The Digital Literacy of First Grade Primary School Students

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Abstract

The research presented in this paper aims to explore the digital literacy of first grade primary school students. The research sample consists of 104 students from northwestern Croatia. They were invited to fill out the self-assessment questionnaire consisting of eleven items including statements about their gender, place of residence (rural or urban), and simple yes/no statements concerning the knowledge of using the computer hardware and software. The research results show a statistically significant difference in respondents' asking for parents' or guardians' permission to use a computer by gender ($\chi 2=4.27$, df=1, $p=0.039$). There are more female respondents (81.3%) than male respondents (60.7%) who ask their parents or guardians for permission to use the computer. Most of the respondents (88.5%) know how to turn on/off computers, 87.5% of respondents know how to write a text using a computer and 94.2% of respondents know how to make a drawing using a computer. There is 94.2% of respondents who know how to use the Internet and there is a statistically significant difference by the place of residence ($\chi 2=4.63$, df=1, $p=0.031$). There are more urban respondents (100.0%) than rural respondents (88.2%) who know how to search the Internet. Most of the respondents (91.3%) understand and apply the rules of conduct on the Internet. Most respondents (87.5%) self-assess themselves as having acquired the learning outcomes specified in the informatics curriculum.

Key words:

digital competence; informatics curriculum; primary education

Introduction

Children begin to use digital technologies at a very early age: two-year-old toddlers regularly watch films and videos and listen to music on tablet computers (Ólafsson et al, 2014). Children's Internet use is generally over 85% for the age group beginning at six, rising to around 95% for older children (14 and older). One study finds that even 40% of 3 to 6-year-olds use the Internet at

least once a week, predominantly with a tablet device (Ólafsson et al, 2014).

Today's children use digital devices, such as tablets, smartphones and computers, from an early age. Radesky et al. (2020) report research results on the sample of 346 parents and guardians of children aged 3 to 5 years where children were using tablets and smartphones to access applications such as YouTube, YouTube Kids, Internet browser, Quick Search Box or Siri, and streaming video services. 121 children (35%) had their own devices, and their average daily usage was 115 minutes (SD 115.1; range 0.20–632.5).

It is important to prepare children and young people to use information and communication technology safely and responsibly. In the era when Artificial Intelligence (AI) is having a growing influence on people's everyday lives, it is important to acquire knowledge and skills to learn and work with the newest digital technologies and to be prepared for the future. This set of knowledge and skills is known as digital literacy.

"Digital literacy is the set of knowledge, skills, attitudes and values that enable children to confidently and autonomously play, learn, socialize, prepare for work and participate in civic action in digital environments. Children should be able to use and understand technology, to search for and manage information, communicate, collaborate, create and share content, build knowledge and solve problems safely, critically and ethically, in a way that is appropriate for their age, local language and local culture" (Nascimbeni & Vosloo (UNICEF), (2019), p. 32).

In the European Union, digital literacy is defined through digital competence. "Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking" (European Union, 2019, p. 10).

Digital competence is one of the key competences for lifelong learning (European Union, 2019, p. 5): Literacy competence, Multilingual competence, Mathematical competence and competence in science, technology and engineering, Digital competence, Personal, social and learning to learn competence, Citizenship competence, Entrepreneurship competence, Cultural awareness and expression competence.

More than one in five young people fail to reach a basic level of digital skills across the European Union (European Commission, 2020b). Providing schooling in computing equips young people with a solid comprehension of the digital realm. Initiating students into computing early on and employing inventive and engaging teaching methods across both formal and informal settings, aids in building problem-solving, creativity, and teamwork skills. Furthermore, it nurtures enthusiasm for STEM fields and potential careers, simultaneously addressing gender stereotypes. Endeavours to enhance computing education's quality and inclusivity can significantly influence the enrolment of female students in IT-related higher education programs and subsequently their participation in digital professions across various economic sectors (European Commission, 2020a).

The Digital Education Action Plan (2021-2027) has two strategic priorities (European Commission, 2020b):

- to foster a high-performing digital education ecosystem, and
- to enhance digital skills and competences for the digital age.

The latter includes the following activities:

- support the provision of basic digital skills and competences from an early age:

- digital literacy, including management of information overload and recognising disinformation
- computing (informatics or computer science) education
- good knowledge and understanding of data-intensive technologies, such as AI
- boost advanced digital skills: enhancing the number of digital specialists and girls and women in digital studies and careers.

One of the Action Plan activities is to encourage female participation in STEM. Female students generally perform better than male students in the Programme for International Student Assessment (PISA) and International Computer and Information Literacy Study (ICILS) international skills tests. However, only one in three STEM graduates is a woman (European Commission, 2020a).

Digital literacy and communication include knowing the possibilities of hardware and software solutions and developing cooperation and communication skills in an online environment. Knowledge of the possibilities of current technology and computer programs is a prerequisite for their proper selection and effective and innovative application in various fields. It is necessary to develop digital literacy from an early age and throughout schooling so that students are prepared for life and work in a digital society (Ministry of Science and Education, 2018).

According to the same source, after the first year of studying the subject Informatics in the field of Digital Literacy and Communication, the students should acquire the following learning outcomes:

- C.1.1 with the support of the teacher student uses the proposed programs and digital educational content and
- C.1.2 with the support of the teacher student creates simple digital content with very simple actions.

Digital literacy is essential to learn, work and succeed in today's digital society and it is important to prepare children and young people to use information and communication technology safely and responsibly from an early age.

Methodology

Aims

The research aims to explore the digital literacy of first grade primary school students and possible differences by gender and by place of residence (urban or rural).

Hypotheses

H1: There is no statistically significant difference in the self-assessed digital literacy of first grade primary school students by gender.

It is expected that the respondents will self-assess their digital literacy equally regardless of their gender (female and male). Female students generally perform better than male students in the Programme for International Student Assessment (PISA) and International Computer and Information Literacy Study (ICILS) international skills tests. However, only one in three STEM graduates is a woman (European Commission, 2020). The research results can show whether there are differences in the digital literacy of female and male students already at this early age.

H2: There is no statistically significant difference in the self-assessed digital literacy of first grade primary school students by their place of residence.

It is expected that the respondents will self-assess their digital literacy equally regardless of their place of residence (rural and urban). There is a possibility that the availability of optional subjects of informatics in urban and rural schools is not the same and that Internet connectivity in schools and at home is not the same in rural and urban areas. These two factors, the availability of optional subjects of informatics and Internet connectivity, can influence the students' digital literacy.

H3: More than 80% of students use the Internet.

From an early age, children are exposed to the Internet through information and communication technology such as smartphones, tablets, laptops and desktop computers and know how to use it to search the Internet. It is expected that more than 80% of students use the Internet.

Sample

The research sample consists of 104 first grade primary school students from four primary schools and two primary district schools (district school in Croatian: područna škola) from northwestern Croatia in the spring of 2023. There are 48 female (46.2%) and 56 male (53.8%) students in the sample. There are 53 students (51.0%) from urban places of residence and 51 students (49.0%) from rural places of residence. There are 98 students (94.2%) who attend the optional subject of informatics in the first grade, and 6 students do not attend (5.8%) (Table 1).

Table 1
Respondents' demographic data

Item		**Number of respondents**	**Percent**
Gender			
	Female	48	46.2
	Male	56	53.8
	Total	104	100.0
Place of residence			
	Rural	51	49.0
	Urban	53	51.0
	Total	104	100.0
Attending the optional subject of Informatics			
	Yes	98	94.2
	No	6	5.8
	Total	104	100.0

Instruments

Since the respondents were aged six and seven, the data gathering method used was a simple questionnaire containing eleven items written on paper (Table 2).

Table 2

Questionnaire items with answer options

No.	Item	Item type	Answer options
1	Respondent’s gender	Multiple choice	Female / Male
2	Respondent’s place of residence	Multiple choice	Rural / Urban
3	I attend the optional subject of informatics in the first grade	Statement - multiple choice	Yes / No
4	I have a computer at home (yes/no)	Statement - multiple choice	Yes / No
5	I always ask parents or guardians for permission to use a computer (yes/no)	Statement - multiple choice	Yes / No
6	I know how to turn on/off the computer (yes/no)	Statement - multiple choice	Yes / No
7	I know the names of the computer parts (yes/no)	Statement - multiple choice	Yes / No
8	I know how to write a text using a computer (yes/no)	Statement - multiple choice	Yes / No
9	I know how to make a drawing using a computer (yes/no)	Statement - multiple choice	Yes / No
10	I know how to search the Internet (Google, YouTube) (yes/no)	Statement - multiple choice	Yes / No
11	I understand and apply rules of conduct on the Internet (yes/no)	Statement - multiple choice	Yes / No

The first two items dealt with students’ gender and the place of residence. The other nine items were statements concerning attending the optional subject of informatics, having the computer at home, asking parents or guardians for permission to use computers, knowledge of recognizing the computer parts, knowledge of the use of computer hardware and software to perform simple tasks such as turning on or off computers, writing and editing texts, make drawings, searching the Internet, and understanding and applying rules of conduct on the Internet. The students could answer if they agree or disagree with the statement with simple dichotomous options: yes or no.

The statements were chosen according to the curriculum of the optional subject Informatics and its learning outcomes in the first grade of primary school in Croatia (Ministry of Science and Education, 2018). The items of the questionnaire were adapted to the target group.

Procedure

The survey was implemented using the guidelines of the Ethical Code of Research with Children (National Ethics Committee for Research with Children, 2020).

The survey took place in two counties of northwestern Croatia from March to May 2023. The respondents were students of four primary schools, of which two are in urban and the other two in rural areas. The first author of this paper provided assistance and explanations to the respondents when they were filling out the questionnaire.

The chi-squared test is used to explore the statistically significant differences between students according to their gender and their place of residence (urban and rural).

The statistical software GNU PSPP 1.4.1 was used in the data processing.

Results

Table 3 shows the statements and the number of respondents' responses (whether they agree with a specific statement or not). There is a total number of responses and there are responses by gender. In the next columns are the results of chi-squared tests (χ^2, df, *p*).

Table 3.

Number of students' responses by item and gender

		Total		Male		Female				
No.	**Item**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**χ^2**	**df**	***p***
1	I attend the optional subject of informatics in the first grade	98	6	54	2	44	4	0.38	1	0.538
2	I have a computer at home	91	13	51	5	40	8	0.80	1	0.372
3	I always ask parents or guardians for permission to use a computer	73	31	34	22	39	9	4.27	1	0.039

		Total		Male		Female				
No.	**Item**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**χ^2**	**df**	*p*
4	I know how to turn on/off the compute r	92	12	50	6	42	6	0.00	1	1.000
5	I know the names of the compute r parts	93	11	46	10	47	1	5.23	1	0.022
6	I know how to write a text using a compute r	91	13	48	8	43	5	0.09	1	0.766
7	I know how to make a drawing using a compute r	98	6	51	5	47	1	1.15	1	0.284
8	I know how to search the Internet (Google, YouTube)	98	6	52	4	46	2	0.05	1	0.820
9	I understa nd and apply rules of conduct on the Internet	95	9	51	5	44	4	0.00	1	1.000

Most of the respondents (98 out of 104, 94.2%) attend the optional subject of informatics in the first grade and there is no statistically significant difference by gender (χ^2= 0.38, df=1, p=0.538).

Most of the respondents (91 out of 104, 87.5%) have a computer at home and there is no statistically significant difference by gender (χ^2= 0.80, df=1, p=0.372).

Most of the respondents (73 out of 104, 70.2%) always ask parents or guardians for permission to use a computer and there is a statistically significant difference by gender (χ^2= 4.27, df=1, p=0.039). There are more female respondents (81.3%) than male respondents (60.7%) who ask their parents or guardians for permission to use the computer.

Most of the respondents (92 out of 104, 88.5%) know how to turn on and off computers and there is no statistically significant difference by gender (χ^2= 0.00, df=1, p=1.000).

Most of the respondents (93 out of 104, 89.4%) know the names of the computer parts and there is a statistically significant difference by gender (χ^2= 5.23, df=1, p=0.022). There are more female respondents (97.9%) than male respondents (81.1%) who know the names of computer parts.

Most of the respondents (91 out of 104, 87,5%) know how to write a text using a computer and there is no statistically significant difference by gender (χ^2= 0.09, df=1, p=0.766).

Most of the respondents (98 out of 104, 94.2%) know how to make a drawing using a computer and there is no statistically significant difference by gender (χ^2= 1.15, df=1, p=0.284).

Most of the respondents (98 out of 104, 94.2%) know how to search the Internet (Google, YouTube) and there is no statistically significant difference by gender (χ^2= 0.05, df=1, p=0.820).

Most of the respondents (95 out of 104, 91.3%) understand and apply the rules of conduct on the Internet and there is no statistically significant difference by gender (χ^2= 0.00, df=1, p=1.000).

Table 4 shows the statements and the number of respondents' responses (if they agree with a specific statement or not) by the place of residence. In the next columns are the results of chi-squared tests (χ^2, df, *p*).

Table 4.

Number of students' responses by item and the place of residence

		Rural		**Urban**				
No.	**Item**	**Yes**	**No**	**Yes**	**No**	**χ^2**	**df**	*p*
1	I attend the optional subject of informatics in the first grade	50	1	48	5	1.47	1	0.225
2	I have a computer at home	45	6	46	7	0.00	1	1.000

		Rural		Urban				
No.	**Item**	**Yes**	**No**	**Yes**	**No**	**χ^2**	**df**	***p***
3	I always ask parents or guardians for permission to use a computer	36	15	37	16	0.00	1	1.000
4	I know how to turn on/off the computer	44	7	48	5	0.14	1	0.706
5	I know the names of the computer parts	45	6	48	5	0.00	1	0.946
6	I know how to write a text using a computer	42	9	49	4	1.59	1	0.208
7	I know how to make a drawing using a computer	49	2	49	4	0.14	1	0.710
8	I know how to search the Internet (Google, YouTube)	45	6	53	0	4.63	1	0.031
9	I understand and apply rules of conduct on the Internet	44	7	51	2	2.12	1	0.145

When the place of residence is considered then there is no statistically significant difference between rural and urban respondents except in the item “I know how to search the Internet” where there is a statistically significant difference (χ^2= 4.63, df=1, p=0.031). There are more urban respondents (100.0%) than rural respondents (88.2%) who know how to search the Internet

(Google, YouTube).

The research results show that most of the respondents (over 87.5%) self-assess themselves as having acquired the required learning outcomes specified in the informatics curriculum for the first grade in the field of Digital Literacy and Communication: 88.5% know how to turn on/off computers, 89.4% know the names of the computer parts, 87.5% know how to write a text using a computer, 94.2% know how to make a drawing using a computer, 94.2% know how to use the Internet, and 91.3% understand and apply the rules of conduct on the Internet. 87.5% have computers at home and 92.3% of the respondents attended the optional subject of informatics.

Discussion

Confirmation of the hypotheses

H1 states that there is no statistically significant difference in the self-assessed digital literacy of first grade primary school students by gender (female and male).

There is no statistically significant difference in the following items that contribute to the digital literacy of first grade primary school students:

- I know how to turn on/off the computer
- I know how to write a text using a computer
- I know how to make a drawing using a computer
- I know how to search the Internet (Google, YouTube)
- I understand and apply rules of conduct on the Internet.

A statistically significant difference is observed only in the item “I know the names of the computer parts” where there are more female respondents (97.9%) than male respondents (81.1%) who know the names of computer parts (χ^2= 5.23, df=1, p=0.022).

The hypothesis H1 is confirmed.

H2 states that there is no significant difference in the self-assessed digital literacy of first grade primary school students by their place of residence (rural and urban areas).

There is no statistically significant difference in the following items that contribute to the digital literacy of primary school first-grade students:

- I know how to turn on/off the computer
- I know the names of the computer parts
- I know how to write a text using a computer
- I know how to make a drawing using a computer
- I understand and apply rules of conduct on the Internet.

A statistically significant difference is observed only in the item “I know how to search the Internet (Google, YouTube)” where there are more urban respondents (100.0%) than rural respondents (88.2%) who know how to search the Internet (χ^2= 4.63, df=1, p=0.031).

The hypothesis H2 is confirmed.

H3 states that more than 80% of students use the Internet.

98 out of 104 (94.2%) respondents self-assess themselves as they know how to search the Internet. The hypothesis H3 is confirmed.

The research in this paper uses respondents’ self-assessed data related to their digital competence. The respondents’ age is six or seven so there is a possibility that they do not

understand the questionnaire statements and/or cannot self-assess their knowledge. However, they could get guidance and help from a researcher who was present when they filled out the questionnaire. The questionnaire items were very simple and dichotomous.

It is difficult to get valid overviews of skills through questionnaires. The main reason for this is that respondents tend to overestimate themselves, especially when it comes to technical skills (Ala-Mutka, 2011).

García-Vandewalle et al. (2021) warn that evaluating subjectivity may have limitations. The respondents' subjectivity regarding their level of knowledge is one of the main issues with self-assessment. However, self-assessment is still a valid tool for ascertaining how students perceive their learning and enables the detection of their strengths and weaknesses.

Godaert et al. (2022) analysed 14 studies concerning the assessment of students' digital competences in primary school. The studies used various scoring systems: three were dichotomous (1=correct; 0=incorrect), four were 5-point Likert scale, one was a 7-point Likert scale, one scoring rubric (0-2 point, 0-5 points), four combined, and one not mentioned. At least five of them were using self-reported data collection. The age of the target population in the studies was mostly in the range of 9 to 13. Only one study, Jun et al (2014), included the first grade of primary school respondents of age 6.

Merritt et al. (2005) report that there were differences in respondents' self-reported and actual digital literacy. They asked 55 students to self-report their computer literacy and later they were tested in their digital literacy. Research results show that there is a statistically significant difference between self-reported (N=55, M=2.164, SD=0.788) and actual tested (N=55, M=1.873, SD=0.610) levels of digital literacy.

Porat et al. (2018) report on digital literacy research results on 280 junior-high-school students where they compared their perceived digital literacy competencies and their actual performance in relevant digital tasks. Participants expressed high confidence in their digital literacy and overestimated their actual tested competence.

However, Tzafilkou et al (2022) developed and validated students' digital competence scale based on self-reported data.

Asil et al (2014) used the 5-point Likert scale to collect data on measuring computer attitudes of young students in three separate factors: perceived ease of use, affect towards computers and perceived usefulness.

Hernández-Marín (2024) concludes that attitude scales have been consolidated as valuable elements in educational evaluation, allowing participants' perceptions of their learning to be satisfactorily captured. Self-assessment turns out to be an exceptionally effective method for measuring attitudes. However, to gain more perspective, complete and accurate learning, it is necessary to complement the attitude scales with other methods.

In their three-year longitudinal study, Lazonder et al (2020) followed the digital literacy progress of 151 fifth and sixth graders in their skills to collect, create, transform, and safely use digital information. They report that the children made the most progress in their ability to collect information. However, their capacity for generating information showed the smallest enhancement. "Development of most skills was moderately related, and it was independent of gender, grade level, migration background, and improvements in reading comprehension and maths. Children's socioeconomic status was weakly associated with the ability to collect and safely use information, but not with the other two digital literacy skills" (Lazonder et al, 2020, p. 1).

There are not many research results in the literature which deal with the digital literacy of first grade primary school students. However, the research results of first grade primary school students' self-evaluation agree with the results of Lazonder et al (2020) in the part which states that digital literacy skills are independent of gender.

Conclusion

Most of the respondents (over 87.5%) self-assess themselves as having acquired the required learning outcomes specified in the informatics curriculum for the first grade in the field of Digital Literacy and Communication.

There are no statistically significant differences in digital literacy of first grade primary school students by their gender or by their place of residence. The statistically significant differences were observed only in two items that contribute to digital literacy: more female respondents know the names of computer parts and more respondents coming from urban places of residence know how to search the Internet.

From an early age, students are using the Internet and there is a need to educate them to use it safely and responsibly. It is important to include and continue to teach the subject of informatics (computer science) in the initial grades of elementary school not only as an optional but as a compulsory subject.

It is important to continue to develop the digital literacy of students at an early age so that they can use information and communication technology safely and responsibly and that they are ready for new technologies and new occupations. The goal is also to achieve the equal representation of female and male students in university STEM study programs. The study presented in this paper shows that, at this early age, there are still no statistically significant differences in respondents' self-assessed digital literacy by gender. However, there is a need to encourage female students in STEM subjects, such as informatics/computer science, to achieve the goal of equal representation of female and male graduates in the STEM fields.

Limitations of the research

The collected data is respondents' knowledge self-assessment. The authors are aware that the respondents could overestimate their assessment, especially at their current age of six or seven. Actual testing of students' knowledge would probably get more precise data.

The sample size is 104 and the representativeness of the results is limited.

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Competing interests

The authors declare that they have no competing interests.

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The results of the research presented in this paper have not been published before.

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Odgoj danas za sutra:
Premošćivanje jaza između učionice i realnosti
3. međunarodna znanstvena i umjetnička konferencija Učiteljskoga fakulteta Sveučilišta u Zagrebu Suvremene teme u odgoju i obrazovanju – STOO4 u suradnji s Hrvatskom akademijom znanosti i umjetnosti

Digitalna pismenost učenica i učenika prvih razreda osnovne škole

Sažetak

Cilj istraživanja prikazanog u ovom radu je istražiti digitalnu pismenost učenica i učenika prvih razreda osnovne škole. Uzorak istraživanja čine 104 učenica i učenika iz sjeverozapadne Hrvatsk. Oni su pozvani da ispune anketni upitnik za samoprocjenu svojeg znanja koji se sastoji od jedanaest čestica koje uključuju izjave o njihovom spolu, mjestu stanovanja (ruralno ili urbano) te jednostavne izjave da/ne o poznavanju korištenja računalnog hardvera i softvera. Rezultati istraživanja pokazuju statistički značajnu razliku u traženju dopuštenja roditelja ili skrbnika za korištenje računala prema spolu ($\chi2=4,27$, $df=1$, $p=0,039$). Više je ispitanica (81,3%) nego ispitanika (60,7%) koji od roditelja ili skrbnika traže dopuštenje za korištenje računala. Većina ispitanica i ispitanika (88,5%) zna uključiti/isključiti računala, 87,5% ispitanica i ispitanika zna napisati tekst pomoću računala i 94,2% ispitanica i ispitanika zna napraviti crtež pomoću računala. Internet zna koristiti 94,2% ispitanica i ispitanika te postoji statistički značajna razlika prema mjestu stanovanja ($\chi2=4,63$, $df=1$, $p=0,031$). Više je ispitanica i ispitanika iz gradova (100,0%) nego ispitanica i ispitanika iz sela (88,2%) koji znaju pretraživati internet. Većina ispitanica i ispitanika (91,3%) razumije i primjenjuje pravila ponašanja na internetu. Većina ispitanica i ispitanika (87,5%) procjenjuje se da su stekli ishode učenja navedene u kurikulumu nastavnog predmeta informatike.

Ključne riječi:

digitalna kompetencija; nastavni plan i program informatike; osnovno obrazovanje

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