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The Role of Digital Nativity and Digital Citizenship in Predicting High School Students' Online Information Searching Strategies

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Abstract

This study examined the relationship of digital nativity and digital citizenship with online information search strategies. 331 high school students participated in the study. The data collection instruments were Online Information Searching Strategies Inventory (OISSI), Digital Nativity Assessment Scale (DNAS), and Digital Citizenship Scale (DCS). Stepwise multiple regression analysis was employed in the analysis. The results indicated that online information search strategies were best predicted by "digital communication and literacy" levels. "Digital security" was a significant determinant for all sub-dimensions of online information searching strategies while "Digital etiquette and law" was not a statistically significant predictor. On the other hand, "Comfortable with multi-tasking" and "Reliant on graphics for communication" were significant determinants for behavioral domain strategies of the online information searching. Procedural and metacognitive domain strategies were predicted by "Thrive on instant gratifications and rewards". The results of this study will be important for educators and parents in providing guidance for digital natives in terms of access to and use of information.

Keywords

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Introduction

Today's children are growing up in a digital environment where they learn to use various devices starting from early years (Kabali et al., 2015; Rideout, 2013). Turkey is one of the countries where the use of technology by children increases day by day (Dinleyici, Carman, Öztürk, & Şahin Dağlı, 2016; Genç, 2014; Konca & Köksalan, 2017). According to 2015 EU Kids Online latest summary report, the ratio of children's internet access and internet use increased from 2010 to 2015. Similarly, children's age of first internet access has decreased from 5 to 2 and the average age of internet use by children has decreased from 9.64 to 8.24 (Aslan, 2016). This trend in Turkey seems relevant to Prensky's (2001) definition of "Digital natives" that refers children who grow up in a technology surrounded environment and are motivated to use technology in their daily lives. Within this context, Prensky (2001) describes digital natives as individuals who receive information really fast, enjoy parallel processing

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and multitasking, prefer graphics before text, prefer random access (such as hypertext), function best when networked, thrive on instant gratifications and frequent rewards and prefer games (Prensky, 2001).

Apart from the Prensky's definition (2001), there are also different terms in the literature for defining new generations; such as Net-generation (Tapscott, 1998), Millennials (Oblinger, Oblinger, & Lippincott, 2005), and i-Generation (Rosen, 2010). The common characteristics of these definitions are growing up with technology and being native speakers of the digital language. Also, being a digital native is associated with having access to technology, using the technology, or having digital literacy competencies (Ng, 2012; Thompson, 2013). In addition, Teo (2013) proposes a framework to measure students' perceptions of the digital nativity. The framework consists of four factors: "Grew up with technology", "Comfortable with multitasking", "Reliant on graphics for communication", "Thrive on instant gratifications and rewards" related with the characteristics that are associated with digital natives.

Although it is stated that new generations are closely related to technology compared to the old, it is necessary to investigate how technology use affects the lives of new generations (Ryberg, Dirckinck Holmfeld, & Jones, 2010). Furthermore, there is a need to investigate how new generations add value to their life by using digital technologies, their technology use behaviour, how they access information and use technology to solve the problems in their life in line with the rights and responsibilities (Çubukcu & Bayzan, 2013). As a result, how the new generations grow as digital citizens should be examined. Therefore, there is a need for guidance on the conscious use of technology to become a good citizen. Disturbing others in digital environments (cyberbullying), downloading music illegally or plagiarizing on the Internet are some examples of improper internet use (Ribble, Bailey, & Ross, 2004). In this regard, one of the comprehensive definitions of digital citizenship is offered by Ribble (2011, p. 10) as "norms of appropriate, responsible behavior with regard to technology use". In order to explain the complex nature of digital citizenship Ribble (2011) proposes nine general areas related to technology use: (1) Digital Access: access to digital environments with equal opportunities; (2) Digital Commerce: the process of online purchasing and selling norms and practices; (3) Digital Communication: selecting suitable digital tools to exchange information with appropriate rules of communication; (4) Digital Literacy: ways of learning by using or selecting digital technologies and knowledge of technology itself; (5) Digital Etiquette: knowing how to interact appropriately in digital environments; (6) Digital Law: knowing the electronic responsibility of the actions in digital environments and evaluating its legal results; (7) Digital Rights and Responsibilities: knowing digital rights and responsibilities such as privacy or freedom of speech (8) Digital Health and Wellness: physical and psychological health risks in digital environments and ways of protection; (9) Digital Security (self-protection): strategies to protect electronic data. It is important to gain digital citizenship skills to maintain healthy relationship with technology. In this context, supporting future generations to be conscious and active individuals in digital environments is considered important for the development of the country in the future (Machfiroh, Sapriya, & Komalasari, 2018). In terms of online environments, accessing and using information (Head, 2013) and determining what can be accepted as a reliable source in a given situation (Francke, Sundin, & Limberg, 2011) are among the greatest problems that people are facing today. According to the studies, evaluating the reliability of the digital resources was found quite complex by high school students in a given task (Francke et al., 2011). On the other hand, it was stated that in general students are searching information on the internet as part of their school assignments without using any analysis and synthesis strategies (Limberg, 2007). It is also stated that children and adolescents who are not competent on the conscious and the proper use of technology do not know how to evaluate the complex information that they face (Tarı Cömert & Kayıran, 2010). At this point, the acquisition of digital citizenship skills at an early age will support the training of individuals who use digital environments legally, ethically, safely and responsibly (Hollandsworth, Dowdy, & Donovan, 2011).

Another important component expressed in the literature for the effective use of digital environments is to gain online information search strategies (Aşkar & Mazman, 2013). Online information searching strategies are pointed as a crucial factor in the literature to use digital environments effectively. Searching information is a complex process including problem-solving, decision-making, and text comprehension processes (Monchaux, Amadieu, Chevalier, & Mariné, 2015). In this process, a number of strategies are developed to enable individuals to search for information effectively. Tsai and Tsai (2003) propose one of the frameworks for information searching strategies including "behavioral domain strategies (BDS)", "procedural domain strategies (PDS)", and "meta-cognitive domain strategies (MDS)". BDS, which determine the basic skills required for searching on the internet, consist of "control" and "disorientation". Control indicates the users' comfort of using computers and the Internet. Disorientation means getting lost among pages or information when searching online. Sub-dimensions of PDS are "trial and error" and "problem-solving". Trial and error refer to the users' efforts to try different searching approaches until reaching appropriate information. Problem-solving is a skill to overcome problems that arise during the search. Finally, MDS consist of "purposeful thinking", "selecting main ideas", and "evaluation" sub-dimensions. Purposeful thinking is considered as an individual's self-monitoring skills while searching for information. Selecting the main idea refers to identifying key concepts of information when searching the internet or summarizing the main information. Evaluation is an ability to judge and organize information obtained from the Internet.

Finding appropriate and reliable information while searching online is an important skill for users (Tseng, Liang, & Tsai, 2014). In this context, there are studies in the literature to determine the variables that influence the online information searching process. Kim (2001) finds that online search experience, cognitive style, and navigational style affect users' information searching behavior. Other studies indicate that web experience (Demiraslan Çevik, 2015; Monchaux et al., 2015; Thatcher, 2008), gender (Maghferat & Stock, 2010; Tsai, 2009), epistemological beliefs (Demiraslan Çevik, 2015; Tu, Shih, & Tsai, 2008), goal orientation, and decision-making style (Demiraslan Çevik, 2015) play important roles in users' online searching strategies. Recently, Çoklar, Dulkadir Yaman, and Kabakçı Yurdakul (2017) conclude that information literacy and digital nativity are significant predictors of online information searching. However, there are only a few studies which have examined the role of digital citizenship and digital nativity on information searching strategies. Also, most of the studies were conducted with university students. This study was carried out with high school students who are in their adolescence that refers to transition from childhood to adulthood (Balkaya & Ceyhan, 2007). In terms of the future of the societies, the extent to which new generations, who take an active role in digital media, adapt to the changes of the digitalization is considered important (Kim & Choi, 2018; Ladbrook & Probert, 2011). In this context, high school students are included in the study to investigate the strategies of accessing information in digital environments. This study aims to investigate whether digital nativity and digital citizenship in terms of digital communication and literacy, digital security, and digital etiquette and law could predict high school students' online information searching strategies. This research is an attempt to answer: To what extent high school students' online information search strategies in terms of BDS, PDS, MDS are predicted by their digital nativity level and digital citizenship level?

Method

In this study, correlational research was used to describe an existing relationship between the variables without any manipulation (Fraenkel, Wallen, & Hyun, 2012).

Sample

The study was carried out with students from two Anatolian high schools and two science high schools located in Trabzon. A total of 331 high school students selected by convenience sampling method participated in the study. Students age ranged from 15 to 17. Among the students 56.5% of were female (n=187) and 43.5% of were male (n=144). In addition, 57.4% of the students were in 9th, 26.9% were in 10th, and 15.7% were in 11th grade. Because of the students' preparations for the university entrance exam their teachers advised that students would not able to provide healty answers for the

scale items, thus senior high school students were not included in the study. The mean value of students' internet use experience was 6.46 years (SD=3.11). The average daily internet usage of these students was 3.39 hours (SD=3.00).

Instruments

Three sets of data collection tools were used, namely the Online Information Searching Strategies Inventory (OISSI), Digital Nativity Assessment Scale (DNAS) and sub-dimensions of Digital Citizenship Scale (DCS) (digital communication and literacy, digital security and digital etiquette and law). OISSI was developed by Tsai (2009) and translated into Turkish by Aşkar and Mazman (2013). The inventory consisted of 25 items and three sub-dimension (BDS, PDS, and MDS) scored on a 6-point Likert scale. Aşkar and Mazman (2013) indicated the Cronbach's alpha value of the inventory as.91. For the purpose of this study the Cronbach's alpha value of the inventory was calculated as .90. Also, Aşkar and Mazman (2013) indicated that the inventory can be used in high school and upper levels to assess the online information searching strategies.

DNAS, which was developed by Teo (2013), translated into Turkish and reliability assessment were performed by Teo, Kabakçı Yurdakul, and Ursavaş (2014). There are four dimensions in the scale (Grew up with technology, Comfortable with multitasking, Reliant on graphics for communication, Thrive on instant gratifications and rewards) and the scale covers totally 21 items. Students were asked to respond on a 7-point Likert scale. The reliability and validity studies of the survey developed by Teo (2013) was performed on students aged between 13 and 16. In this context, DNAS was used to determine the digital nativity levels of the high school students in this study and the Cronbach's alpha value was calculated as .89.

DCS was developed by Kocadağ (2012). The scale consisted of seven dimensions and 63 items. Each item was measured using a five-point Likert scale. Instead of using all seven dimensions, only three dimensions of the scale was used in the study, namely "Digital communication and literacy" (24 items), "Digital Security" (5 items), and "Digital etiquette and law" (16 items). Kocadağ (2012) indicated that the survey could be used in high school and upper levels and the Cronbach's alpha values of each dimension were .96, .95 and .79 respectively. In this study, the Cronbach's alpha values of each dimension were calculated as .90, .88 and.76.

Data Collection

Data were collected between January and March 2017, through an online form including three sets of scales. The researchers contacted with the Information Technologies Teachers of the four different high schools and received teachers' support during data collection. The link of the online form, which includes the information about the study and the instruments, shared with the students. High school students filled out the online survey in order to participate in the study. Also, students were informed that participating in the study was on a voluntary basis and they will have a chance to win one of the four gift cards.

Data Analysis

Stepwise multiple regression analysis was used in order to determine the predictors that explain the greatest and significant proportions of the variance of high school students' online information searching strategies. First, the assumptions of multiple regression analysis were tested. To identify outliers within the data set, z statistic and box graphics were used and 22 of the students were excluded from the study. Second, Mahalanobis distance measures were used for multivariate outliers and 12 students were excluded from the study. For the remaining 331 data, normality assumptions were tested by skewness and kurtosis coefficients. Finally, scatter diagram was used to assess multivariate normality. Correlation coefficients between variables were calculated to check whether there was a high correlation between two or more predictors. There is no multicollinearity for the predictors with tolerances larger than .10 and VIF smaller than 10 (Field, 2005). As a result, all assumptions were met in order to perform multiple regression analyses.

Results

Firstly, descriptive statistics were employed to summarize the high school students' online information searching strategies, digital nativity, and digital citizenship levels and its sub-dimensions. The data regarding mean scores, standard deviations, min-max scores, skewness, and kurtosis are given in Table 1.

Table 1. Descriptive Statistics (n=331)

Scale	Dimensions	Number of items	Min	Max	Mean	SD	Skewness	Kurtosis
Digital Native	Grew up with technology	5	5.00	35.00	26.89	6.17	-0.62	-0.20
	Comfortable with multitasking	6	6.00	42.00	34.12	7.48	-0.95	0.50
	Reliant on graphics for communication	5	5.00	35.00	23.50	7.43	-0.33	-0.41
	Thrive on instant gratifications and rewards	5	5.00	35.00	25.75	6.15	-0.58	0.18
Digital Citizenship	Digital communication and literacy	24	46.00	120.00	92.38	14.66	-0.40	-0.25
	Digital etiquette and law	16	32.00	80.00	61.76	11.33	-0.58	-0.42
	Digital security	5	10.00	25.00	21.25	3.54	-0.98	0.35
Online Information Searching Strategies	Behavioral domain strategies (BDS)	8	21.00	48.00	36.94	6.90	-0.18	-1.04
	Procedural domain strategies (PDS)	6	11.00	36.00	27.04	5.56	-0.49	-0.17
	Metacognitive domain strategies (MDS)	11	11.00	66.00	48.42	12.14	-0.59	0.19

As seen in Table 1, according to Kline (2010), skewness and kurtosis were within acceptable limits. The result indicated that the level of students' digital nativity in terms of "Grew up with technology" (M=26.89, SD=6.17) and "Comfortable with multitasking" (M=34.12, SD=7.48) was higher than "Reliant on graphics for communication" (M=23.50, SD=7.43) and "Thrive on instant gratifications and rewards" (M=25.75, SD=6.15). As to sub-dimensions of digital citizenship, the level of students' "Digital communication and literacy" was 92.38 (SD=14.66), "Digital etiquette and law" was 61.76 (SD=11.33), and "Digital security" was 21.25 (SD=3.54). Lastly, students' domain strategies were at similar levels. Table 2 have shown that the relationships among sub-dimensions of online information searching strategies, digital nativity, and digital citizenship.

Table 2. Correlations among Sub-dimensions of Online Information Searching Strategies, Digital Nativity, and Digital Citizenship (n=331)

	Digital communication and literacy	Digital Etiquette and Law	Digital Security	Grew up with Technology	Comfortable with Multitasking	Reliant on Graphics for Communication	Thrive on Instant Gratifications and Rewards
BDS	.523**	.190**	.336**	.213**	.396**	.098*	.201**
PDS	.474**	.241**	.331**	.226**	.344**	.210**	.318**
MDS	.506**	.291**	.375**	.265**	.338**	.312**	.404**

**p< .001, *p< .05

Table 2 illustrates that there are positive relationships between all variables. There are moderate positive correlations between each dimensions of the online information searching strategies and "Digital communication and literacy". The levels of the relationship differ between the sub-dimensions of the digital nativity and the sub-dimensions of the online information searching strategies. While BDS and PDS are most correlated with "Comfortable with multitasking" as a sub-dimensions of digital nativity, MDS are most correlated with "Thrive on instant gratifications and rewards". There were weak positive correlations between each dimensions of online information searching strategies and "Digital

etiquette and law". When the sub dimensions of digital nativity were examined a weak correlation was found between "Reliant on graphics for communication" and BDS (r=.098, p <.05). A similar relationship was found between "Reliant on graphics for communication" and PDS (r=.210, p <.01). However, the weakest relationship was found between MAS and "Grew up with technology (r=.265, p <.01).

Results on the Prediction of BDS

The results of the multiple regression analysis to specify the predictors of students' BDS were presented in Table 3.

Table 3. Summary of Stepwise Multiple Regression Analysis for Variables Predicting BDS (n=331)

Model	Variable	*R*	R^2	ΔR^2	*F*	B	Std. error	β	t
1	(Constant)					14.198	2.067		6.868
	Digital communication and literacy	.523	.274	.272	124.024**	.246	.022	.523	11.137
2	(Constant)					12.066	2.109		5.720
	Digital communication and literacy	.550	.303	.298	13.612**	.204	.025	.433	8.292
	Comfortable with multitasking					.178	.048	.193	3.689
3	(Constant)					7.749	2.421		3.201
	Digital communication and literacy	.572	.327	.321	11.973**	.174	.026	.370	6.784
	Comfortable with multitasking					.180	.047	.195	3.799
	Digital security					.328	.095	.169	3.460
4	(Constant)					8.240	2.411		3.418
	Digital communication and literacy	.583	.340	.331	6.019**	.176	.025	.374	6.905
	Comfortable with multitasking					.219	.050	.238	4.417
	Digital security					.358	.095	.184	3.772
	Reliant on graphics for communication					-.112	.046	-.121	-2.453

As seen in Table 3, four models were found significant to explain the students' BDS. "Digital communication and literacy" in Model 1 explained the 27% of the variation in BDS. "Comfortable with multitasking" in Model 2 was 3%, "Digital security" in Model 3 was 3%, and "Reliant on graphics for communication" was 1%. Total variance explained by these variables was calculated as 34%. The results indicated that "Digital communication and literacy" was a significant determinant for BDS (β=.523, p<.05). Similarly, "Comfortable with multitasking" (β=.193, p<.05) and "Digital security" (β=.169, p<.05) was a significant predictive effect on BDS. Conversely, students with "Reliant on graphics for communication" (β=-.121, p<.05) performed a low behavioral search strategy use.

Results on the Prediction of PDS

The results of the multiple regression analysis to specify the predictors of students' PDS were presented in Table 4.

Table 4. Summary of Stepwise Multiple Regression Analysis for Variables Predicting PDS (n=331)

Model	Variable	*R*	R^2	ΔR^2	*F*	B	Std. error	β	t
1	(Constant)					10.433	1.722		6.058
	Digital communication and literacy	.474	.225	.222	95.363**	.180	.018	.474	9.765
2	(Constant)					6.722	1.993		3.373
	Digital communication and literacy	.503	.253	.249	12.463**	.155	.019	.408	7.944
	Digital security					.284	.081	.181	3.530
3	(Constant)					5.198	2.021		2.572
	Digital communication and literacy	.525	.276	.270	10.411**	.136	.020	.359	6.800
	Digital security					.259	.080	.165	3.244
	Thrive on instant gratifications and rewards					.146	.045	.162	3.227

As seen in Table 4, three models were found significant to explain the students' PDS. "Digital communication and literacy" in Model 1 explained the 23% of the variation in PDS. "Digital security" in Model 2 was 2% and "Thrive on instant gratifications and rewards" in Model 3 was 3%. Total variance explained by these variables was calculated as 28%. The results indicated that "Digital communication and literacy" was a significant determinant for PDS (β=.474, p<.05). "Digital security" (β=.181, p<.05) and "Thrive on instant gratifications and rewards" (β=.162, p<.05) had an effect on the procedural searching strategy levels.

Results on the Prediction of MDS

The results of the multiple regression analysis to specify the predictors of students' MDS were presented in Table 5.

Table 5. Summary of Stepwise Multiple Regression Analysis for Variables Predicting MDS (n=331)

Model	Variable	*R*	R^2	ΔR^2	*F*	B	Std. error	β	t
1	(Constant)					9.718	3.684		2.638
	Digital communication and literacy	.506	.256	.254	113.103**	.419	.039	.506	10.635
2	(Constant)					3.133	3.736		2.838
	Digital communication and literacy	.563	.317	.313	29.507**	.345	.040	.417	8.607
	Thrive on instant gratifications and rewards					.519	.096	.263	5.432
3	(Constant)					-5.065	4.183		-2.211
	Digital communication and literacy	.591	.349	.343	16.175**	.292	.041	.352	7.041
	Thrive on instant gratifications and rewards					.482	.094	.244	5.131
	Digital security					.664	.165	.194	4.022

As seen in Table 5, three models were found significant to explain the students' MDS. "Digital communication and literacy" in Model 1 explained the 26% of the variation in MDS. "Thrive on instant gratifications and rewards" in Model 2 was 6% and "Digital security" in Model 3 was 3%. Total variance explained by these variables was calculated as 35%. The results indicated that "Digital communication and literacy" was a significant determinant for MDS (β=.506, p<.05). "Thrive on instant gratifications and rewards" (β=.263, p<.05) and "Digital security" (β=.194, p<.05) supported metacognitive searching strategies.

Discussion, Conclusion and Suggestions

This study examined the relationship between digital nativity and digital citizenship in terms of "Digital communication and literacy", "Digital security", and "Digital etiquette and law" with online information searching strategies through multiple regression analysis.

The overall sub-dimensions of online information searching strategies were positively correlated with "Digital communication and literacy", "Digital security", "Digital etiquette and law", and sub-dimensions of the digital nativity. Particularly, "Digital communication and literacy" had a moderate relationship with BDS, PDS, and MDS. In this regard, students with a high level of digital communication and literacy skills could be considered better in the process of online information searching. Similarly, Noh (2017) conducted a study with college students about the effect of digital literacy on information use behaviors and found that as one of the aspects of the digital literacy, ICT literacy was related to information searching. In addition, Kwon and Hyun (2014) argued that people who have high levels of digital literacy able to find the desired information on the internet more easily and freely express and share their opinions in this process.

In the literature, web searching experience (Demiraslan Çevik, 2015; Tsai, 2009), epistemological beliefs, decision-making styles, achievement goals (Demiraslan Çevik, 2015), information literacy, and digital nativity (Çoklar et al., 2017) were examined as the predictors of online searching strategies. In

this study, different from previous studies digital nativity and specific dimensions of digital citizenship such as "Digital communication and literacy", "Digital security", "Digital etiquette and law" were considered. The results indicated that "Digital communication and literacy" and "Digital security" were significant determinants for all sub-dimensions of online information searching strategies while "Digital etiquette and law" were not found a predictor of online information searching. Taken together, it could be argued that high school students might have ignored the ethical and legal aspects while searching information. "Digital etiquette and law" involves "electronic standard and procedure" and "electronic responsibility for actions and deeds such as plagiarism or illegal downloads". From this point of view, using strategies such as "cut and paste" which was a type of plagiarism and frequently used by students (Källermark Haya, 2015; Ladbrook & Probert, 2011) might hinder extracting, analyzing, and synthesizing the content while searching information.

On the other hand, "Comfortable with multi-tasking" and "Reliant on graphics for communication" were significant determinants of BDS. This result might be related to the need for lower cognitive abilities for BDS. Similarly, it was stated in the literature that because of the limitations in human cognitive architecture multitasking was not performed in tasks that require complex examinations (Brumby & Salvucci, 2006; Kirschner & De Bruyckere, 2017; Kirschner & van Merriënboer, 2013). In addition, PDS and MDS were predicted by mere sub-dimensions of the digital nativity as "Thrive on instant gratifications and rewards". Thus, it could be concluded that the digital natives tended to access information quickly and they used MDS and PDS in order to reach the desired information. One of the most interesting results of this study was that the sub-dimension grew with technology did not predict online information searching strategies. This result confirmed that qualifying today's generation as digital natives do not assert that they are digitally literate (Li & Ranieri, 2010; Šorgo, Bartol, Dolničar, & Boh Podgornik, 2017). Accordingly, although students used technology in their daily lives frequently, very few of them used technology to learn something or explore information (Ng, 2012).

In this direction, it is important to examine the factors affecting online behaviors of the students who used online environments to access information. In the present study, it was examined whether digital nativity and some dimensions of digital citizenship were effective indicators in the prediction of online information searching strategies. The results of this study is important for educators and parents in terms of providing guidance for digital natives in terms of factors that affect accessing and using information. Educators and parents should manage the process of introduction ans the use of technology which start at an early age and provide relevant guidance. Teachers should be a role model in terms of the conscious, safe, and effective use of online environments and should provide feedback by evaluating the students' online behaviors. In this regard, teachers can provide online activities inside and outside of the classrooms and encourage students' active participation. In this process, instead of focusing on online information search results, students' online information search experiences should be discussed and evaluated. Educators and researchers should not rely on the assumption proposed by digital native concept that new generations have advanced knowledge and skills about technology, and through these experiences, they have different learning preferences or styles than previous generations. In this regard, examining new generations' technology usage and perspectives based on empirical findings can be useful in terms of the actions to be taken for their education. Future studies can focus on the effects of other variables such as literacy type. In many studies, information searching behaviors of university students have been examined (Çoklar et al., 2017; Demiraslan Çevik, 2015; Maghferat & Stock, 2010); however, this study carried out with high school students. Besides, future studies can be conducted with middle school or high school students who do not have equal access to technology. Lastly, online information searching strategies were determined based on self-reporting data. For more objective measurements, future research can benefit from eye-tracking studies to determine online information searching strategies and examine its relationship with other variables.

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