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‘It Goes Around the World’ – Children’s Understanding of the Internet

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Abstract

The Internet has become an important literacy environment, even for children. Therefore, building the foundations for their critical engagement with online information should start when they first enter school. One way to start is to help children build an understanding about the complexities of the Internet environment. The present study aimed at increasing our knowledge about children’s understanding of the Internet as a technical and social environment. It also explored how children perceive the trustworthiness of online information. The participants included 30 children aged 7–9 years. The children were interviewed and the data was analysed using content analysis. We share the results from the following perspectives: 1) children’s understanding of the Internet as a complex environment; 2) children’s perceptions of the benefits and risks of the Internet; and 3) children’s perceptions of the trustworthiness of online information. The implications of developing instruction to educate critical readers are discussed.

Keywords

Critical reading, digital literacy, primary school, Internet, epistemic cognition

Introduction

At an ever-increasing early age, the Internet has become a significant medium for children’s reading, learning, pleasure and social interactions (Danby et al., 2013; Davidson, 2009; Livingstone & Bober, 2004; Thorpe et al., 2015). Children’s increasing reliance on the Internet as a source of information and a site to interact may have many implications for their physical, cognitive, social and behavioural development (Katz & Rice, 2002; Subrahmanyam, Greenfield, Kraut, & Gross, 2001; Yan, 2006), including both opportunities and risks for their growth (Livingstone & Bober, 2004). Therefore, helping younger children understand the environment in which they are interacting (e.g. Davidson, 2009) and to deal with the various quality levels and purposes of online information is essential (Leu, Kinzer, Coiro, Castek, & Henry, 2013).

However, previous research has shown that children have little understanding of the online world, and some parents seem to think that this is not important (Livingstone, Mascheroni, Dreier, Chaudron, & Lagae, 2015). Children often go online on more personal and mobile devices, making it difficult for parents to guide their online activities. This

emphasises the role of schools and teachers, along with parents, to build children's understanding of the technical, social and critical aspects of the Internet. First, it is necessary to gain an understanding of how children understand the Internet and perceive the quality of online information. This study seeks to capture younger children's understanding of the Internet as a complex technical and social environment. It also seeks to understand how children perceive the trustworthiness of information found on the Internet.

Understanding the Technical and Social Complexities of the Internet

The Internet refers to the global information system that is logically linked together by a globally unique address space that enables various services, such as the World Wide Web, e-mail, file sharing, and media streaming (Leiner et al., 2009). The Internet is a technically and socially highly complex system with more than 3.5 billion users worldwide, and an increasing number of people are producing new content to be accessed by other users (Internet Live Stats, 2017). Yan (2006) pointed out that the Internet's virtual, connective and open nature makes it challenging for young children to understand it. He further stressed that children's understanding of the technical and social complexities of the Internet may enhance their positive use of the Internet and protect them from potential negative experiences.

Children's ages, the quantity of their online experiences, and the amount of time they spend online are related to their understanding of the nature of the Internet (Greenfield & Yan, 2006; Yan, 2006). Yan's (2005) study revealed that almost all children aged 5 to 10 years old only possess a minimal or partial understanding of the technical and social complexities of the Internet, whereas approximately one third of 11 to 12-year-olds reach a more sophisticated level of understanding. Similarly, Murray and Buchanan (2018) found that among the 33 children aged from 10 to 12 participating in their study, most had a limited technical understanding of the Internet, and they mostly described the Internet through activities that it enables. However, a few students had initial ideas of the global nature of the Internet. When age had an effect on children's understanding of both the technical and social aspects of the Internet, the frequency of Internet use had a small but significant effect only on understanding its social aspects (Yan, 2006). Yan (2006) also found that a technical understanding of the Internet seems to advance children's understanding of its social complexity but not vice versa.

Benefits and Potential Risks of the Internet

The Internet has democratised the access, production and distribution of information, enabling the global sharing of ideas, culture and creative processes (Bhargava & Klat, 2017). For younger children, the Internet also offers materials and tools for learning, entertainment and communication (Livingstone, 2003). Along with many positive consequences, the Internet also poses potential risks, especially for children. According to Valcke, De Wever, Van Keer and Schellens (2011), these risks can be related to content (inappropriate content, wrong information), contacts (cyber-bullying, sexual solicitation, privacy) and commercialism (exploitation, unwanted collection of personal data). In spite of children's increasing use of the Internet, Valcke et al. (2011) found that the level of parental and teacher control over its use decreased from 2005 to 2009 (see also Nikken & Schols, 2015).

Some studies have clarified children's perceptions of the Internet's benefits and potential harmful effects (Livingstone, Kirwil, Ponte, & Staksrud, 2013). In Yan's (2005) study, five to

eight-year-old children said that the Internet helped them with learning, but they were not able to name any negative influences. However, some older children were able to describe some negative implications of the Internet. Also, Dodge, Husain and Duke (2011) observed that more than half of the children in their study (5–7 years old) could not specify negative issues related to the Internet, and they had a very limited understanding of its potential dangers.

Foundations for Critical Reading on the Internet

Although an enormous amount of valuable and timely information is available on the Internet, it also contains information varying in authorship, purpose and quality, and even misleading information (Flanagin & Metzger, 2008). This highlights the critical role of epistemic cognition when engaging with online information (Barzilai & Zohar, 2012; Strømsø & Kammerer, 2016) as individuals' beliefs and thinking about knowledge and the processes of knowing may form a foundation for critical reading and thinking (Hofer, 2016). When selecting and acquiring information online, individuals need to consider the trustworthiness and accuracy of the abundant information that is available (Hofer, 2004; Mason, Ariasi, & Boldrin, 2011). The role of the critical evaluation of online information is highlighted in various approaches concerning reading and learning from online information, such as new literacies (Leu et al., 2013), information literacy (Bawden, 2001) and media literacy (Livingstone, 2004). Consequently, efforts to teach students, including those in the upper-elementary grades, how to critically evaluate sources have been on the increase (Kuiper, Volman, & Terwel, 2008; Macedo-Rouet, Braasch, Britt, & Rouet, 2013; Paul, Stadtler, & Bromme, 2019).

Because of the unique features of the Internet as an information environment, researchers have suggested that both reading and learning online involve Internet-specific epistemic beliefs (e.g. Bråten, Strømsø, & Samuelstuen, 2005; Strømsø & Kammerer, 2016). Thus far, studies on Internet-specific epistemic beliefs, concerning aspects, such as certainty of knowledge on the Internet and justification for knowing, have only involved adults or older students (Strømsø & Kammerer, 2016). In other contexts, such as learning science, history or language arts, epistemic cognition has also been studied among elementary school students (for review see Bendixen, 2016). These studies have examined, for example, children's beliefs about the nature of knowledge and justifications for causal claims using various methods, e.g. interviews, surveys and classroom observations. Bendixen (2016, p. 290) states that research in the lower grades 'may provide important insights into the origins of epistemic cognition.' Similarly, we believe that understanding children's thinking about knowledge and the processes of knowing on the Internet would be valuable for understanding the origins of Internet-specific epistemic beliefs. In addition, this understanding would be beneficial for developing instruction that builds on children's understanding of the quality of information on the Internet.

Present Study

The aim of the present study is to gain knowledge about children's understanding of the Internet. The research questions are as follows:

- What are children's understandings of the Internet as a technical and social environment?
- How do children perceive the benefits and risks of the Internet?
- How do children perceive the trustworthiness of information on the Internet?

Method

Participants

The participants were 30 children aged from 7 to 9 years old (17 girls and 13 boys) from one primary school in a suburban area of Finland. The school is part of the university serving as a training school for pre-service teachers. We selected this school because the first author acted as a supervisor for pre-service teachers, and therefore, the children were familiar with her. This, in turn, helped the first author to create a warm and confidential relationship with the children during the interviews that were used as a data collection method.

The children were randomly selected from the first, second and third grades, 10 from each grade. Thus, the children represented the lowest grades where the focus is on teaching basic skills. Guardians filled in a consent form, agreeing to their child's participation. Both the children and their parents were aware of the purpose of the study. Children were also informed that they were free to withdraw from the interview any time.

Interviews

We chose to interview the children in order to capture their own understanding of the Internet and take their views seriously (see Eder & Fingerson, 2001). When interviewing young children, we must recognise their abilities to express themselves. During the interviews, it is also essential to promote interactional adult-child processes (Danby, 2002; Danby, Ewing, & Thorpe, 2011).

The children were interviewed individually in a quiet corner of the corridor outside the classroom. The interviewer tried to build a warm relationship with each child by chatting with him or her for a while before addressing the interview questions. The interviewer also encouraged the children to answer in their own words. The interviews were semi-structured, and open-ended questions gave the children an opportunity to express their own understanding about the Internet. The interviewer only asked prompting questions if a child had difficulties expressing him or herself (see Danby, 2002). If a child was not able to answer after prompting questions, the interviewer emphasized that this was totally acceptable and proceeded to the next question. If a child had difficulties to answer multiple successive questions, the interviewer asked whether the child would like to end the interview. These procedures were followed to make sure that children did not feel pressured.

The interview questions concerned the following areas:

- The Internet as a technical and social environment:
 - What do you think the Internet is?
 - Where is the Internet?
 - How does information come to the Internet?
- Benefits and disadvantages of the Internet:
 - Is the Internet useful? Please describe.
 - Could the Internet be harmful? Please describe.
- Trustworthiness of information on the Internet:
 - Is everything true on the Internet? Why do you think so?

The length of the interviews varied from a little over two minutes to seven and one-half minutes. The children's answers were recorded and literally transcribed from the audio-recordings. The amount of transcribed texts totalled 26 pages.

Data Analysis

The data were analysed using qualitative problem-driven content analysis and inductive reasoning (Krippendorff, 2013; Patton, 2015). The analysis was conducted in four phases. First, after a profound reading of the transcribed texts, the researchers took *verbatim texts* to find analytical paths for answers to the research questions. Second, theoretical literature and previous studies on children’s Internet usage and their understanding of the Internet were utilised to deduce *meanings* from emerged expressions (Patton, 2015). In the third phase, *main meanings* came into prominence through the interpretative process of careful examination and constant comparison, which were based on discussions between the two researchers. Finally, in the fourth phase, the main meanings were reduced to first classify them for interpretation by both authors separately and then by synthesising the main meanings together into *categories*. During the whole analysis, we paid particular attention not to over-interpret the children’s sometimes quite short expressions. The analysis process is illustrated in Table 1.

Table 1 An Example of the Analysis Process Concerning Children’s Answers to Question What the Internet Is

Verbatim text	Meanings	Main meanings	Categories
ID8: Well, it is in all computers. Yes, it is like you can do everything . . . well, you can do important things . . . pay all bills and so on . . . You can play and everything and you can also download video games . . . and also . . . everything and so on. (7-year-old boy)	The Internet allows you to do many things. You can pay bills on the Internet. You can play on the Internet. You can download games from the Internet.	paying bills playing games downloading	The Internet as a set of practices
ID27: The Internet is where you can play and watch everything (9-year-old boy)	The Internet allows playing and watching.	playing watching	
ID2: Well, is it like something that is, well, in the computer? When . . . for example, when it is Google, then it is like, something like, well, I can’t really explain it well, but, it is at least a thing, which is connected to computers. (7-year-old girl)	The Internet is in the computer. Applications can be found on the computer. The Internet is connected to computers.	computer application	The Internet as a device
ID29: There are lots of applications, for example, there is Chrome; Chrome is one thing. But if you think for example about our iPads, the Internet is also on iPads. There is Safari, Chrome and Math King, and there are also games, and also, there are other things that enable Book Creator work. And those things we sometimes use. (9-year-old boy)	There are applications on the Internet. The Internet is connected to the iPad and its contents.	application iPad contents	
ID20: The Internet is, well, in which is, well, that, for example, if you go to Google, you can find information about something, if, well . . . I have a cat and if I don’t know what to do with the cat . . . And there is also a front page there, and then you go from there to cats, and then you search if you want to know something about cats or what to do with those cats. (8-year-old girl)	There is information on the Internet. There is front page. The Internet gives answers. The Internet gives information.	information system questions answers	The Internet as an information environment
ID23: If you need, for example, a picture you can search for the picture and you can upload it from the Internet. There are also texts, if you need to have that text for school for your subject. Well, you can find all the information there. (8-year-old girl)	There are pictures on the Internet. There are texts on the Internet. The Internet gives answers. The Internet gives information.	questions answers pictures texts information	

Results

Understanding of the Internet as a Technical and Social Environment

When the children were asked what the Internet is, they seemed to understand the Internet in three different ways: 1) the Internet as a set of practices; 2) the Internet as an information environment; and 3) the Internet as a device. Altogether, 34 expressions were identified. Four of the answers included two expressions that fall into two different categories. The majority of the children's expressions (47.1%) were related to set practices that the Internet provides, such as gaming, watching movies or paying bills. The children also quite often saw the Internet as an information environment (23.5% of the expressions) where one can find, for example, pictures, texts and comments. Further, fewer children (14.7% of the expressions) thought that the Internet was a device. One expression (2.9%) did not fall into any of the aforementioned categories. Among all the children, 11.8% were unable to answer the question.

With the question, 'Where is the Internet?', we were better able to capture the children's understanding about its technical aspects. Table 2 shows the emerged categories of understanding with authentic examples, as well as the frequencies of the expressions that fall into each category. The children most often understood that the Internet is in a device.

The children also approached the question by thinking of accessing the Internet, either through an Internet connection or electricity. Only one child referred to the global nature of the Internet, reflecting the initial understanding of the Internet as a network. One third of the children could not answer the question.

Table 2 Children's Understanding of the Internet as a Technical Environment by Grade Level

Category	Example	Number of expressions by grade level				
		1st	2nd	3rd	Total	%
The Internet in a device	It is in a telephone, in a tablet, and in computers (ID1, Grade 1).	6	4	2	12	40.00
The Internet in relation to electricity	It is where electricity is (ID6, Grade 1).	2	0	0	2	6.67
The Internet as an access	It is a thing not everyone has. One has to buy it – the mobile connection (ID26, Grade 3).	0	3	2	5	16.67
The Internet as a global environment	It goes around the world and then it is in every computer (ID11, Grade 2).	0	1	0	1	3.33
Unable to describe		2	2	6	10	33.33
Total		10	10	10	30	100

Further, we wanted to clarify the children's understanding of the origin of the information on the Internet by asking them how information comes to it. Again, only a little more than one-half of the children (53.3%) were able to provide an answer to this question. Seven children (23.3%) described the information on the Internet as resulting from human activities such as writing or loading information. One third-grade student described his understanding in quite a detailed way: 'Well, for example, people shoot videos by themselves if they are playing or doing something else. And, then, they load the videos to YouTube and then, other people can comment on them. Then, the amount of videos increases all the time, the amount' (ID29, Grade 3). The above example shows that a child has at least an initial understanding about the cumulative and social nature of information on the Internet. Some chil-

dren did not connect the origin of information to human activities, but rather to electricity (13.3%), a device (10%) or space or a satellite (6.7%). Additionally, one child (3.3%) said that information comes from a firm.

Perceptions of the Usefulness of the Internet

Three categories emerged to describe the children's understanding of the usefulness of the Internet. The children connected the Internet's usefulness to: 1) learning (30.0%); 2) practices facilitating daily life (26.7%); and 3) entertainment (6.7%). Out of all the children, 11 (36.7%) were unable to name any useful aspect of the Internet. In many cases, the answer was still 'I don't know,' even after the interviewer asked the children to describe their understanding in their own words.

The learning opportunities were described, for example, through a knowledge gain, as expressed by one second-grade student: 'Yes, there are quite a lot of benefits. For me, it is essential because we are going to have a kitten. I read a lot of information on the Internet about breeding cats and everything like that.' In addition, the same second grader described the learning opportunities from the perspectives of both adults and children: 'Yes. It is useful. If you are, for example, an adult, you can study on the Internet, and if you are a child, you can play there, for example, math learning games. And you can learn there' (ID20, Grade 2).

Practices facilitating daily life were related to sending e-mails, checking someone's phone number, transferring money or paying bills. A second grader described how the Internet has changed communication and financial practices: 'Yes. When we didn't yet have the Internet, we wrote everything in letters, and we had to carry them somewhere (meaning the post office) . . . Even the bills, we had to pay them with real money, and you had to deposit money in the bank. Now, you can pay the bills and execute money transfers online, and money goes via the Internet' (ID19, Grade 2). This extract suggests that this child, who was born in the age of the Internet, has discussed the seminal role of the Internet from a historical perspective with an adult. Only two children referred to entertainment, and more precisely, gaming offered by the Internet.

Perceptions of the Possible Harmfulness of the Internet

A little more than one-half of the children expressed (altogether 17 expressions) an issue that could be harmful when using the Internet. These expressions fell into four categories: 1) harmful content or communication (23.3%); 2) addictions (20.0%); 3) health problems (10.0%); and 4) bullying (2.7%). Several children were aware of the harmful content or communication that a person may encounter on the Internet. One third-grade child described harmful content as follows: 'Yes, could be. There can be found content, well, something that is not suitable for children and that kind of thing . . . For example, there are horror stories and all sorts of terrible videos and that kind of thing. And then I tell my mom and dad, and then they tell me that it's not true . . . or something' (ID24, Grade 3). Harmful communication was shared by a second grader: 'Yes, could be. My friend Matt (pseudonym) got a nasty message supposedly from some woman and that woman forwarded that message to one of our school's sixth graders, that Matt's message . . .' (ID16, Grade 2).

The children also referred quite often to addictions related to Internet usage. This was described as follows by one third grader: 'Yes, you see, if you are all the time on the device, and you are hooked on it, you do not necessarily feel up to doing anything other than that' (ID30, Grade 3). Three children were also aware of possible health problems (headaches, eyestrain) that could result from spending too much time on the computer. Only one child mentioned bullying on the Internet.

Perceptions of the Trustworthiness of the Information on the Internet

As Table 3 shows, six categories of children's perceptions of the trustworthiness of the information on the Internet emerged. Table 3 also provides authentic examples of the students' answers for each category. Among all of the children, 80.0% expressed some doubt towards the trustworthiness of the information on the Internet (Categories 4 to 6), and 43.3% were also able to provide a justification for the expressed doubt (Categories 5 and 6). Some children's (30.0%) justifications were very concrete (Category 5). They referred to a specific example, such as an event from their own life, or a specific type of the content.

We also observed (13.3% of children) some sophisticated justifications for doubt (Category 6), where children, for example, referred to false information that someone could spread, even intentionally, on the Internet. One child was also able to justify his doubt with the nature of the Internet, and more precisely, with the fact that anyone can publish anything on the Internet. The remaining 20.0% of children did not answer, did not know or did not express any doubt (Categories 1 to 3). Most of these students were first graders.

Table 3 Categories of Children's Perceptions of the Trustworthiness of Information on the Internet

Category	Description	Example	Children's grade			
			1st	2nd	3rd	Total
1. No answer	A child does not answer at all.		10%	0	0	3.33%
2. Do not know	A child does not know.	I do not know.	10 %	0	10 %	6.67%
3. Expression without doubt	A child says that everything is true.	Yes.	30 %	0	0	10.00%
4. Unjustified expression of doubt	A child expresses doubt towards the trustworthiness of information on the Internet but is unable to justify it.	Wellll... Everything is not true. Well. I don't really know why (ID14, Grade 2).	20 %	30 %	60 %	36.67%
5. Expression of doubt with a concrete justification	A child expresses doubt towards the trustworthiness of information on the Internet and justifies his or her doubt with a specific example or with a specific type of content e.g. jokes, horror stories.	Wellll... Not all things are true. For example, some.. some horror stories or that kinds of things (ID26, Grade 3).	30 %	30 %	30 %	30.00%
6. Expression of doubt with somewhat sophisticated justification	A child expresses doubt towards the trustworthiness of information on the Internet, and justifies his or her doubt with the possibility of spreading false information on the Internet or with the nature of the Internet as an information environment.	No. Wellll... some guys just write strange things that are not totally true. For example in Wikipedia. Not everything is true there (ID17, Grade 2).No. Not everything. Because the Internet is bit like, where anyone can publish anything (ID15, Grade 2).	0	40 %	0	13.33%
Total			100 %	100 %	100 %	100 %

Discussion

The present study sought to increase our knowledge on how children, aged 7 to 9 years, understand the Internet as a complex technical and social environment, as well as how they perceive the trustworthiness of online information. This knowledge is particularly important, since children's understanding of the Internet serves as a foundation towards both their safer use of online information in different aspects of their personal lives (Byron, 2008), and their critical reading (Leu et al., 2013).

Many children either had difficulty explaining what the Internet is, or had misunderstandings about the Internet. Some children, for example, thought that the Internet is inside a device or that the Internet has something to do with electricity (see also Mertala, 2018). These understandings can be easily explained by children's day-to-day experiences with their physical world (cf. Smith III, Disessa, & Roschelle, 1994). In our study, only one child out of 30 was able to show an initial understanding of the Internet as a global network. In addition, we observed that slightly less than one-fourth of the children were able to show some kind of understanding that the information on the Internet is a result of human activities. The rest of the children were either unable to explain, or they related the origin of the information to electricity, a device or a satellite.

Our findings are in line with previous research showing that children have only a minimal or partial understanding of the Internet's complexity (Murray & Buchanan, 2018; Yan, 2005), and they begin to achieve a better understanding during the ages of 9–12 (Yan, 2005). As Yan (2006) showed, children's understanding of the Internet's technical complexity helps them to understand its social complexity. Therefore, it would be worthwhile to also discuss the technical aspects of the Internet in the classroom (see also Vandoninck, d'Haenens, & Smahel, 2014).

According to Smith III et al. (1994), instruction should confront children with the disparity between their misunderstanding and a more advanced understanding. The advantage of this approach is that when the disparity is done explicitly, children will appreciate the advantages of the more advanced concept and relinquish their misunderstanding. One way for teachers to get a sense of children's prevailing understanding of the Internet is to ask them to draw their understanding, and then ask them to explain their understanding with the aid of their illustration (see Yan, 2006).

This may be a useful way to access children's understanding of the Internet when they have difficulties verbalising their thinking, as was also perceived in the present study. However, drawings should not be interpreted as reflecting children's understandings as such, but should be taken in conjunction with their comments (Vosniadou, Skopeliti, & Ikospentaki, 2005). Teachers could use students' drawings to stimulate classroom discussions, and move these discussions towards the idea of the Internet as a global network that enables the sharing of socially constructed knowledge. To strengthen students' more advanced understanding, they could express their new understandings with an additional drawing.

This study also aimed to shed light on children's perceptions of the kinds of advantages and disadvantages the Internet provides. It is encouraging that one-third of the children in the present study saw the Internet as a beneficial environment for learning as it could be regarded as a good starting point for the productive use of the Internet (Strømsø & Kammerer, 2016). The children were also aware of the potential harmful aspects of the Internet, while a little more than one-half of the children named a relevant harmful issue. This might be due to potential harms being discussed at home or at school. The school's role is important, as the harmful aspects of the Internet may not be raised in all households (Helsper,

2017; Livingstone et al., 2015). It is also important to discuss with children what they should do if such potential risks should be realised.

This study suggests that even children are capable of thinking critically about online information. As much as 40% of the participants expressed a justified doubt towards the trustworthiness of information on the Internet. A few children even expressed quite sophisticated justifications for their scepticism, referring to how knowledge is produced on the Internet. Others gave very concrete examples to express their justifications. Children draw, for example, on their personal experiences. These experiences provide valuable insights for understanding how children perceive the quality of the information on the Internet. Children's everyday experiences also serve as a good starting point for discussing the trustworthiness of information on the Internet in classrooms. Teachers can take advantages of students' views when building more strategic knowledge on how to evaluate the quality of online information (Zhang, Duke, & Jimenéz, 2011). Furthermore, since the available instruments for examining the Internet-specific epistemic beliefs are targeted at adults (e.g. Bråten, Brandmo, & Kammerer, 2018), the findings of this study could be utilised for developing instruments also for children.

As the Internet is a significant literacy environment for children at an early age (Kucirkova, 2014), their ability to think critically about the messages on the Internet should be addressed when they first enter school. As previous studies (e.g. Coiro, Coscarelli, Maykel, & Forzani, 2015) have shown older students' limited abilities to critically evaluate online sources, younger students would benefit from instruction that builds a foundation for critical reading alongside basic literacy skills. Understanding how online information is socially constructed and distributed, and how it can be globally accessed could be a good cornerstone for building awareness of the need to critically evaluate online information.

As our results showed, the students varied markedly in how they perceived the Internet, related practices and trustworthiness of information on the Internet, as well as how well they were able to articulate related thoughts. One possible reason for these differences may reside in whether students have had opportunities to discuss these issues with adults. Thus, our study encourages educators and parents to talk with children about different aspects related to the Internet and its practices. The examples shared in this study illuminate for adults the level at which children of this age can talk about the Internet and its practices. Further, the shared examples could be used in teacher professional development sessions where teachers think about how students' expressions could be bridged to the broader principles related to the Internet and its use. This practice would better prepare teachers to engage in dialogue with students whenever the opportunities arise in the classrooms (see Alexander, 2018). Future research could also examine the quality of classroom discussions about the Internet and its use to gain a better understanding of how dialogical discussion could stimulate thinking around the Internet in authentic classroom situations.

Our study comes with several limitations. First, this study was a small, exploratory study that was conducted in a particular cultural context and in a technically well-equipped school. Second, the interviews were quite short, and some children might have not been able to express all the nuances of their understanding. It might have been difficult for the children of this age to elaborate their thoughts, and some of the questions addressed were quite abstract. Depending on the question, the proportion of children who were unable to provide an answer, other than 'I do not know,' varied from 10% to 47%. This might be due to individual differences in the children's abilities to verbalise their thoughts (cf. Pressley & Afflerbach, 1995). Maybe because of these limitations of interviewing children, Internet concepts have been previously examined with even younger children with the help of some

artefacts, such as children's drawings (Mertala, 2018; Edwards et al., 2018). As we examined not only the children's conceptions of the Internet from a technological point of view but also their perceptions of the benefits, risks and trustworthiness of the information on the Internet, we chose to use interviews.

Because of the small sample size, only 10 students per grade, we were not able to draw any conclusions about children's understanding of the Internet in relation to their age. In spite of the small sample size, the study shares authentic examples of how children conceptualise the different aspects of the Internet. Even though we only asked children one question about the trustworthiness of the information on the Internet, the current study was one of the first attempts to understand Internet-related epistemic cognition of children as young as 7 to 9 years of age. Future studies could explore multiple aspects of children's knowledge and processes of knowing when using the Internet as an information resource. Another interesting aspect to examine would be the relationships between children's understandings of the Internet as a technological and social environment and their perceptions of the trustworthiness of the information on the Internet.

The advantage of this study is that it focused its attention on what children actually say about the Internet, instead of putting children's answers into categories according to their correctness. Understanding children's ways of thinking can help teachers prepare classroom dialogue that will assist them with addressing the critical aspects of the Internet. Furthermore, it will facilitate teachers to take the necessary steps to build an understanding of the importance of critical reading on the Internet.

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References

- Alexander, R. (2018). Developing dialogic teaching: Genesis, process, trial. *Research Papers in Education*, 33, 561–598. <https://doi.org/10.1080/02671522.2018.1481140>
- Barzilai, S., & Zohar, A. (2012). Epistemic thinking in action: Evaluating and integrating online sources. *Cognition and Instruction*, 30, 39–85. <https://doi.org/10.1080/07370008.2011.636495>
- Bawden, D. (2001). Information and digital literacies: A review of concepts. *Journal of Documentation*, 57, 218–259. <https://doi.org/10.1108/eum000000007083>
- Bendixen, L. D. (2016). Teaching for epistemic change in elementary classrooms. In J. A. Greene, W. A. Sandoval, & I. Bråten (Eds.), *Handbook of epistemic cognition* (pp. 19–38). New York, NY: Routledge.
- Bhargava, J., & Klat, A. (2017). Content democratization: How the Internet is fueling the growth of creative economies. *Strategy&S*. Retrieved from <http://www.strategyand.pwc.com/reports/content-democratization>
- Bråten, I., Brandmo, C., & Kammerer, Y. (2018). A validation study of the Internet-specific epistemic justification inventory with Norwegian preservice teachers. *Journal of Educational Computing Research*. Advanced online publication. <https://doi.org/10.1177/0735633118769438>
- Bråten, I., Strømsø, H. I., & Samuelstuen, M. S. (2005). The relationship between Internet-specific epistemological beliefs and learning within Internet technologies. *Journal of Educational Computing Research*, 33, 141–171. <https://doi.org/10.2190/e763-x0ln-6nmf-cb86>
- Byron, T. (2008). *Safer children in a digital world: The report of the Byron Review: Be safe, be aware, have fun*. London: Department for Children, Schools and Families. Retrieved from http://dera.ioe.ac.uk/7332/7/Final%20Report%20Bookmarked_Redacted.pdf
- Coiro, J., Coscarelli, C., Maykel, C., & Forzani, E. (2015). Investigating criteria that seventh graders use to evaluate the quality of online information. *Journal of Adolescent & Adult Literacy*, 59, 287–297. <https://doi.org/10.1002/jaal.448>

- Danby, S. (2002). The communicative competence of young children. *Australian Journal of Early Childhood*, 27(3), 25–30. <https://doi.org/10.1177/183693910202700306>
- Danby, S., Davidson, C., Theobald, M., Scriven, B., Cobb-Moore, S. H., Grant, S., . . . & Thorpe, K. J. (2013). Talk in activity during young children's use of digital technologies at home. *Australian Journal of Communication*, 40(2), 83–99.
- Danby, S., Ewing, L., & Thorpe, K. J. (2011). The novice researcher: Interviewing young children. *Qualitative Inquiry*, 17, 74–84. <https://doi.org/10.1177/1077800410389754>
- Davidson, C. (2009). Young children's engagement with digital texts and literacies in the home: Pressing matters for the teaching of English in the early years of schooling. *English Teaching: Practice and Critique*, 8, 36–54.
- Dodge, A. M., Husain, N., & Duke, N. K. (2011). K–2 children's use and understanding of the Internet. *Language Arts*, 89, 86–98.
- Eder, D., & Fingerson, L. (2001). Interviewing children and adolescents. In J. F. Gubrium & J. A. Holstein (Eds.), *Handbook of interview research* (pp. 181–201). Thousand Oaks: Sage.
- Edwards, S., Nolan, A., Henderson, M., Mantilla, A., Plowman, L., & Skouteris, H. (2018). Young children's everyday concepts of the internet: A platform for cyber-safety education in the early years. *British Journal of Educational Technology*, 49, 45–55. <https://doi.org/10.1111/bjet.12529>
- Flanagin, A. J., & Metzger, M. J. (2008). Digital media and youth: Unparalleled opportunity and unprecedented responsibility. In M. J. Metzger & A. J. Flanagin (Eds.), *Digital media, youth, and credibility* (pp. 5–27). Cambridge, MA: MIT press.
- Greenfield, P., & Yan, Z. (2006). Children, adolescents, and the Internet: A new field of inquiry in developmental psychology. *Developmental Psychology*, 42, 391–394. <https://doi.org/10.1037/0012-1649.42.3.391>
- Helsper, E. J. (2017). A socio-digital ecology approach to understanding digital inequalities among young people. *Journal of Children and Media*, 11, 256–260. <https://doi.org/10.1080/17482798.2017.1306370>
- Hofer, B. K. (2004). Epistemological understanding as a metacognitive process: Thinking aloud during online searching. *Educational Psychologist*, 39, 43–55. https://doi.org/10.1207/s15326985ep3901_5
- Hofer, B. K. (2016). Epistemic cognition as a psychological construct: Advancements and challenges. In J. A. Greene, W. A. Sandoval, & I. Bråten (Eds.), *Handbook of epistemic cognition* (pp. 19–38). New York, NY: Routledge.
- Internet Live Stats. (2017). Google search statistics. Retrieved from <http://www.internetlivestats.com/google-search-statistics/>
- Katz, J. E., & Rice, R. E. (2002). *Social consequences of Internet use: Access, involvement, and interaction*. Cambridge, MA: MIT Press.
- Krippendorff, K. (2013). *Content analysis. An introduction to its methodology* (3rd ed.). Thousand Oaks, CA: Sage.
- Kucirkova, N. (2014). iPads in early education: Separating assumptions and evidence. *Frontiers in Psychology*. <https://doi.org/10.3389/fpsyg.2014.00715>
- Kuiper, E., Volman, M., & Terwel, J. (2008). Integrating critical web skills and content knowledge: Development and evaluation of a 5th grade educational program. *Computers in Human Behavior*, 24, 666–692. <https://doi.org/10.1016/j.chb.2007.01.022>
- Leiner, B. M., Cerf, V. G., Clark, D. D., Kahn, R. E., Kleinrock, L., Lynch, D. C., . . . & Wolff, S. (2009). A brief history of the Internet. *ACM SIGCOMM Computer Communication Review*, 39(5), 22–31.
- Leu D. J., Kinzer, C. K., Coiro, J., Castek, J., & Henry, L. A. (2013). New literacies and the new literacies of online reading comprehension: A dual level theory. In N. Unrau & D. Alvermann (Eds.), *Theoretical models and process of reading* (6th ed., pp. 1150–1181). Newark, DE: International Reading Association.
- Livingstone, S. (2003). Children's use of the Internet: Reflections on the emerging research agenda. *New Media & Society*, 5, 147–166. <https://doi.org/10.1177/1461444803005002001>
- Livingstone, S. (2004). Media literacy and the challenge of new information and communication technologies. *The Communication Review*, 7, 3–14. <https://doi.org/10.1080/10714420490280152>
- Livingstone, S., & Bober, M. (2004). *UK children go online: Surveying the experiences of young people and their parents*. London: LSE Research Online. Retrieved from <http://eprints.lse.ac.uk/archive/00000395>

- Livingstone, S., Kirwil, L., Ponte, C., & Staksrud, E. (2013). *In their own words: What bothers children online?* Retrieved from <http://eprints.lse.ac.uk/48357/>
- Livingstone, S., Mascheroni, G., Dreier, M., Chaudron, S., & Lagae, K. (2015). *How parents of young children manage digital devices at home: The role of income, education and parental style*. London: EU Kids Online, LSE. Retrieved from <http://eprints.lse.ac.uk/63378/>
- Macedo-Rouet, M., Braasch, J. L. G., Britt, M. A., & Rouet, J.-F. (2013). Teaching fourth and fifth graders to evaluate information sources during text comprehension. *Cognition and Instruction*, 31, 204–226.
- Mason, L., Ariasi, N., & Boldrin, A. (2011). Epistemic beliefs in action: Spontaneous reflections about knowledge and knowing during online information searching and their influence on learning. *Learning and Instruction*, 21, 137–151. <https://doi.org/10.1016/j.learninstruc.2010.01.001>
- Mertala, P. (2018). Young children's conceptions of computers, code, and the Internet. *International Journal of Child-Computer Interaction*. Advanced online publication. <https://doi.org/10.1016/j.ijcci.2018.11.003>
- Murray, T. & Buchanan, R. (2018) 'The Internet is all around us': How children come to understand the Internet. *Digital Culture & Education*, 10. Retrieved from <https://nova.newcastle.edu.au/vital/access/services/Download/uon:32748/ATTACHMENT02?view=true>
- Nikken, P. & Schols, M. (2015). How and why parents guide the media use of young children. *Journal of Child and Family Studies*, 24, 3423–3435. <https://doi.org/10.1007/s10826-015-0144-4>
- Patton, M. Q. (2015). *Qualitative research and evaluation methods. Integrating theory and practice* (4th ed.). Thousand Oaks, CA: Sage.
- Paul, J., Stadler, M., & Bromme, R. (2019). Effects of a sourcing prompt and conflicts in reading materials on elementary students' use of source information. *Discourse Processes*, 56(2), 155–169. <https://doi.org/10.1080/0163853x.2017.1402165>
- Pressley, M., & Afflerbach, P. (1995). *Verbal protocols of reading: The nature of constructively responsive reading*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Smith III, J. P., Disessa, A. A., & Roschelle, J. (1994). Misunderstanding reconceived: A constructivist analysis of knowledge in transition. *The Journal of the Learning Sciences*, 3, 115–163. https://doi.org/10.1207/s15327809jls0302_1
- Strømsø, H. I., & Kammerer, Y. (2016). Epistemic cognition and reading for understanding in the Internet age. In J.A. Greene, W.A. Sandoval, & I. Bråten (Eds.), *Handbook of epistemic cognition* (pp. 230–246). New York, NY: Routledge.
- Subrahmanyam, K., Greenfield, P., Kraut, R., & Gross, E. (2001). The impact of computer use on children's and adolescents' development. *Journal of Applied Developmental Psychology*, 22, 7–30. [https://doi.org/10.1016/s0193-3973\(00\)00063-0](https://doi.org/10.1016/s0193-3973(00)00063-0)
- Thorpe, K., Hansen, J., Danby, S., Zaki, F. M., Grant, S., Houen, S., Davidson, C., & Given, L. M. (2015). Digital access to knowledge in the preschool classroom: Reports from Australia. *Early Childhood Research Quarterly*, 32, 174–182. <https://doi.org/10.1016/j.ecresq.2015.04.001>
- Valcke, M., De Wever, B., Van Keer, H., & Schellens, T. (2011). Long-term study of safe Internet use of young children. *Computers & Education*, 57, 1292–1305. <https://doi.org/10.1016/j.compedu.2011.01.010>
- Vandoninck, S., d'Haenens, L., & Smahel, D. (2014). *Preventive measures: How youngsters avoid online risks*. EU Kids Online, London, UK. Retrieved from <http://eprints.lse.ac.uk/55797/>
- Vosniadou, S., Skopeliti, I., & Ikospentaki, K. (2005). Reconsidering the role of artefacts in reasoning: Children's understanding of the globe as a model of the Earth. *Learning and Instruction*, 15, 333–351. <https://doi.org/10.1016/j.learninstruc.2005.07.004>
- Yan, Z. (2005). Age differences in children's understanding of the complexity of the Internet. *Journal of Applied Developmental Psychology*, 26, 385–396. <https://doi.org/10.1016/j.appdev.2005.04.001>
- Yan, Z. (2006). What influences children's and adolescents' understanding of the complexity of the Internet? *Developmental Psychology*, 42, 418–428. <https://doi.org/10.1037/0012-1649.42.3.418>
- Zhang, S., Duke, N. K., & Jimenez, L. M. (2011). The WWWDOT approach to improving students' critical evaluation of websites. *Reading Teacher*, 65, 150–158. <https://doi.org/10.1002/trtr.01016>