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The Role of Online Information Searching Strategies and Digital Literacy Levels in Predicting Students' Lifelong Learning Competencies

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Lifelong learning (LL), which emphasizes the spread of learning throughout life, is a continuous process that aims to develop or change the competencies that individuals have or want to have throughout their lives. This study focused to investigate the extent to which online information-searching strategies (OISS) and digital literacy (DL) can predict LL competencies. The sample consists of 1658 high school students. The convenience sampling approach was used to select the sample. The dataset was collected using the “Key Competencies Scale in Lifelong Learning”, “Online Information Searching Strategies Inventory”, and “Digital Literacy Scale”. Data analysis was conducted using descriptive statistics, Pearson correlation coefficients, and stepwise multiple regression analysis. The results indicated that DL levels and OISS significantly predicted LL competencies. In predicting LL competencies, it was concluded that the best predictor was DL levels. DL independent variable explained 27.7% of the total variance. Also, it was determined that DL levels and OISS explained 34.2% of the total variance of LL competencies and that independent variables affected the dependent variable at a large level ($R^2 = .342 > .26$). In line with the findings of the research, suggestions were made to determine and increase DL levels and OISS to increase their LL competencies.

Introduction

Human beings are constantly learning from the moment they exist. This learning is ongoing as a lifelong, formal, or informal learning. Therefore, education has existed with humans. Education affects people, society, and the world directly or indirectly (Rogers, 2014). Educational institutions inside all institutions have been impacted by technological innovations in the twenty-first century, which has created a responsibility to address these changes, developments, consequences, and demands of globalization. Considering these developments, the need for individuals who learn to learn and continue lifelong learning is increasing. Therefore, individuals must be trained to meet the demands of the century (Taşçı

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& Titrek, 2020). The European Union declared 1996 as the “year of lifelong learning”. Studies on LL in European Union member countries were reported in the 2000s, and LL was particularly emphasized at the council meetings held in Lisbon and Stockholm (Neculau & Anghel, 2022).

LL provides equal opportunities to individuals by eliminating restrictions such as gender, age, education level and socio-economic status, time and place (Yap & Tan, 2022). LL competencies, defined as a guiding and modern phenomenon, should be examined in every aspect and these competencies should be gained by individuals (Erdogan & Ayanoglu, 2021). Accordingly, the importance of individuals who can fulfill the requirements of the information age such as analyzing, questioning, and producing solutions, and learning knowledge and competencies on their own, at any age and throughout their lives is an undeniable fact. In addition to all these, science and technology are developing so quickly. For this reason, the argument that people use the information they learned in their childhood throughout their lives has become invalid. Much of this information won't be accurate and helpful to them for the rest of their life (Kesici, 2022). In the century we are in, individuals live in a technology-oriented environment with a lot of information and rapid changes occur in technology tools in this environment. At this point, individuals are required to display a variety of practical information and technology abilities (Partnership for 21st Century Learning (P21), 2015). Therefore, LL, which affects the success of the learner psychologically and cognitively, ensures learner autonomy and the continuity of individual development, comes to the fore (Derrick, 2003).

LL refers to a long process that continues throughout life and everywhere, unlike compressing learning and education processes to a certain part of lives (Yap & Tan, 2022). LL competencies are expressed as the basic competencies required for individuals to self-realize throughout their lives. It is aimed to continuously improve society by gaining these competencies to individuals (Garzón-Artacho et al., 2021). What competencies an individual should have for LL is an important consideration. LL competencies are communication, technology, and engineering, personal, social and learning to learn competence, mathematical competence and competence in science, digital competence, cultural awareness, entrepreneurship, and expression competencies. (Malykhin et al., 2022). LL is now a must for the information age. The successful individuals of the future include competencies such as using information technologies, problem-solving, and self-learning. Also, every individual who grew up in the information age should have the basic competence of learning to learn. LL individuals, i.e., self-supervised, taking responsibility, having high-level thinking competencies, making independent decisions, eager to receive information, willing to learn, solving problems, communicating effectively, and competencies related to information technology, required by the information society are those who adapt to changes and innovations (Demirel, 2011).

When the related studies on LL competencies are examined, there are many factors that directly or indirectly affect LL. Among these factors, demographic factors (Moustakas, 2018), socio-economic status (Chae & Kang, 2018), and cultural structure (Chen & Liu, 2019) play an important role in LL competencies. Besides, a positive correlation was found between LL and foreign language proficiency (Adams, 2007), problem-solving competencies (Durak et al., 2021), critical thinking competencies (Deveci & Ayish, 2017), digital citizenship perception (Dhamanitayakul, 2019), information literacy (Kozikoglu & Onur, 2019).

Emphasizing the spread of learning opportunities throughout life, LL is a continuous process



that develops the competencies and potential of the individual, supports the educational, personal, and social development of the individual, and focuses on the learners and their needs, emerging as a learning and life cycle (Demirel, 2011). LL is an important skill for individuals to adapt to changes and to remain useful to society or to become useful individuals. Although the acquisition of this skill is decisive not only for personal development and actively adapting to the society we live in, but also to be successful in a constantly changing business life, studies for predicting this skill are limited. In order to structure LL competencies, it is required to ascertain the potential roles of the factors that may be involved.

To fill this gap, we aimed to a) examine the relationship among LL competencies, OISS, and DL, and b) what extent OISS and DL variables predict LL in this study. For this purpose, it was investigated to what extent DL levels and OISS could explain LL competencies.

The theoretical background of dealing with DL levels and OISS in predicting LL competencies and the hypotheses of the research are explained below.

Theoretical Background

The Relationship Between LL and DL

LL includes competencies such as using information technologies effectively, self-learning and problem solving (European Commission, 2018). Life-long learners required by the information society have high-level thinking, DL, and problem-solving competencies. At the same time, they are self-regulated, able to communicate effectively, willing to learn, adapt to changes and innovations. LL is now seen as a necessity for the information age (Demirel, 2011).

Technology, information, and media competencies are essential for individuals to develop an understanding based on the correct and functional use of information (Singh & Ramaiah, 2021). According to P21 (2015); DL is explained as using technology in several information management processes such as accessing, transmitting, organizing, adapting, and evaluating information. Digitally literate individuals can actively access digital information, solve, and evaluate the information, and add new ones to this digital information (Kuek & Hakkennes, 2020).

The higher the level of DL of the individual, the easier it is to adapt to new technologies. DL based on acquired knowledge and competencies includes cognitive, technical, emotional, and social learning perspectives (Ng, 2012). DL is important in acquiring competencies such as using different technologies, increasing the use of secure internet, and solving the problems. This circumstance highlights the need for people to have DL competencies (Hamutoğlu et al., 2017). One of the eight key competencies that individuals should have in LL is digital competence (European Commission, 2018). Considering these studies, the suggested hypothesis is the following:

H1: LL is positively linked to DL.

The Relationship Between LL and OISS

LL skill is a learning ability that predicts individuals to acquire knowledge, attitudes, competencies, and habits (Parisi et al., 2019). With the development of technology, the need

for learning to learn and gaining LL competencies is becoming increasingly important due to the constant change of learned knowledge and new information produced (Çetin & Demirtaş, 2022).

In the past, learning the basic information about any discipline was sufficient to be successful in this discipline, while the information learned in this process, the main feature of which is change, loses its validity in a very short time. In this case, successful individuals of today's society are faced with the threat that they have to constantly improve themselves (Lazić et al., 2021). The constant change and increase of information make it unnecessary and impossible for people to memorize everything. Therefore, knowing how to access information and produce new information using this information has become an indicator of being a member of the information society citation (Habibzadeh & Abdolrahmani, 2020). Considering that the vast majority of information is available online, OISS come to the forefront as a key concept. For their assignments, projects, and presentations, students primarily use the internet as their source of information. In addition to searching and accessing the information on the internet, students must decide on the suitability, reliability, and relatively the most qualified of the information (Aşkar & Mazman, 2013). When online searching, it is important to find appropriate and reliable information that will inform time-sensitive decision making. (Topal & Süner, 2021). It is stated that individuals frequently get lost in online information-searching processes, do not know where to go and what to do to search for information, and they are likely to find incorrect or incomplete information online (Çoklar et al., 2017).

The cognitive and metacognitive strategies that should be possessed in online environments are that individuals can easily and always access reliable and accurate information and go through a variety of cognitive processes like analysis, decision-making, and evaluation during the search for information (Aşkar & Mazman, 2013). OISS are categorized under three main headings as a behavioural, approach, and metacognitive. These main headings are grouped as control and disappearance strategies under the behavioural dimension, problem-solving and purposeful thinking strategies under the approach dimension, and finally, under the metacognitive dimension, the strategies of distinguishing and evaluating the basic ideas are grouped as sub-factors (Tsai & Tsai 2003). When these sub-factors are examined, the importance of raising individuals with research, inquiry, analysis, and synthesis competencies, which is the primary objective of education, emerges. Investment in the acquisition of OISS can have a significant impact in this direction (Neves & Henriques, 2020). The characteristics of individuals with LL competencies are in parallel with these seven sub-factors. Individuals with LL have problem-solving, critical thinking, analyzing, questioning, and digital competencies. Based on this literature, the suggested hypothesis is the following:

H2: LL is positively linked to OISS.

H3. DL and OISS significantly predict LL.

Method

A multifactorial predictive correlational pattern was used in the study. In the predictive correlation pattern, the relationships between factors are examined, and an unknown variable is estimated based on one of the variables. If there is only one predictor variable, it is called a one-factor predictive correlational pattern, and if there are two or more predictors, it is called a multifactorial correlational pattern (Roberts & Roberts, 2021). In the study, investigating DL levels and OISS, as predictors of their LL competencies, required the determination of the method as a multi-factor correlational pattern.



Participants

The study's sample, which was selected using the convenience sampling approach, includes 1720 students from several Anatolian high schools in Ankara. 62 records were excluded from the dataset, including records from 11 students who had outlier values determined and including records from 51 people whose expressions were sequential or blank were specified in the scales. Following data pre-processing, stepwise multiple regression analysis was carried out on the remaining 1658 records. The participants' demographic characteristics are given in Table 1.

Table 1. Participant demographic characteristics.

Variables	f	%
<i>Gender</i>		
Male	790	47.6
Female	868	52.4
<i>Class level</i>		
9th Grade	454	27.4
10th Grade	418	25.2
11th Grade	410	24.7
12th Grade	346	22.7

Table 1 shows that of the total participants, 868 (52.4%) were women and 790 (47.6%) were men. According to class levels, there were 454 (27.4%) students in the 9th grade, 418 (25.2%) in the 10th grade, 410 (24.7%) in the 11th grade, and 346 (22.7%) in the 12th grade. This study was performed with the approval of the Gazi University Ethics Board.

Data Collection Tools

Data was collected using “Key Competencies Scale in Lifelong Learning”, “Online Information Searching Strategies Inventory”, and “Digital Literacy Scale”. “Key Competencies in Lifelong Learning” scale was developed by Şahin et al. (2010) by considering the key competencies determined by the European Union. The LL scale, which is a 5-point Likert format, has 23 items (Şahin et al., 2010). Confirmatory factor analysis (CFA) was used to determine the usability of scale for the current study group. The assumptions were checked. It is recommended to reach 5-10 folds for each item when the sample size is sufficient. This scale consists of 23 items. For this reason, a sample of 300 high school students was used. Mahalanobis distance values were used in controlling outlier values and outlier values were not detected in the dataset. Skewness and kurtosis coefficients were used in the study to evaluate the assumption of normality. In this study, the assumption that there is not multicollinearity or singularity between sub-dimensions was checked with Variance Inflation Factor (VIF) and tolerance values. Table 2 displays the values for skewness, kurtosis, VIF, and tolerance:

Table 2. Skewness, Kurtosis, VIF and Tolerance Values of Sub-Dimensions

Sub Dimensions	Skewness	Kurtosis	Tolerance	VIF
Communicative competence in a native language	-,717	-,275	,555	1,800
Communicative competence in a foreign language/s	-,200	-,768	,800	1,251

Mathematical basis competence in technology and science	-,230	-,488	,596	1,677
Digital competence	-,238	-,672	,519	1,929
The learning to learn	-,581	,103	,519	1,926
The social citizenship awareness	-,453	-,312	,482	2,073
The sense of initiative and entrepreneurship	-,429	-,390	,378	2,644
The cultural awareness and expression	-,827	-,028	,728	1,373

VIF (<10) and tolerance (>.01) values are checked to understand that there is not multicollinearity (Hair et al., 2014). The tolerance values of all eight sub-dimensions are above .01 and VIF values are well below 10. According to these results, there is not multicollinearity between sub-dimensions. Table 3 displays the correlation coefficients among the different variables:

Table 3. Pearson Correlation Coefficients for Relationship among Variables

Variables	1	2	3	4	5	6	7	8
1- Communicative competence in a native language	1.00							
2- Communicative competence in a foreign language/s	.183**	1.00						
3- Mathematical basis competence in technology and science	.418**	.359**	1.00					
4- Digital competence	.474**	.310**	.528**	1.00				
5- The learning to learn	.486**	.330**	.508**	.543**	1.00			
6- The social citizenship awareness	.517**	.210**	.455**	.502**	.571**	1.00		
7- The sense of initiative and entrepreneurship	.631**	.212**	.505**	.593**	.563**	.671**	1.00	
8- The cultural awareness and expression	.378**	.293**	.319**	.421**	.288**	.361**	.430**	1.00

** p < .01

According to Table 3, the medium and low level of the positive significant relationship between variables shows that the variables are not separate from each other. Finally, the assumption that fit index values are within acceptable limits was checked for CFA. The model fit indices were given in Table 4.

Table 4. The goodness-of-fit indexes of the proposed model

Goodness-of-fit indexes	Coefficient	Results
X^2/df	2.922	$X^2/df \leq 3$ → Close fit
GFI	.907	GFI $\geq .90$ → Reasonable fit
AGFI	.861	AGFI $\geq .85$ → Reasonable fit
NFI	.971	NFI $\geq .95$ → Close fit
RFI	.956	RFI $\geq .95$ → Close fit
CFI	.984	CFI $\geq .95$ → Close fit
RMSEA	.020	RMSEA $\leq .05$ → Close fit

The fit indices of the tested model have quite high values. The model fit indices are “close fit” and “responsible fit” ($X^2/df=2.922$, AGFI=.861, GFI=.907, NFI=.971, CFI=.984, RFI=.956, and RMSEA=.020) (Kline, 2015). Based on these results, the proposed model is compatible with the data.



Respectively; when the factor load values of the sub-dimensions are examined, first sub-dimension is .870, .891, .876 and .922; second sub-dimension is .898, .953, .888 and .816; third sub-dimension is .932, .892 and .832; fourth sub-dimension is .840 and .856; fifth sub-dimension is .911 and .689; sixth sub-dimension is .697, .852 and .726; seventh sub-dimension is .787, .858, .798 and .817; eighth sub-dimension was found to be .812. According to these results, Key Competences in LL scale showed a structure compatible with the original.

Within the validity of the scale, the construct and discrimination validities were examined. The fit indices given in Table 4 show that the scale has construct validity. The AVE value, composite reliability (CR) and Cronbach alpha ($C\alpha$) was calculated and presented in Table 5:

Table 5. AVE, CR and $C\alpha$ Values of the LL Scale (n = 300)

Scale	AVE	CR	$C\alpha$
LL	0.717	0.983	.910

Based on these results, it was determined that the scale could be used in the study group in its current form, since it met the discriminant validity ($AVE > .50$) and composite reliability ($CR > .60$) conditions. The $C\alpha$ of the scale was expressed as .8893 by Şahin et al. (2010). In this study, the $C\alpha$ of the scale was calculated as .910 for CFA (n=300) and .913 for Multiple Regression Analysis (n=1658).

OISS inventory was developed by Tsai (2009). The inventory adapted into Turkish by Aşkar and Mazman (2013). The OISS inventory, which is a 6-point Likert format, has a total of 25 items. The inventory can be used to determine the OISS in high school and upper levels. The $C\alpha$ of the OISS inventory was expressed .91 (Aşkar & Mazman, 2013). The $C\alpha$ of the OISS inventory was calculated as .896 in this study.

The DL Scale was developed by Ng (2012). The scale adapted into Turkish by Hamutoğlu et al. (2017). The DL scale, which is a 5-point Likert format, has a total of 17 items and 4 sub-factors, namely attitude, cognitive, technique, and social. The $C\alpha$ of the inventory was expressed .93 (Hamutoğlu et al., 2017). The $C\alpha$ of the DL scale was calculated as .884 in this study.

Data Analysis

Multiple regression analysis was used data analysis. The analysis examines the linear relationship between two or more independent variables and one dependent variable. It was examined whether there were extreme values. Mahalanobis distance was used to examine the extreme values, and extreme values above the .001 significance level were excluded from the dataset (Tabachnick & Fidell, 2018). The analysis assumptions were tested for the remaining 1658 records in the dataset. In order to perform multiple regression analysis, the assumptions of (a) normality, (b) absence of high correlation (multicollinearity) between the independent variables, and (c) absence of autocorrelation must be met (Shrestha, 2020). To test the assumptions of this analysis, the following procedures were used:

- (a) Skewness and kurtosis coefficients were used to evaluate the assumption of normality in the study. Skewness coefficients ranged between -.0426 and -.045; kurtosis coefficients ranged between -.567 and .133. Since these values are in the range of +1 to -1, the normality condition is met. (Hair et al., 2014).

- (b) For the multicollinearity problem, (i) VIF and Tolerance values and (ii) correlation values between independent variables are examined. If the VIF (1/Tolerance) value is lower than 4, it means that there is not multicollinearity problem (Hair et al., 2014). In this study, the tolerance value was .778 and the VIF value was 1.285. Also, there should be no relationship between the independent variables. For this, correlation values between independent variables were examined. If this value is greater than 0.70, it means that there is a multicollinearity problem (Tabachnick & Fidell, 2018).
- (c) Durbin-Watson d statistics can be used to determine whether there is autocorrelation. The Durbin-Watson d statistic less than 1 indicates a positive correlation and a greater than 3 indicates a negative correlation. Calculating the value around 2 indicates that there is no autocorrelation (Tabachnick & Fidell, 2018). In the current study, the Durbin-Watson d statistic was calculated as 1.772. The fact that this value is close to 2 indicates that there was no autocorrelation. As a result, all conditions are provided to perform multiple regression analysis.

Results

Firstly, descriptive statistics were employed to summarize DL, OISS, and LL levels. The data regarding descriptive statistics values of these scales are given in Table 6:

Table 6. Descriptive statistics of scales

Scale	Min	Max	\bar{x}	Std.Deviation (sd)	Skewness	Kurtosis
DL	1.82	5	3.9252	0.588	-.426	.133
OISS	2.84	6	4.7716	0.710	-.338	-.567
LL	1.87	5	3.8556	0.600	-.045	-.279

The mean values of each scale were calculated; DL (\bar{x} =3.9252, sd =0.588), OISS (\bar{x} =4.7716, sd =0.710) and LL (\bar{x} =3.8556, sd =0.600). As seen in Table 6, DL levels, OISS, and LL levels are high. When the findings of skewness and kurtosis values are examined, it is seen that it is within the range of -1 to +1, that is, within acceptable limits (Hair et al., 2014).

Pearson Correlation Coefficients were calculated to determine the existence of the relationship between the variables. The findings were also used to test the assumption that there is not multicollinearity problem, which requires a high relationship among the independent variables. Correlation coefficients of the variables are given in Table 7.

Table 7. Pearson Correlation Coefficients for Relationship among Variables

Variables	LL	DL	OISS
LL	1.00	.526**	.473**
DL	.526**	1.00	.471**
OISS	.473**	.471**	1.00

** p < .01

When Table 7 is examined, there is a positive and significant relationship among LL competencies with their DL levels ($r = .526$; $p < 0.01$), and OISS ($r = .473$; $p < 0.01$). When the correlation coefficients between the variables were examined, it was determined that H1 (LL is positively linked to DL) and H2 (LL is positively linked to OISS) hypotheses were supported. Another finding in Table 7 is that the significant relationship between independent



variables (DL and OISS) is not high. ($r = 0.471$; $p < 0.01$). If the correlation coefficient between the independent variables is greater than 0.70, it indicates that there is a very high correlation between the variables, so there is a multicollinearity problem (Tabachnick & Fidell, 2018). This finding ($r = 0.471$; $p < 0.01$) shows that there is not multicollinearity problem. As a result of determining that all necessary assumptions are met, progressive multiple regression analysis was performed. In Table 8, the results of the analysis are shown.

Table 8. Results of Stepwise Multiple Regression Analysis

Model	Variables	R	R ²	ΔR^2	F	B	Std. Error _B	β	t
1	(Constant)					1.748	.120		14.592
	DL	.526	.277	.276	316.679**	.537	.030	.526	17.795
2	(Constant)					1.129	.133		8.469
	DL	.585	.342	.340	214.459**	.398	.033	.390	12.196
	OISS					.244	.027	.289	9.024

Dependent variable: LL

When the R² values are examined in Table 8, in the first stage DL variable explains 27.7% of the total variance. In the second stage, it was found that the total variance explained in the LL dependent variable increased to 34.2% with the inclusion of the OISS independent variable. In Model 2, OISS contributed to a 6.5% total variance. R² (effect size) value shows large effect level if $0.26 \leq R^2$ (Cohen, 1988). Independent variables in Model 1 (R² =.277) and Model 2 (R²=.342) have a significant effect on the dependent variable. When the regression coefficient (β) values standardized in Table 8 are examined; It is that the contribution of the DL variable to the model ($\beta = .390$) is more than the contribution of the OISS variable ($\beta = .289$). According to the findings obtained as a result of the stepwise multiple regression analysis, it was determined that the variables of DL and OISS predicted the LL variable significantly. H3 hypothesis (DL and OISS significantly predict LL) was supported.

Discussion and Conclusions

In this study, the relationship among LL competencies, DL, and OISS, and the extent to which DL and OISS are effective in predicting LL competencies have been investigated by stepwise multiple regression analysis. In the study, firstly, the level of lifelong competencies, DL levels, and OISS of students according to the midpoint scores received from these scales, and the scores obtained were investigated.

According to the results of the study, the midpoint scores of students from DL, OISS, and LL competence scales were found as 3.92, 4.77, and 3.85, respectively. The students got above midpoint scores on all scales. Many studies in the literature find DL levels above the midpoint score (Ocak & Karakuş, 2019; Üstündağ et al., 2017). Ocak and Karakuş (2019) found that many of the university students' DL levels were high. It is stated that individuals with high DL competencies will be more advantageous than other individuals in terms of accessing, understanding, managing, analyzing, and interpreting information. For digitalization to continue increasing in all areas of the society and to make the correct analysis and criticism of the data obtained, the necessity of developing DL awareness emerges in society (Sarı et al., 2019). In the literature, however, it is emphasized that being a very good technology user does not mean being digital literate. DL is a complex concept that goes beyond just being able to use technology. It includes the ability to understand and use information in multiple formats with an emphasis on critical thinking (Semerci & Semerci, 2021). DL refers to the knowledge

and skills required for student's professional development and active participation in technology-based societies (Araniri et al., 2021). Therefore, being DL means having the ability to use digital technology effectively and efficiently, including the ability to evaluate, analyze, and create digital content (Erwin & Mohammed, 2022).

Another finding obtained in the study is that students' online searching strategies are above the midpoint. If individuals have high DL competencies, they are better at online searching strategies (Çebi & Özdemir, 2019). People with high DL proficiency can access, share, process, understand and create information more easily in digital or media environment (Guess & Munger, 2023). Moreover, DL skills have an important role in online learning, and people with good digital literacy skills will strive to find and select important information and understand it better (Dinata, 2021).

In the study, it was found that the LL competencies of the students were close to the maximum score of 5, that is, the LL competencies of the students were at a high level. When the literature on determining the LL competencies of the students is examined, the studies found different results (Kozikoglu & Onur, 2019). Although the growth in technology does not mean being digital literate, it is an undeniable fact that as the level of exposure to technology increases, DL, OISS, and consequently LL abilities increase (Kim, 2019; Mehdi, 2023).

In this study, OISS and DL levels are above the midpoint score, similarly high in the literature, especially in recent studies. The reason for this situation can be interpreted as the effect of the growth of students in technology, their access to technology, and their interaction.

Another finding obtained at the end of the study is that there is a significant and positive relationship between LL competencies and DL levels ($r = .526$; $p < 0.01$) and OISS ($r = .473$; $p < 0.01$) (H1 and H2). Although there is no study that directly investigates the relationships between these variables in the literature, it is seen that the competencies that individuals should have in LL coincide with the DL and OISS competencies of individuals (European Commission, 2018; Neves & Henriques, 2020). In the information society, DL is a foundational skill and an integral requirement for LL. Lifelong learners have digital competencies and high-level thinking competencies, are willing to receive and learn, know how to obtain the right information, can question the accuracy and reliability of the obtained information (Reid et al., 2023).

DL independent variable explained 27.7% of the total variance, and the total variance explained increased to 34.2% with the inclusion of the OISS variable. When the value is examined, it is concluded that independent variables in both Model 1 ($R^2 = .277$) and Model 2 ($R^2 = .342$) have a significant effect on the dependent variable. In other words, the effect size is quite high (H3). However, it has been determined that the contribution of the DL variable to the model ($\beta = .390$) is more than the contribution of the OISS variable ($\beta = .289$). It was found that individuals with a high level of OISS and DL positively affect LL competencies and significantly predicted. This finding is consistent with the eight key competence results identified by the European Commission (2018) under the name of "European Framework of Key Competences in Lifelong Learning". Among these eight key competencies, there is also a digital competence. Many factors affect LL competencies. Among these factors, digital competencies such as being able to communicate with the internet, using the methods of accessing information, using the computer effectively, use of communication and information

technologies effectively come to the fore (Demirel, 2011; Oberländer et al., 2020). Accordingly, it is important to investigate which competencies an individual should have in LL and the factors that predict LL.

The study has several limitations. The sample was determined by the convenience sampling method due to time constraints and difficulty in reaching the sample. In this context, the generalizability of the results of the study is limited. Another limitation is that the study was performed only with high school students and other education levels were not included. For future studies, it can be suggested to include adults and students in other education levels such as primary school and university. In this study, a quantitative study based on scale items was conducted using the key competencies in LL scale, OISS inventory, and DL scale. Nonetheless, in terms of validity, it might be preferable to measure LL competencies, OISS, and DL using a qualitative analysis approach by observing the participants' behaviour, although very difficult. In other words, studies that will be done using qualitative analysis can make significant contributions to the literature. For future studies, it can be proposed to investigate other variables that are thought to affect LL competencies, find out to what extent these variables explain the total variance, and compare these variables. Besides, to reveal the factors that indirectly affect LL competencies and to understand this competence better, it can be recommended to conduct studies in which OISS and DL levels are considered predictive variables in this study.

Despite these limitations, the study has significant strengths. This study is, to our knowledge, the first to examine the relationships among LL competencies, OISS, and DL. Therefore, the current findings are also valuable. They provide new insight into the relationships between LL competencies, OISS, and DL among high school students and explore more about explanatory factors. Finally, another strength of the current study also provides more evidence of the role of LL proficiency level in using quite a large sample of high school students from Turkey.

In conclusion, it was determined that high school students got above-average scores on the scales of LL competencies, DL levels, and OISS. There is a positive relationship among LL competencies, DL levels and OISS, and to what extent DL and OISS are effective predictors in predicting LL competencies. The variance explanation ratio ($R^2 = .342 > .26$) at this level is an important result. In terms of practice, the results of this study will benefit teachers, administrators, and families for the development of students' LL competencies and will guide education programmers in the development of training programs and strategies. DL courses, which are among these predictors of LL, are already available in many educational curricula with different names. At this stage, these curricula must be up-to-date in parallel with the developing technology. The scope of applications that develop DL, information literacy and IOSS based on pedagogical principles should be expanded in the education curriculum. In addition, it is necessary to provide training for trainers, to use appropriate teaching methodologies and to develop self-directed instructional designs customized by the learner according to their needs in order to promote lifelong learning. Besides, planning activities for the development of OISS in these courses and making applications to improve competencies of students can help raise awareness of LL.

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