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Kids Surfing the Web: A Comparative Study in Portugal

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Abstract: The conditions for safe Internet access and the development of skills enabling full participation in online environments are recognized in the Council of Europe's strategy for child rights, from 2022. The guarantee of this right has implications for experiences inside and outside the school context. Therefore, this article aims to compare the perceptions of students from different educational levels, who participated in a digital storytelling workshop, regarding online safety, searching habits, and digital competences. Data were collected through a questionnaire survey completed by 84 Portuguese students from elementary and secondary schools. A non-parametric multivariate analysis of variance was used to identify differences as children advance across educational stages. The results revealed that secondary students tend to spend more time online, and demonstrated more advanced search skills. Interestingly, the youngest children exhibited higher competences in creating games and practicing safety measures regarding online postings. These findings emphasize the importance of schools, in a joint action with the educational community, including parents, teachers and students, developing a coordinated and vertically integrated approach to digital education that considers the children's current knowledge, attitudes, and skills as a starting point for pedagogical intervention.

Keywords: Internet use; digital competences; online safety; basic education

1. Introduction

Children's use of the Internet through various devices, especially mobile devices, is increasingly widespread. On the one hand, this situation accentuates the opportunities for developing digital skills, but on the other hand, it can expose them to risks. In this sense, the Council of Europe's strategy for the rights of the child (2022–2027) [1] emphasizes the importance of aligning national legislation with international standards, particularly the United Nations Convention on the Rights of the Child [2]. This legislation includes guaranteeing the meaningful participation of children in decisions that affect their lives and protecting them from all forms of violence, such as physical, sexual, and emotional abuse, neglect, exploitation, and bullying. The strategy also highlights the importance of ensuring the right to education and providing education that is inclusive, accessible, and tailored to children's needs. Furthermore, it recognizes the growing impact of the digital world on children's lives and fosters initiatives to enhance their digital literacy, protect them from online risks, and promote positive and responsible Internet use.

Aspects related to children's digital literacy and online safety in Europe have been consistently studied by Livingstone et al. [3–5]. By 2010, the main results of the study conducted by the network EU Kids Online [3], involving 25,142 children, 9 to 16 years old, and their parents in 25 countries, indicated that Internet use was already widespread. Children mainly accessed the Internet at home, using a desktop computer, followed by school, to accomplish tasks like school work, playing games, watching video clips, and using instant messaging. From a safety point of view, the results of the study revealed that possible risks do not necessarily represent harm from the point of view of the

children and young respondents and that "the more children in a country use the internet daily, the more those children have encountered one or more risks. However, more use also brings more opportunities and, no doubt, more benefits" (p. 7).

The most recent edition of the same study was held in 2020 [6], involving 25,101 children from 9- to 16-year-olds from 19 countries. The main findings point to massive changes in children's online experiences, with the more notable use of mobile technology to access YouTube and sharing of images and videos through Instagram and other apps. The children evidenced higher operational and social skills compared to creative skills and the ability to create content and programming. Regarding security issues, the study carried out in 2020 by Mýlek et al. [7] involving five European countries provided evidence that older adolescents tend to interact more with unknown people online than younger adolescents because of developmental needs, such as identity exploration, emotional adaptation or to foster new interpersonal relationships. This behaviour can be seen as a consequence of the growth process, particularly for adolescents between 11 and 15 years old, who have more offline social life [8]. However, it can also be understood as risky behaviour and a common cause for parental concern [7,9].

As a result of studies conducted previously, in 2012, the European Commission launched the first European strategy for a better Internet for kids (BIK). After a decade, in May 2022, the new strategy titled "A Digital Decade for children and youth: the new European strategy for a better Internet for kids (BIK+)" was introduced. This strategy is based on the principle that "Children and young people should be protected and empowered online" and aims to complement and support the practical implementation of existing measures to protect children online, develop their digital skills, and empower them to safely enjoy and shape their online lives [10].

Portugal is one of the countries where more than half of children share about what they do online with their parents (at least sometimes), despite 40% never doing that. According to the survey's national results [6], Portuguese adolescents from 12 to 14 talk to their parents about Internet issues more than younger and older kids. In addition, this survey showed that in most of the 17 countries involved, parents have difficulty discussing online activities with their children which increases as they age. From the point of view of the political and educational framework, this country is carrying out a digital transition plan in line with the European Union's Digital Education Action Plan. In this context, the government has invested in the distribution of equipment, offering a laptop for each child and young person of school age, as well as in teacher training and the production of digital educational resources [11].

The intention to leave no one behind and to generalize individual access can also increase exposure to risk, as seen above, which demonstrates the importance of studying this issue. Given the COVID-19 pandemic, more studies are necessary to comprehend the current landscape of children's Internet usage and digital competences to intervene promptly in potentially risky situations. In the same line of reasoning, the present article presents a study that compares the perceptions of students from different school levels who participated in a digital storytelling workshop regarding online behaviours, competences, and security habits. The workshop was carried out within the framework of the European project "MINDtheGaps", which aimed to enhance the digital and media literacy of young people through teaching programming and creating games and videos. The production process of the digital narratives involved collaborative work, starting from the initial conception of a unique story from a personal point of view. The next steps included oral sharing and improvement of the story in reading circles with peers, selecting images, audio recording for the narration, and editing the video for public sharing.

The article is divided into five sections. After this introduction, section 2 presents the theoretical framework, section 3 the material and methods, followed by the results in section 4. Section 5 includes the discussion. Section 6 proposes the conclusion, limitations, and future work.

2. Theoretical Framework

Recent literature on children's Internet use during the post-pandemic period (2022–2023) has identified several key topics. These include online security, risks, and potentials, as well as Internet

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use and the development of competences. Additionally, the effects of the pandemic crises on children have been explored.

Regarding the security and potential risks of Internet use, studies primarily focus on parental perceptions of safe Internet and computer usage [12] and cyberbullying awareness among young children [13]. These studies emphasize the importance of providing information and training to parents to help them protect their children from Internet risks. It was also noted by Tosun and Akçay [13] that cyberbullying incidents against children increased by 70% during the pandemic, with risks being exacerbated by increased screen time. Furthermore, Özkan and Esra examined the effects of increased screen usage on pre-schoolers' cognitive process skills during the COVID-19 period [14]. Another study analysed technology addiction, challenging behaviour in young children [15], and mobile game addiction among Chinese primary school students and potential interventions [16].

Concerning screen time, Özkan and Esra [14] concluded that spending excessive time in front of a screen can make it harder for children to focus on educational activities, resulting in shorter attention spans and reduced engagement. Similarly, authors like Dere and Feng [15,16] found that online games and mobile gaming are primary factors contributing to addiction among children. Dere's study [15] identified a correlation between online gaming and challenging behaviour, while Feng highlighted negative impacts such as children's academic performance, physical health, and mental health. Both authors emphasized the importance of parental supervision, limiting online time, and intervening to protect children's rights and well-being. They also pointed out the responsibility of schools and teachers in providing information and creating conditions that foster children's willpower to reject game addiction.

Some studies focused on the effects of using the Internet with children with special needs [17–19]. These studies recognized the challenges faced by children with disabilities due to the pandemic and the lack of information and support provided to their parents. On the other hand, Givigi et al. [19] highlighted factors contributing to the effectiveness of remote education during the pandemic, including the selection of tools, Internet connection quality, user proficiency, virtual platforms for mutual support, communication between schools and families, improvements in special education policies and programmes, and adequate support.

Moreover, other authors studied the use of YouTube videos by young children [20] and how this tool contributes to communication fluency development in English at the secondary education level [21]. Additionally, the research explored the online reading habits of primary education students [22] and the types of digital books accessible to children [23], as well as problem-solving and digital transformation in kindergartens [24]. One article also discussed the socio-economic and political effects of the pandemic [25], including difficulties faced by schools and families in terms of equipment, lack of digital skills, challenges in organizing digital learning activities by teachers, and lack of parental support or resistance to computer and Internet use for children's learning. However, in a contradictory way, parents often allow children to have unsupervised use of the Internet for playing games and watching videos.

Given this state of the art and the need to investigate these issues with children, especially in this post-pandemic period, the study presented in this article is situated in the non-formal education context. However, it involved children and young people from different school levels, belonging to three public schools and one private. Because of the lack of direct student representation, it was decided to question young people directly, as will be presented in the following section.

2. Materials and Methods

The sample comprises 84 Portuguese students (53.6% female and 46.4% male) from elementary and secondary education aged between 8 and 20 years old (M = 12.06; SD = 3.91), with the majority of them (70.2%) being elementary students.

An online questionnaire containing sociodemographic questions as well as questions concerning online safety, searching habits and digital competences was created using Google Forms. Table 1 shows the inquiries related to these three dimensions.

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Table 1. Questions related to online safety, searching habits and digital competences that were included in the online questionnaire.

Dimensions	Question
searching habits	SH1. Indicate the social media platforms on which you have an active account.
	SH2. In a typical week, what is the probability of your accessing social media?
	SH3. On a typical weekday, approximately how much time do you spend online (excluding time dedicated to schoolwork and online classes)?
	SH4. Have you ever had your Internet usage restricted by an adult (parent, guardian, teacher, etc.) because they considered it excessive?
digital competences	Indicate your level of agreement with the following statements regarding your digital skills (1 = *Strongly disagree*; 5 = *Strongly agree*):
	DC1. I am capable of finding data, information, and content through a simple search in digital environments and navigate between them.
	DC2. I know how to identify simple ways to protect my devices and digital content (e.g., passwords, avoiding sensitive information, not opening emails from unknown senders, etc.).
	DC3. I know how to apply search filters (e.g., "+", "AND", "OR") to obtain data, information, and content in a digital environment.
	DC4. I am capable of selecting simple digital technologies to interact with others and can identify appropriate means of communication for a given context.
	DC5. I can use a variety of digital technologies to interact with other people.
	DC6. I know how to create and edit simple content in text formats (e.g., Word).
	DC7. I am capable of recording audio.
	DC8. I know how to edit audio files.
	DC9. I know how to edit images.
	DC10. I am capable of producing videos.
	DC11. I know how to create games.
	DC12. I am familiar with at least one programming language (e.g., Scratch, Java, Python...).
online safety	OS1. Do you trust that the information published online is true in the following cases:
	OS2. How often do you question the possibility of online information being false?
	OS3. Who do you usually accept or would accept a friend request from online?
	OS4. When you make a post on a social network, who can see it?
	OS5. When creating a password, what should you use?
	OS6. Who can you share your passwords with?
	OS7. You access a website that asks for your personal information (phone number, home address, etc.) or asks you to download a link before proceeding. What do you do?
	OS8. If a friend your age tells you they have been talking to a stranger online and plan to meet them in person, what do you do?
	OS9. What do you do if a stranger or someone you don't know personally asks you to send them photos or videos of yourself?
	OS10. If someone at your school has posted or circulated embarrassing content about a fellow student, what do you do?

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As shown in Table 1, all questions were ordinal in nature with five possible answers (coded from 1 to 5) except the first question related to searching habits (SH1) and the first question related to online safety (OS1). Concerning the ordinal questions related to searching habits (SH2, SH3, SH4), a higher score corresponds to more frequent use of the Internet (excluding use for school activities or classes). Concerning the ordinal questions related to digital competences (DC1 to DC12), a higher score corresponds to higher digital competences and, pertaining to the ordinal questions related to online safety (OS2 to OS10), a higher score corresponds to greater safety when online.

Recruitment of participants was done through a digital storytelling workshop. When this study began, it was not required to submit it to an ethics committee. Therefore, since the content does not report on sensitive data, the authors chose to safeguard ethical issues with requests for authorization from the parents in the case of minors, or their own informed consent in the case of adults of legal age. In both cases, anonymity and individual confidentiality of the data collected were guaranteed.

Analysis was performed using IBM SPSS Statistics software (version 28). To compare the perceptions of elementary and secondary students who participated in a digital storytelling workshop on online safety, searching habits, and digital competences, three non-parametric MANOVAs (multivariate analysis of variance) were performed due to the ordinal nature of the dependent variables [26]. When the MANOVAs were statistically significant, posterior Mann-Whitney tests for each dependent variable were performed, with p-values adjusted by Bonferroni corrections, multiplying them by the number of analyses performed.

Descriptive analysis was performed to compare the social media platforms where both groups have an active account (SH1) and to compare the situations where online information is seen as believable by those two groups of students (OS1).

A significance level of .05 was considered.

3. Results

Table 2 shows the descriptive analysis of the questions from the online questionnaire that were related to searching habits.

Table 2. Descriptive analysis of the questions related to searching habits that were included in the online questionnaire.

	Total sample (n = 84)					Elementary students (n = 59)					Secondary students (n = 25)				
Question	***n***	***%***	***Mo***	***Md***	***Range***	***n***	***%***	***Mo***	***Md***	***Range***	***n***	***%***	***Mo***	***Md***	***Range***
SH1															
Google+	62	73.8				48	81.4				14	56.0			
Facebook	53	63.1				34	57.6				19	76.0			
Myspace	1	1.2				0	0.0				1	4.0			
Twitter	27	32.1				13	22.0				14	56.0			
YouTube	68	81.0				46	78.0				22	88.0			
TikTok	59	70.2				41	69.5				18	72.0			
Instagram	62	73.8				38	64.4				24	96.0			
Other	25	29.8				15	25.4				10	40.0			
SH2			5	4	1–5			5	4	1–5			5	5	4–5
SH3			2	2	1–5			2	2	1–5			2	3	1–5
SH4			1	2	1–5			1	2	1–5			1	2	1–4

Note: *Mo*: Mode; *Md*: Median.

As shown in Table 2, most elementary students have active Google+ and YouTube accounts, with Google+ being the most frequent answer. While YouTube was also one of the two most frequent

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platforms mentioned by secondary students, Google+ was not one of the most used, being replaced by Instagram as the number one platform where these students have an active account. In both groups, Myspace was the least used platform.

A non-parametric MANOVA with SH2, SH3 and SH4 as dependent variables revealed significant differences in searching habits between elementary and secondary students ($\chi 2$ (3) = 17.181; n = 84; p = .001). Posterior Mann-Whitney tests revealed statistically significant differences between both groups only for SH2 (U = 348.500; z = -4.053; p = .003) and SH3 (U = 477.000; z = -2.690; p = .021). Indeed, Table 2 shows that, when asked if an adult had already limited their time of Internet usage due to its excessive use (SH4), both groups had similar answers, with the most frequent answer in both groups being that it never happened. When comparing the probability of having access to social media during a typical week (SH2), the most frequent answer in both groups was several times a day. However, comparing the median and the range of the answers in elementary and secondary groups, it is possible to see that the probability of having access is higher for secondary students. Also, when comparing the time that students spend online on a daily basis during the week (excluding the time spent with school activities and classes) (SH3), the most frequent answer in both groups was between two and four hours. However, comparing the median of the answers in elementary and secondary groups, it can be seen that secondary students tend to spend more time online than elementary students.

Table 3 shows the descriptive analysis of the questions from the online questionnaire that were related to digital competences.

Table 3. Descriptive analysis of the questions related to digital competences that were included in the online questionnaire.

	Total sample (*n* = 84)			**Elementary students (*n* = 59)**			**Secondary students (*n* = 25)**		
Question	***Mo***	***Md***	***Range***	***Mo***	***Md***	***Range***	***Mo***	***Md***	***Range***
DC1	5	4	2–5	5	5	2–5	4	4	2–5
DC2	5	4.5	1–5	5	4	1–5	5	5	1–5
DC3	1	3	1–5	1	2	1–5	4	4	1–5
DC4	5	4	1–5	5	4	1–5	4	4	2–5
DC5	5	5	1–5	5	4	1–5	5	5	2–5
DC6	5	4	1–5	5	4	1–5	5	5	2–5
DC7	5	5	1–5	5	5	1–5	5	5	2–5
DC8	5	3	1–5	2/5	3	1–5	5	3	1–5
DC9	5	4	1–5	5	5	1–5	5	4	2–5
DC10	5	4	1–5	5	4	1–5	5	4	2–5
DC11	5	4	1–5	5	5	1–5	1	2	1–5
DC12	5	3	1–5	5	4	1–5	2	2	1–5

Note: *Mo*: Mode; *Md*: Median.

Upon analysing Table 3, it can be concluded that, in general, the sample under study has high levels of digital competences. However, a non-parametric MANOVA with DC1 to DC12 as dependent variables revealed significant differences in digital competences between elementary and secondary students ($\chi 2$ (12) = 34.528; n = 84; p < .001). Posterior Mann-Whitney tests revealed statistically significant differences between both groups only for DC3 (U = 449.500; z = -2.892; p = .036) and DC11 (U = 386.000; z = -3.603; p = .012). Indeed, Table 3 shows that, when asked if they agree with the phrase "I know 'search' filters (such as "+", "AND", "OR") to find information online" (DC3), the most frequent answer was *I completely disagree* for elementary students, and *I mostly agree* for secondary students. Furthermore, the median for secondary students was also higher, pointing to

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higher digital competence of the secondary group in terms of "search" filter use. When asked if they agreed with the phrase "I know how to create games" (DC11), the most frequent answer was *I completely agree* for elementary students and *I completely disagree* for secondary students. Furthermore, the median for elementary students was also higher, pointing to a higher digital competence of the elementary group in terms of creating games.

Table 4 shows the descriptive analysis of the questions from the online questionnaire that were related to online safety.

Table 4. Descriptive analysis of the questions related to online safety that were included in the online questionnaire.

	Total sample (*n* = 84)					Elementary students (*n* = 59)					Secondary students (*n* = 25)				
Question	***n***	***%***	***Mo***	***Md***	***Range***	***n***	***%***	***Mo***	***Md***	***Range***	***n***	***%***	***Mo***	***Md***	***Range***
OS1															
OS1a	11	13.1				6	10.2				5	20.0			
OS1b	15	17.9				13	22.0				2	8.0			
OS1c	45	53.6				36	61.0				9	36.0			
OS1d	18	21.4				16	27.1				2	8.0			
OS1e	43	51.2				25	42.4				18	72.0			
OS2			3	3	1–5			1	3	1–5			3	3	2–5
OS3			4	4	1–5			4	4	1–5			4	4	1–4
OS4			4	3	1–5			4	4	1–5			3	3	1–5
OS5			4	4	1–5			4	4	1–5			4	4	1–5
OS6			4	4	2–5			5	4	2–5			4	4	2–5
OS7			4	4	1–5			4	4	1–5			4	4	2–5
OS8			4	4	1–5			4	4	1–5			4	4	1–5
OS9			4	4	1–5			5	4	2–5			4	4	1–5
OS10			5	5	1–5			5	5	1–5			4	4	1–5

Note: *Mo*: Mode; *Md*: Median.

Concerning the question about the situations when online information is perceived as believable (OS1), most elementary students answered that they believe the information is true if it is in websites from well-known newspapers or TV channels. They also believe the information is true if is given by someone from their social media that they already know in person, this being the most given answer. These were also the two main answers from secondary students, although the most frequent answer in this group was the first one. It is interesting to note that, although being older, 20% of the secondary surveyed students believe that online information is true simply because it is online. Otherwise, they think that it would not be posted. In contrast, only 10.2% of elementary students believe that this is true (see Table 4).

Upon analysing the descriptive statistics of questions OS2 to OS10 (see Table 4), it can be concluded that, in general, the studied sample has high levels of online safety. However, a non-parametric MANOVA with OS2 to OS10 as dependent variables revealed significant differences in online safety between elementary and secondary students ($\chi 2$ (9) = 19.173; n = 84; $p < .001$). Posterior Mann-Whitney tests revealed statistically significant differences between both groups only for OS4 (U = 464.500; z = -2.760; p = .045). Indeed, Table 4 shows that, when asked who can see their posts in social media (OS4), the most frequent answer for elementary students was only their families and/or close friends, while the most frequent answer for secondary students was their friends from social media. Furthermore, the median of the answers for elementary students is also higher, pointing to increased safety of this group when posting online.

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4. Discussion

The use of the Internet by children and young people is inevitable, and strategies need to be found to address the challenges that arise in children's education. Concerning security issues, the two groups of students stated that they do not have time limitations defined by adults for Internet use or abuse. Supposing that, in most cases, those adults are their parents; it is interesting to consider the EU Kids Online 2020 survey [6] and the study by Eyuboğlu and Yilmaz [12].

Our results also show a higher probability of Internet access among the older group. This fact is in accordance with the study by Mýlek et al. [7], as well as the recent survey mentioned above, in which adolescents between 14 and 16 years old tend to spend almost twice the time on online communications compared with children from 9 to 10 years old. In addition, considering all the countries included in the survey, 34% of the younger group (9- to 11-year-olds) are not allowed to use social networking sites, but in Portugal, this percentage increases to 21%. We must be aware of the correlation between the overuse of online media and the risk of problematic Internet use since this can develop into psychopathological situations [9]. The *Diagnostic and Statistical Manual of Mental Disorders* has already classified problematic Internet use among children and adolescents, with a prevalence between 4% and 8%, according to the American Psychiatric Association [27].

Regarding security issues, in Portugal, over 80% of the children receive advice on safe Internet use from adults [7], and the group of 12- to 14-year-olds report being advised more than the youngest and the older groups. We must consider the level of adolescents' comprehension regarding online risky behaviours. Even those who understand those risks choose to take them into account [28]. It can explain why our results show increased safety of the students belonging to the youngest group when posting online. Again, developmental factors can contribute to understanding adolescents' online behaviour. The information on how to avoid risky behaviours or parental guidance is not enough to guarantee safe behaviour, both in daily life contexts and on the Internet. Nevertheless, the feeling of being safe online (always or often) increases gradually from 9 to 16 years old, and 20% of the older students believe that information available on the Internet is credible. We believe this is a worrisome factor when intervening with young people in this age group.

As expected, older students have more skills to seek information on the Internet, using filters, such as "+", "AND" and "OR", but the younger students think they are more able to create a game. Considering the study developed by Porat et al. [29] with junior high school students (about 13 years old), those students tend to overestimate their digital competences. However, those perceptions do not align with their actual performance because their results in digital tasks fall far short.

Considering the developmental issues, it is impossible to prescribe universal healthy Internet use for all pre-adolescent and adolescent individuals [30]. Using the words of Sedgwick [31], "Understanding the functions across online platforms that are supportive or detrimental for different age groups, or populations, will be important to guide clinicians' line of inquiry, risk assessment as well as recommendations about social media/internet use and future interventions" (p. 537). This idea is in line with previous studies regarding the online learning mediation for people facing vulnerable situations [32].

It seems that there is a digital void in competency between the youngest and the oldest, but mainly for the older adolescents, and it is thus essential to implement programmes to realign and balance their perceptions about their digital competences and their actual level of digital literacy.

5. Conclusion and limitations

The aim of the present study was to compare the perceptions of students from different school levels who participated in a digital storytelling workshop regarding online behaviours and competences.

Previous studies indicate that Internet use occurs at home and school, especially for online gaming, watching videos, sharing images, and completing school tasks [3–5]. However, there is significant concern regarding safety issues [12,13] and the lack of information and training for parents [12] and teachers on digital literacy matters, as they require more training on the pedagogical use of digital technologies [25]. Most recent studies were based on the perceptions of teachers and parents,

which means that students are heard less frequently. Furthermore, it was noted, above all, that the pandemic period has changed the form and purpose of Internet use by children and has increased and diversified the ways of learning [20,21], but it has also contributed to increased time of exposure to screens [14] and, as a consequence, the risks of this use when unsupervised [25].

The main conclusions of the study presented in this article points to some similarities and some differences between the two groups of students. Both refer to using YouTube and elementary students also referred Google Apps for Education since it is adopted in the majority Portuguese public schools, while the secondary students also refer the use of Instagram, mostly for social interaction. The secondary students tend to spend more time online [14], and demonstrated more advanced search skills. However, as referred, the youngest ones consider that they have more creative abilities, which may be related to the pilot project launched in 2015/2016 by the Portuguese Ministry of Education, promoting the "Initiation of Programming in the 1st Cycle of Basic Education" and the existence of clubs and other actions for this level of schooling, in line with the Digital Action Plan [11]. Regarding security issues, it is important to continue working on raising the awareness of teachers, parents, children and young people about the risks of the Internet and how to develop an attitude that allows them to take advantage of the Internet's potential for learning, engaging, and socializing, without exposing themselves to cyberbullying or adopting addictive habits [15,16].

As limitations of the study, the sample is not representative of the entire Portuguese population aged 8 to 20 years old; therefore, it is not expected that the results can be generalized. However, they could still provide valuable insights to support the joint reflection of multiple actors. Future studies should consider evaluating actual competences rather than solely relying on perceived competences. Additionally, these studies should include gender as a variable of analysis and take the sociodemographic characteristics of the students into account.

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