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The Relationship Between the Daily Use of Digital Technologies and the Reading and Information Literacy Skills of 15-Year-Old Students

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Abstract: Digital technologies in all forms have become ubiquitous in our media-rich, modern information society, but the connection between their use and information literacy is not always clear. This paper examines the impact of daily use of digital technologies on the reading and information literacy skills of 15-year-old students in Slovenia, based on data from the Programme for International Student Assessment (PISA) 2018 study. The study examines PISA 2018 variables related to Information and Communication Technologies (ICT), as well as a reading task involving the use of ICT. The sample consists of 2612 Slovenian students with a gender distribution of 50.8% girls and 49.2% boys. The study explores students' experiences, enjoyment, self-efficacy, autonomy, and independence in using ICT and learning about its use and identifies two groups of students: one group that is curious and another that is cautious. The results of confirmatory factor analysis (CFA) and structural equation modelling (SEM) show that the constructs of enjoyment, self-efficacy, learning, autonomy, and independence are highly/strongly correlated but have a low/insignificant impact on information literacy skills.

Keywords: *Information and communication technologies, information literacy, PISA2018, reading literacy, secondary school.*

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Introduction

Digital technologies in all forms have become ubiquitous in our media-rich, modern information society, to such an extent that the European Union has recognized digital competence as one of the eight key competencies for lifelong learning (European Commission, 2019). Digital pocket, mobile, and desktop devices are used constantly and intensively not only by adults but even by children who cannot read or write. The paradox of this situation is that many children are at least partially computer and digitally literate even before they are "literate" in the traditional sense of the word “literacy” (Keefe & Copeland, 2011). The question arises whether the daily use of digital technology has contributed to an improvement not only in computer and digital literacy but also in general (European Commission, 2019) and information literacy (Mackey & Jacobson, 2011). For a review of different information literacy definitions and standards, see Boh Podgornik et al. (2016).

Relations between literacy, information literacy, and digital literacy are by no means straightforward (Jones-Jang et al., 2021). For example, to access and use the functionalities of digital technology, digital literacy is a must. It is defined as the knowledge and skills a user needs to use computers, smartphones, and other digital devices (Knobel & Lankshear, 2006). In many uses of digital devices, such as playing games, work applications, and the like, information literacy, a concept closely related to digital literacy, is of secondary importance. On the other hand, information literacy is ubiquitous in all cases where a digitally literate person must acquire, select, and understand the meaning of information while being able to use that information across networks (Jones-Jang et al., 2021). Finally, someone can be literate by the traditional definition (Keefe & Copeland, 2011) without any knowledge of working with computers and therefore functionally digitally illiterate.

Prensky (2001a, 2001b) refers to today's youth generation as "digital natives" and Wang et al. (2013) as the "digital fluent" because they were born into the digital age. For this reason, young people are expected to be proficient in the ubiquitous digital technologies that are now predominantly internet-based. However, findings from the study by Šorgo et al. (2017) suggest that mastery of software tools and frequent use of internet-based services do not necessarily mean

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that digital natives are information literate. Although children were born in the digital age, they are not directly digital or information literate (Selwyn, 2009), so both literacies should be developed in an organized way and not left to chance (Dolenc & Šorgo, 2020). For example, Dolenc and Šorgo (2020) show that students who spend more time on digital devices can be even less information literate, allowing an informed guess that the quality of digital work is more important than its quantity.

The level of information literacy and factors influencing it can be assessed by different methods, one of which is a secondary analysis of public data sets. We used the Programme for International Student Assessment (PISA) 2018 database as a source of data for the study. The PISA tests assess students' reading, mathematics, and science skills and how well students can apply their knowledge. Since 2000, more than 90 countries and economies with approximately 3,000,000 students worldwide have participated (The Organization for Economic Cooperation and Development [OECD], 2020), contributing to the rich source of data available for secondary studies. PISA 2018, with the participation of 79 countries, was the seventh cycle of the program, and this cycle focused on testing reading literacy (OECD, 2019). In addition to testing knowledge and comprehension, PISA collects data on students' access to, use of, and information literacy with modern technologies. What is special about PISA is that it is intended not to measure curricular knowledge acquired in school, but to establish how well young people are prepared for the challenges of modern society at the end of compulsory education. The PISA 2018 survey showed that Slovenian students are above the average of OECD members in all three areas.

PISA 2009 introduced Electronic Reading Assessment (ERA) since reading of electronic texts has become ubiquitous. ERA aims to answer two primary research questions:

1. What are students' attitudes towards ICT use outside school?
2. Does ICT use outside school have an impact on student's information literacy?

The research aimed to determine if working with ICT affects literacy and information literacy among Slovenian students, an aspect not considered in the available reports.

Digital Literacy vs. Information Literacy

A review of the literature shows that there is no single definition of the term digital literacy, since different authors understand and define digital literacy differently. However, what all definitions have in common is that the concept of digital literacy evolves in line with technological developments. The definition of digital literacy is moving more and more from an initial, technological perspective to the integration of more complex, thoughtful, socially critical, and ethical skills and abilities. Digital literacy thus encompasses a range of many other competences, such as media, information, visual, technological, communication and social competences (Jones-Jang et al., 2021; Stanojev & Florjančič, 2018). The European framework of key competences for lifelong learning (Carretero et al., 2017) includes digital competence and information literacy, along with other literacies such as data and media literacy.

Several overlapping definitions of information and digital literacy can be found. For example, Dolničar et al. (2020) recognize information literacy as a part of digital literacy, a concept elaborated in the DigComp 2.1 frameworks (Carretero et al., 2017).

> With slight differences between definitions, digital literacy encompasses the awareness, attitude, and ability of individuals to use digital tools and facilities appropriately to identify, access, manage, integrate, evaluate, analyse, and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others in the context of specific life situations to enable constructive social action; and to reflect on this process" (Martin, 2005, pp. 135-136).

According to Eshet-Alkalai (2004), digital literacy is not just the ability to use software or operate a digital device but "encompasses a variety of complex cognitive, motor, sociological, and emotional skills, such as photo-visual literacy, reproduction literacy, branching literacy, information literacy, and socio-emotional literacy" (p. 93). Li and Ranieri (2010) describe the multidimensionality of digital learning. They identify the following skills as essential components of this literacy:

1. Understanding the characteristics of digital documents (media literacy).
2. Selecting the right applications for the task to be done.
3. Ability to use a range of applications (information technology literacy).
4. Ability to solve problems related to information retrieval and use methods and tools to access information and knowledge (information literacy).
5. Ability to share information and knowledge within a technological environment.
6. Ability to participate in the life of a community of practice and build knowledge within a virtual environment in a collaborative way.

Livingstone et al. (2005) point out that the main difference between the two literacies is that information literacy emphasizes identifying, retrieving, evaluating, and using a wide range of media materials more broadly, whereas digital

literacy focuses exclusively on using technological media for information seeking and other purposes. The National Forum on Information Literacy (2008) defines information literacy as "the ability to know when there is a need for information and to be able to identify, locate, evaluate, and use that information effectively for the problem or issue at hand."

While information and digital literacy are relatively new concepts, literacy as an ability to read and write is not. However, the emergence of new digital technologies is changing not only the format of news, which has evolved with the coexistence of older formats into multimedia interactive formats but also reading strategies and skills (Dolenc et al., 2015; Kellner, 1998). Among many overlapping formats, we choose the OECD definition (Šterman Ivančič, 2019, p.13): “Reading literacy is the understanding, use, evaluation, thinking about the text and commitment to reading the texts, which enables the reader to achieve the set goals, develop their knowledge, skills, and potential, and actively participate in society.” Accordingly, the feasibility study for the PISA, ICT literacy assessment defines ICT literacy as "the interest, attitude, and ability of individuals to appropriately use digital technology and communication tools to access, manage, integrate, and evaluate information, construct new knowledge, and communicate with others to participate effectively in society" (Lennon et al., 2003, p. 8).

Although the positive impact of digital technology use on student achievement remains controversial, there is consensus that the specific purpose, context, and pedagogical practices surrounding ICT are central to the impact on students. While the majority of ICT expenditure can be attributed to out-of-school activities, these do not necessarily lead to improved literacy (Evans & Robertson, 2020), even when practiced excessively for long periods (Dolenc & Šorgo, 2020). The reason is that students are diffuse and, in some ways, chaotic and focused on immediate actions, which sometimes leads to psychological problems (Przybylski et al., 2013).

Methodology

The Aims of the Research and the Research Questions

Based on empirical evidence that Slovenian students' information literacy is far from excellent at all levels (e.g., Dolenc & Šorgo, 2020; Dolničar et al., 2020; Šorgo et al., 2017), we aim to develop evidence-based recommendations for educators to improve it. Based on the results of the PISA 2018 study, we aimed to investigate whether and how the use of information and communication technologies (ICT), as well as opinions of and experience with digital technologies, influence students' information and general literacy skills.

The research questions were as follows:

1. Does enjoyment of ICT use influence reading and information literacy?
2. Does self-efficacy in ICT use influence reading and information literacy?
3. Do autonomy and independence in ICT use influence reading and information literacy?
4. Does learning how to use different ICTs have an impact on reading and information literacy?

At this point in the study, differences based on personal characteristics and traits and socio-demographic factors were not sought. The reason for this was not that such information was unimportant, but that we were looking for robust models in the early stages of the research. The other reason is practical. Classes should not be formed according to personal characteristics and traits, so information about differences is more likely to feed curiosity than to be of practical use in real classrooms.

Sample and Data Collection

To answer these research questions, the authors analyse data of interest collected in the PISA 2018 survey in order to find patterns not considered in the published final report.

The PISA 2018 survey was conducted in Slovenia in March and April 2018, following international protocols. The target group of the survey were 15- and 16-year-old students participating in various educational programs. An interested reader can get more information about the Slovenian school system on the websites of Eurydice and the Ministry of Education, Science, and Sport.

In the study, 6401 students from 302 upper secondary schools, 43 lower secondary schools, and two adult education institutions participated. More than 90% were enrolled in the first year of upper secondary school programs at the time of the survey. The sample was representative of a population of participants in all Slovenian formal education programs born in the calendar year 2002. The total number of births in this calendar year is 17,501 (Statistical Office). Thus, the students who participated in the PISA 2018 survey generally entered elementary school in the 2008/2009 school year. Only records with no missing data were used for further analysis. This sample (N = 2612) consists of 50.8% girls and 49.2% boys.

Analyzing of Data

The statistical procedure was carried out in several steps. In the first step, data from two databases (IC - ICT Familiarity Questionnaire and ST - Student Questionnaire) were merged into a single SPSS file, based on the students' code ID. This

procedure resulted in a sample of 6410 students. The data were reviewed, and cases with missing data were deleted from the file. This left 2612 cases that could be included in the modelling. No imputation of the data was done. Another argument against trimming the data is that in such a case we lose information about the best and worst performing students, which are not statistical artefacts but actually exist in the population.

Each selected variable was examined for frequency of response (F%), mean, median, mode, and Standard Deviation (SD). These are presented in the form of tables in the appendices.

Each construct (latent variable) was explored. Cronbach's alpha was calculated to assess the reliability of the construct. To assess the one-dimensionality of the constructs, Principal Component Analysis (PCA) was conducted with Direct Oblimin rotation. Previously, KMO and Bartlett's tests for sphericity were performed to assess the fit of the matrices. Component loadings, Eigenvalues, and percent of variance are reported in the tables.

It was found that the construct ST has two components (Table 1), which explain 68.9% of the variance. Since knowledge can be considered summative, the sums of all items forming the ST construct were later used in the models (Kline, 2023).

To check for possible cross-loadings between the IC constructs, we performed PCA with 21 variables. Four extracted components (IC013, IC014, IC015, and IC016) were found to follow the proposed constructs. Based on the results of the exploratory phase, we started building models by applying confirmatory factor analysis (CFA) and structural equation modeling (SEM) according to the procedures described in Byrne (2016). The models are shown in Figure 1 and Figure 2.

Instrument

For the purpose of the study, the ST 166 task from the ST knowledge test and four tasks from the IC questionnaire (IC013, IC014, IC015, IC016, and IC016) were selected from the Slovenian Pisa 2018 study (OECD, 2019).

ST 166 was considered a reading and information literacy task as an outcome (latent) variable. The instructions were as follows: "You have received a message in your inbox from a well-known mobile phone operator telling you that you are one of the winners of a smartphone. The sender asks you to click on the link to fill out a form with your data so they can send you the smartphone. In your opinion, how appropriate are the following strategies in reaction to this email?" Students could choose one response in each of the 5 rows (Table 1) according to the 6-point Likert scale recording how much they agreed with the opinion, where 1 means – not appropriate and 6 means – very appropriate.

We chose tasks IC013, IC014, IC015, and IC016 (Table 2) as predictors of reading literacy (RL). Respondents' thoughts about their experiences with ICT and electronic devices were collected. In each row, they chose one answer indicating to what extent they agreed with the statements (Table 2). Students choose one response to the 4-point Likert scale, where 1 means - strongly disagree and 4 means – strongly agree. IC013 includes assertions about the enjoyment of using ICT; IC014 includes assertions regarding self-efficacy in using ICT; IC015 includes assertions about autonomy and independence in using ICT, and IC016 includes assertions about learning via ICT. ICT means different types of electronic devices used by young people, such as desktops, laptops, notebooks, smartphones, tablets, mobile phones without Internet access, game consoles, and televisions with Internet access.

We hypothesize the following:

H1: Enjoyment (IC013) of using ICT has a statistically significant impact on the reading and information literacy task (ST166).

H2: Self-efficacy (IC014) in using ICT has a statistically significant influence on the reading and information literacy task (ST166).

H3: Autonomy and independence (IC015) of ICT use has a statistically significant influence on the reading and information literacy task (ST166).

H4: Learning (IC016) to use ICT has a statistically significant impact on the reading and information literacy task (ST166).

Additionally, it was hypothesized that all four predictors correlate.

Research Model

Based on the proposed hypotheses, we built a theoretical research model. For the construct (latent variable) hypothesized, the model selected 21 variables in four latent variables (constructs) (IC013, IC014, IC015, IC016). For the construct (latent variable) Reading Literacy was selected sum of 5 variables of the reading task ST166 (Figure 1). Answer 3 was reversed because negation can be regarded as a sign of knowledge. Inside the Model, we can recognize four hypotheses indicated by arrows from latent variables toward RL. Each of the hypotheses can be read as a latent variable (IC013, IC014, IC015, IC016) that will statistically significantly influence reading and information literacy.

Later, the model was subject to improvement based on the tools as provided by AMOS 27 software (Byrne, 2016). Before we embarked on verification of the structural model in modelling with linear structural equations, the measurement model had to be validated. We used the measurement model to explain how much the measured variables represent the

measurement instrument for latent variables. The measurement model and later the structural model were verified using the AMOS 27 program.

Results

The results for students' reading and information literacy are given in Table 1. The results about their experience with ICT use are in Table 2. Then follows a hypothetical and final model of the impact of differing experiences of ICT use on RL and IL.

Table 1. Measures of Central Tendencies and Principal Component Loadings for Responses to the Task (ST166 - Reading Task) About RL and IL (N = 2612).

"You have received a message in your inbox from a well-known mobile phone operator telling you that you are one of the winners of a smartphone. The sender asks you to click on the link to fill out a form with your data so they can send you the smartphone. In your opinion, how appropriate are the following strategies in reaction to this email?"

Code	Items	Mean	Median	Mode	SD	PC1	PC2
ST166Q03HA	Click on the link to fill out the form as soon as possible.	2.43	2	1	1.46	.96	
ST166Q01HA	Answer the email and ask for more information about the smartphone.	2.91	3	1	1.64	.70	
ST166Q02HA	Check the sender's email address.	4.17	4	6	1.61		.85
ST166Q05HA	Check the website of the mobile phone operator to see whether the smartphone offer is mentioned.	4.09	4	6	1.70		.81
ST166Q04HA	Delete the email without clicking on the link.	3.12	3	2	1.72		.43
	Explained variance (%)					40.7	28.2
	Eigenvalue					2.4	1.7
	Cronbach's alpha					.67	.53

From Table 1, it can be recognized that respondents believe that the least appropriate response to a message in their inbox from a well-known mobile phone provider telling them that they are one of the winners of a smartphone is to click on the link and fill out the form as soon as possible; this can be recognized as a good sign. However, most agree that it is appropriate to verify the sending email address.

The remaining two components explained 68.9% of the variance. All items loaded above the 0.4 level, so they were included in the analyses. We note that the task of assessing reading and information literacy can be divided into two components: curiosity (PC1) and caution (PC2). We can explain 40.7% of the variance with the first component (Cronbach's alpha = .67). The first component consists mainly of curiosity settings: "Reply to the email and ask for more information about the smartphone." and "Click on the link to fill out the form as soon as possible." The second component (Cronbach's alpha = .53) explained 28.2% of the variance and included three items of caution: "Check the sender's email address," "Check the mobile operator's website to see if the smartphone offer is mentioned" and "Delete the email without clicking on the link."

Experience With the Use of ICT

Frequency of response and descriptive statistics for Questions IC013, IC014, IC015, and IC016 (N= 2612) are presented in Table 2. Most students disagree with the statements "I really feel bad if no Internet connection is possible," and "I like to meet friends and play computer and video games with them."

They mostly agree with the items "If I need a new application, I choose it by myself", "The Internet is a great resource for obtaining the information I am interested in (e.g., news, sports, dictionary)", "I like using digital devices" and "I feel comfortable using my digital devices at home."

The degree of reliability is very high, as determined by the Cronbach's coefficient alpha .92.

The result of the factor analysis is four components. With the four remaining components, 65.4% of the variance can be explained. All items loaded above the 0.40 level and were therefore included in analyses.

With the first component, we can explain 17.6% of the variance (Cronbach's alpha = .88). This component combines communication claims about learning to use ICT (PC1 includes all claims from IC016). The second component (Cronbach's alpha = .84) explains 16.7% of the variance and contains opinions about the enjoyment of the use of ICT and the internet (PC2 includes all claims from IC013). The third component (Cronbach's alpha = .89) explains 16.6% of the variance and comprises six items about self-efficacy in using ICT (PC3 includes all claims from IC014). The fourth component (Cronbach's alpha = .86) explains 14.5% of the variance and comprises five items about autonomy and independence from others in the use of ICT (PC4 includes all claims from IC015). Before the analyses, KMO (.93) and Bartlett's test (Chi-Square = 30873.37; $df = 210$; $p < .001$) were performed, with a scale falling into the range in which further analyses are permitted

Table 2. Measures of Central Tendencies for Responses to the Question About the Opinions and Feelings About, and Experience With ICT Usage. Cronbach's Alpha: .92.

Thinking about your experience with digital media and digital devices: to what extent do you disagree or agree with the following statements? (Please think of different kinds of digital devices, such as for example, desktop computers, portable laptops, notebooks, smartphones, tablet computers, cell phones without internet access, game consoles, or internet-connected television.)

Model code	Items	F 1 [%]	F 2 [%]	F 3 [%]	F 4 [%]	Mean	Median	Mode	SD	PC1	PC2	PC3	PC4
Q20	I like to share information about digital devices with my friends.	13.2	29.6	47.6	9.5	2.53	3	3	0.84	.82			
Q21	I learn a lot about digital media by discussing with my friends and relatives.	12.4	25.6	51.7	10.3	2.60	3	3	0.83	.81			
Q18	I like to exchange solutions to problems with digital devices with others on the Internet.	12.4	32.6	45.9	9.2	2.52	3	3	0.83	.80			
Q17	To learn something new about digital devices, I like to talk about them with my friends.	10.7	24.5	55.1	9.7	2.64	3	3	0.80	.76			
Q19	I like to meet friends and play computer and video games with them.	20.5	28.6	38	12.8	2.43	3	3	0.96	.70			
Q06	I like using digital devices.	3.8	9.5	63.5	23.2	3.06	3	3	0.69		.77		
Q03	It is very useful to have social networks on the Internet.	4.4	14	60.8	20.8	2.98	3	3	0.72		.76		
Q02	The Internet is a great resource for obtaining information I am interested in (e.g., news, sports, dictionary).	3.7	10.5	61.8	24	3.06	3	3	0.70		.72		
Q01	I forget about time when I'm using digital devices.	8.7	29.1	47.6	14.6	2.68	3	3	0.83		.68		
Q04	I am really excited discovering new digital devices or applications.	6.5	24.8	52.3	16.3	2.78	3	3	0.79		.67		
Q05	I really feel bad if no Internet connection is possible.	14.5	42.6	33.3	9.5	2.38	2	2	0.85		.62		
Q10	When I come across problems with digital devices, I think I can solve them.	3	17.5	59.4	20.2	2.97	3	3	0.70			.78	
Q11	If my friends and relatives have a problem with digital devices, I can help them.	5.3	19.2	55.6	19.9	2.90	3	3	0.77			.77	
Q08	If my friends and relatives want to buy new digital devices or applications, I can give them advice.	6	22.9	52	19.1	2.84	3	3	0.79			.74	
Q07	I feel comfortable using digital devices that I am less familiar with.	5.1	21.4	53.5	19.9	2.88	3	3	0.78			.72	
Q09	I feel comfortable using my digital devices at home.	2.6	8.1	57.4	32	3.19	3	3	0.68			.72	
Q15	If I have a problem with digital devices, I start to solve it on my own.	6.8	27.3	51.4	14.5	2.74	3	3	0.79				.74
Q14	I use digital devices as I want to use them.	4	17.1	61.1	17.7	2.93	3	3	0.71				.72
Q12	If I need new software, I install it by myself.	11.9	31.7	41.3	15.2	2.60	3	3	0.88				.71
Q16	If I need a new application, I choose it by myself.	3.9	11.4	62.9	21.8	3.03	3	3	0.70				.67
Q13	I read information about digital devices to be independent.	10.9	38.7	39.9	10.5	2.50	3	3	0.82				.66
	Explained variance (%)									17.6	16.7	16.6	14.5
	Eigenvalue									3.69	3.50	3.49	3.04
	Cronbach's alpha									.88	.84	.89	.86

Note: F1 – strongly disagree, F2 – disagree, F3 – agree, F4 – strongly agree.

Hypothesized Model

The hypothesized research model was based on correlations between opinions about the use of ICT and the internet and how this affects reading information literacy.

Four latent variables based on opinions about the use of ICT and the internet were hypothesized to correlate opinions about the use of ICT and the internet and how this affects reading and information literacy.

Five research hypotheses were assembled. All hypotheses follow the same principle: that each latent construct has a significant influence on the use of ICT and the Internet. Principal Component Analysis (PCA) and calculation of Cronbach's alpha were chosen to assess the internal consistency and one-dimensionality of the scales.

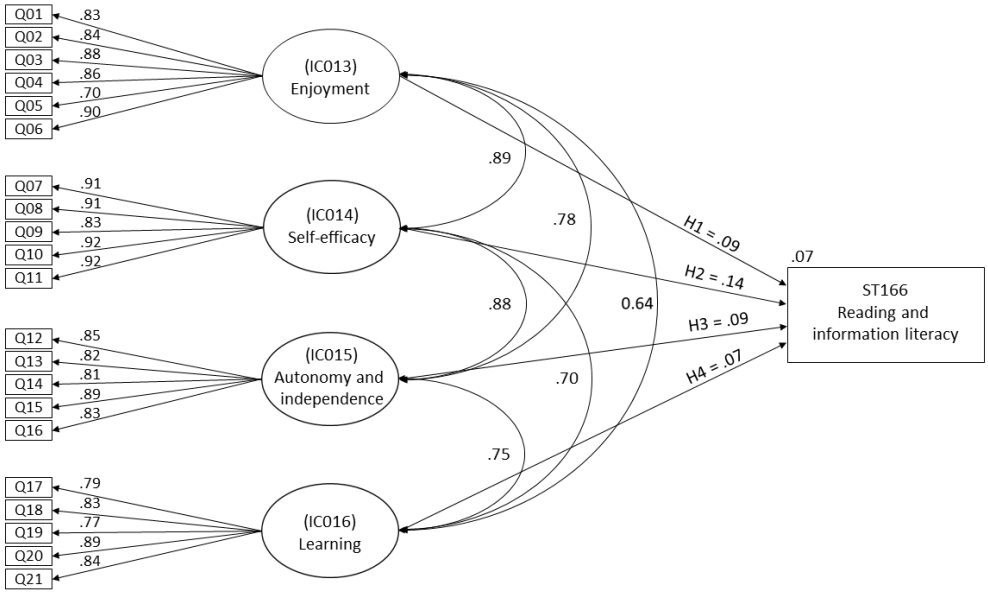

Figure 1. Hypothesized Model.

Correlation calculations were performed to determine the relationship between the variables (Figure 1). It was established that there was a very strong correlation between the constructs. The effects of the constructs on reading and information literacy are very low. To construct a more parsimonious model, the initial model was improved using modification indices and deletion of the redundant items.

Final Model

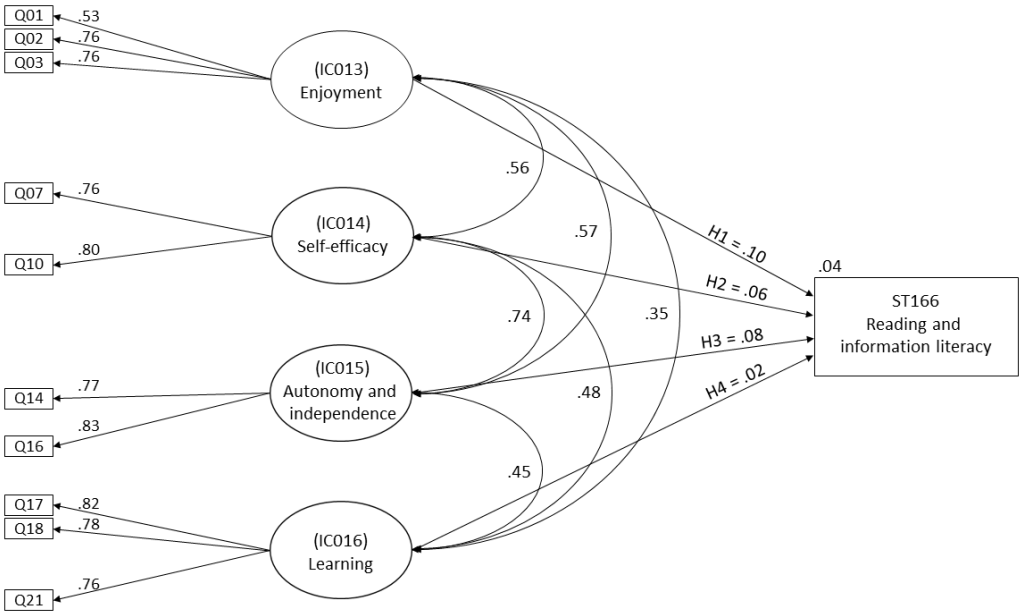

Figure 2. Final Model.

The constructs in the final model are weaker than in the hypothetical model. A strong correlation exists between the constructs Self-efficacy in using ICT (IC014) and Autonomy and independence (IC015) in the use of ICT. Among the other constructs, the correlations are moderate. The effects of the constructs in the final model on reading and information literacy are not significant. We find that enjoyment, self-efficacy, independence in using ICT, and learning about using ICT have no statistically significant effect on RL and IL.

The final model had satisfactory fit indices, slightly better than the Hypothesized model (Table 3).

Table 3. Fit Indices of the Hypothesized Model and Final Model.

Model	NPAR	χ2	df	χ2 /df	IFI	CFI	SRMR	RMSEA
Threshold values				< 3	> .90	> .90	<.08	< .07
Hypothesized model	52	4376.67	201	21.77	.87	.87	.223	.089
Final model	30	133.29	36	3.70	.99	.99	.017	.032

Hypothesis Testing

In the introduction, we set four hypotheses that we sought to test with research.

Table 4. Hypothesis Testing for the Hypothetical and Final Model.

Standardized Regression Weights			
Hypothesis	**Hypothesized model**	**Final model ***	**Results**
H_1	.09	.10	No statistically significant effect.
H_2	.14	.06	No statistically significant effect.
H_3	.09	.08	No statistically significant effect.
H_4	-.07	-.02	No statistically significant effect.

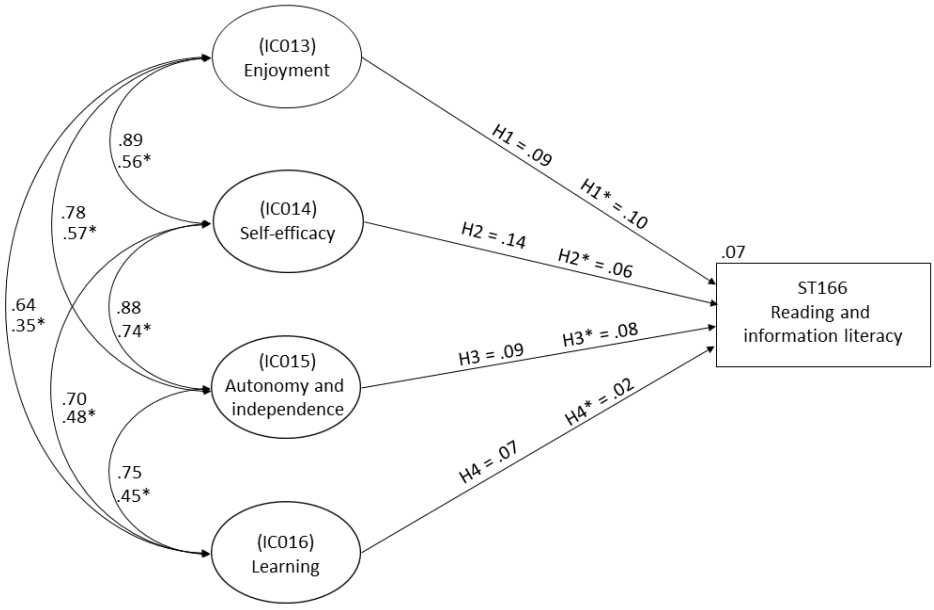

*Figure 3. Hypothesis Testing Model (*Result for Final Model).*

With Hypothesis 1, we tested whether there was a statistically significant association between Enjoyment (IC013) of using ICT and RL, and IL. We checked the correlation between the variable and found that there was no statistically significant correlation. There was also no statistically significant difference in the testing of Hypothesis 2, where we chose to look at the relationship between Self-efficacy (IC014) in using ICT and RL, and IL. In Hypothesis 3, we were interested in the correlation between Autonomy and independence (IC015) in the use of ICT and RL, and IL. We found that there was no statistically significant correlation. With Hypothesis 4, we wanted to test the correlation between Learning (IC016) to use ICT and RL, and IL. We were also unable to find a statistically significant relationship among these hypotheses (Table 4). Our hypotheses that enjoyment, self-efficacy, autonomy, and independence in using ICT and learning to use ICT would influence reading literacy, information literacy, and ICT problem solving can be refuted because there was no statistically significant relationship.

Discussion

Based on the results of the secondary analysis of the data from PISA 2018, we can answer the research questions about the influence on reading and information literacy.

To test reading and information literacy, we selected a task from the PISA 2018 questionnaire that tests students' confidence in receiving unsolicited text messages that seek to motivate a person to enter sweepstakes and provide personal information in order to receive a prize - a smartphone. Most 15-year-olds agree that it is inappropriate to click on a link to such a message and to reply to messages containing personal information. According to Cheshire et al. (2010), in interaction with internet systems, individuals develop implicit or explicit attitudes about the risks and uncertainties in online environments, a finding which relates to our results; most students agree that it is appropriate to check the sender's email address. As expected, the students' responses split into two components. One group is curious, and the other is cautious. Both groups of 15-year-old students mostly agree (86.7%) or strongly agree that they enjoy using digital devices. Enjoyment is a robust determinant of behavioural intention to use information systems (Venkatesh & Davis, 2000). The enjoyment of using ICT is reflected in their responses. To the research question about whether the enjoyment of ICT use influences reading and information literacy, modelling showed that ICT use is strongly correlated with other constructs, especially self-efficacy (.56) and autonomy and independence (.57) in ICT use. The enjoyment of ICT has a very small impact (.10) on literacy and information literacy. Similarly, Guo et al. (2017) found that ICT consumption did not influence participants' behavioural and cognitive intentions.

Self-Efficacy in Using ICT

In general, self-efficacy is understood as students' belief in their competence to solve specific tasks (Bandura et al., 1999). Specifically, ICT self-efficacy refers to students' confidence in solving basic and advanced computer- and internet-related tasks (Fraillon et al., 2014). The results of our secondary analysis of the data show that as much as 89.4% of 15-year-olds agree / strongly agree that they feel comfortable using digital devices. Moreover, 79.6% agree / strongly agree that when they have problems with digital devices, they feel sufficiently competent to solve these themselves. When they cannot solve the problem with digital devices, 75.5% agree / strongly agree that friends and relatives can help to fix it. When friends and relatives want to buy new digital devices or apps, 71.1% of 15-year-olds can still confidently help them buy these devices. Additionally, 73.4% agree / strongly agree that they can even handle digital devices with which they are less familiar. All these results show a higher level of student self-efficacy in using ICT, but does self-efficacy in using ICT influence reading and information literacy? The results and model show a very small, statistically non-significant impact (.06) on reading and information literacy. On the other hand, self-efficacy in using ICT is strongly correlated with other constructs, most strongly with autonomy and independence (.74). When it comes to the relationship between ICT use at school, research findings also report no positive relationship (Biagi & Loi, 2013; Claro et al., 2012; Gorjón & Osés, 2023; Hatlevik et al., 2015; Hori & Fujii, 2021).

Autonomy and Independence in the Use of ICT

Our results show that 15-year-old Slovenians feel autonomous and independent from others when using ICT. As much as 84.7% of them believe that when they need a new application, they can choose it themselves. Moreover, 78.8% of them use digital devices the way they want. When they have problems with digital devices, 65.9% of them solve these themselves. Additionally, 56.5% of 15-year-olds install the software they need by themselves, and 50.4% agree that they like to read about digital devices in order to feel even more independent from others when using ICT.

The results and model show that autonomy and independence are strongly correlated with other constructs, most strongly with self-efficacy (.74), but have a very small, statistically non-significant impact (.08) on reading and information literacy. These results align with the findings of Šorgo et al. (2017), where the authors claimed that the attributes of digital natives are poor predictors of information literacy.

Use of Different Types of ICT

The results of this research show that 64.8% of Slovenian 15-year-olds learn the most about digital devices from friends and relatives, with whom they like to talk about news in the field of digital technology. Moreover, 57.1% agree that they like to share ICT information with friends. They also like to share solutions to problems with digital devices with others on the Internet in various forums. The results and model show that learning to use different types of ICT is strongly correlated with other constructs, most strongly with self-efficacy (.48), but has a very small, statistically non-significant impact (.02) on reading and information literacy.

The research findings provide a good basis for thinking about the effectiveness of promoting digital literacy in the classroom. The results of this and other international research (Dolenc & Šorgo, 2020; Dolničar et al., 2020) show that in Slovenia we still lag behind in the level of digital literacy among pupils and students.

Conclusion

The main aim of the study was to establish whether the 4 components of enjoyment, self-efficacy, independence in using ICT, and learning about using ICT that the 15-year-olds believe do genuinely influence reading and information literacy. The results show that the 15-year-old students feel happy, self-efficacious, and independent when using ICT. Students at least agree with the statement that they feel really bad when no internet connection is possible, and at the same time most agree that they feel comfortable using their digital devices at home. Students' experiences of using ICT are divided into 4 components, with very strong correlations between these components. However, there is no statistically significant relationship between the single component and RL and IL. The results show that the elements in which 15-year-olds feel self-efficacious and independent do not influence reading and information literacy, so we reject our hypothesis and agree with the conclusion of the studies (e.g., Dolenc & Šorgo, 2020; Šorgo et al., 2017) that digital natives are not necessarily information literate. We add that positive opinions about and experience with ICT do not necessarily lead to improved information and literacy skills.

Digital skills are like the alphabet of modern society. Just as we used to learn to read and write letters to read books and write news, today we need to learn these other skills. Acquiring digital skills, such as how to use smartphones, how to use the internet safely, or how to program, is key to living a self-determined life in a digital society. In the digital world, e.g., reading news on digital media, e-learning, e-communication, e-research, e-creating art, e-developing business in all industries, and designing technological innovations, we need digital skills. Like everything in the world, digital media can also go wrong, as in the case of abused personal data or identification. This is an additional reason to be digitally liberated because digital skills are certainly the most effective defence against unwanted complications. Students should be explicitly taught information literacy skills and behaviours (Dolničar et al., 2020; Šorgo et al., 2017), because leaving them to spend long hours on the Internet does not make them information literate (Dolenc & Šorgo, 2020).

Many children have at least partial computer and digital literacy skills even before they are "literate" in the traditional sense of the word". The question arises whether the daily use of digital technology has contributed to an improvement not only in computer and digital literacy, but also in general and information literacy. In this study, ICT use is strongly correlated particularly self-efficacy and autonomy and independence in ICT use. Enjoyment of ICT has a very low impact on reading and information literacy. Students' experiences of using ICT can be divided into 4 components, and there are very strong correlations between these components. However, there is no statistically significant correlation between each component and reading and information literacy.

Recommendations

The research findings provide a good basis for thinking about the effectiveness of promoting digital literacy in the classroom, because the acquisition of digital competences, such as the handling of smartphones, and the safe use of the internet or programming, is the key to a self-determined life in a digital society. The study shows that schools operate as self-sustaining organizations where there are weak links between the intended learning outcomes and the experiences at home. Schools cannot be expected to influence and control leisure activities in the digital worlds' students' access, but they should find ways to cultivate this work to help students achieve literacy skills that can lead to better daily and long-term choices and lifelong learning skills.

As the dataset comes from the official website of PISA (OECD, 2020), researchers cannot add new variables of interest to help interpret the results. However, the existing datasets are rich sources of information and allow for the construction of an almost unlimited number of models that can be explored. The only upper limit may be the creativity of the thinkers. In addition, we recommend follow-up analyses that consider results from different countries and trends between years. In addition, there could also be differences due to the socio-demographic and cultural status of the students that need to be explored.

Limitations

We can only identify a few limitations that are most commonly reported in the studies. As the data collection was carried out by experts from the OECD, we can assume a high reliability of the sample. However, as the study is based on PISA 2018 participants from Slovenia, we can say that the results reflect the student population from that year, and we can only speculate that the conclusions will be identical to the data collected in previous and future years. The reason for this may be the rapid changes in technology (e.g., the release of public access chatbots) and changes in technology use due to the restrictions in place to contain a pandemic. On the other hand, it will be interesting to compare the results of the Slovenian sample with international datasets.

Ethics Statements

All the participants of this investigation were informed of the objectives of the same. All participants have signed a confidentiality agreement and data transfer document. Likewise, all data have been anonymised, guaranteeing the privacy of the participants.

Conflict of Interest

The authors declare that there is no potential conflict of interest in this research.

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Authorship Contribution Statement

Šorgo, Špernjak, and Lang conceived this study and contributed to the design of this study and the final version of research. Lang and Špernjak oversaw the data preparation for the statistical analysis. Lang prepared a draft and Špernjak and Šorgo led and supervised the writing of the paper. Šorgo, Špernjak, and Lang contributed to the study design, data analyses, and final paper editing. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication. All authors have read and agreed to the published version of the manuscript.

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