of both variables, it is another research finding that the time variable, which is one of the cognitive absorption factors, has no effect on digital literacy. According to this result, while the time spent on the Internet is important in terms of cognitive absorption, when the person does not have curiosity, interest and pleasure in the task; in cases where the person has curiosity, pleasure and interest, it is seen that the time spent on the Internet is not important in terms of digital literacy. In the research, the digital literacy levels of the students who spend less than 1 hour on the Internet are higher than those who spend more time. From this point of view, it is seen that the level of digital literacy is affected only by spending a little time on the Internet, but not outside of it. This leads us to the conclusion that individuals who spend a long time on the Internet are not digitally literate individuals.

In terms of cognitive absorption, it is known that the sense of curiosity progresses in parallel with the sense of interest, the sense of curiosity ends when the interest is dispersed (Pace, 2003), the more the time spent on the Internet increases, the more pleasure is gained from the activity/task of interest on the Internet (Vural, 2007), and the level of understanding of how time passes decreases as the level of focus on the activities/tasks they do increases (Esteban-Millat, Martínez-López, Huertas-García, Meseguer, & Rodríguez-Ardura, 2014). It is also known that as the time spent on the Internet increases, the level of Internet addiction also increases (Barnes, Pressey& Scornavacca, 2019). In this context, the time that students spend on the Internet should be controlled, and during this period, they should be provided with activities and tasks that increase their digital literacy levels, curiosity, and interest, and focus on these tasks.

Recommendations

The research was conducted with secondary school students. In future studies, it is recommended that students be selected from different education levels and students at these levels should be compared in terms of digital literacy and cognitive absorption.

In the study, while the effect of cognitive absorption on digital literacy was investigated, the mediating variable was disregarded. However, when the literature was reviewed, it was seen that online information search and technology acceptance model could assume a mediating role between these variables. In this context, in future studies to be conducted on cognitive absorption and digital literacy, it is suggested that these mediating variables should be examined. Besides, considering the studies in which cognitive absorption differentiates according to the levels of use of different technologies, in future studies, it is suggested that the effect of cognitive absorption on digital literacy should be examined according to the levels of use of different technologies.

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