Young children's everyday concepts of the internet

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Young children's everyday concepts of the internet: a platform for cyber-safety education in the early years

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Abstract

Young children from around the world are accessing the internet in ever increasing numbers. The rapid increase in internet activity by children aged 4-5 years in particular is due to the ease access enabled them by touchscreen internet-enabled tablet technologies. With young children now online, often independently of adult supervision, the need for early childhood cyber-safety education is becoming urgent. In this paper, we report the early findings from a project aimed at examining the development of cyber-safety education for young children. We argue that cyber-safety education for young children cannot be effectively developed without first considering young children's thinking about the internet. In this paper, we use Vygotsky's ideas about the development of mature concepts from the merging of everyday and scientific concepts. We identify the potential range of everyday concepts likely to form the basis of young children's thinking about the internet as a platform for cyber-safety education in the early years.

Keywords

Internet, young children, cyber-safety, early childhood education

Introduction

Internet-enabled mobile and touchscreen devices have quite literally put the internet at the fingertips of the very youngest of children. Digital media content, games and apps are now commonly accessed by young children for entertainment, learning and 'edutainment' purposes. Young children are often described as 'digitods' - the first generation of children to be fully online from birth. Growing up online presupposes digital activity and digital activity means that young children, like their older counterparts, require access to cyber-safety education. Cyber-safety education for young children is an under-researched area, with little known about how best to teach 4-5 year olds about online safety. In this paper, we present early findings aimed at investigating how early childhood teachers can engage young children in cyber-safety education. We focus specifically on what we have previously called young children's 'internet cognition', arguing that it is not possible to teach children about cyber-safety education until more is known about how they understand the internet in the first instance (Edwards, et al., 2015). In this paper, we draw on Vygotsky's (1987) ideas about 'everyday' concepts to establish an exploratory knowledge-base about young children's 'everyday concepts of the internet' as a platform for cyber-safety education in early childhood.

Literature review

Research into young children's concepts of the internet is sparse. This is despite documented evidence of the rapid uptake of internet-enabled and mobile technologies by young children around the globe (Holloway, Green & Livingstone, 2013). Research shows that young children typically access the internet in the context of their family activities, using family and/or parental devices, such as touchscreen tablets ('iPad') and smartphones (Plowman, McPake, & Stephen, 2010). Activities include: viewing digital media online, sharing parental social media and using child-based entertainment and learning apps. The advent of touchscreen technologies has significantly increased pre-schooler access to the internet. This is because older technologies, such as the desktop or laptop computer, typically limited young children's independent online activity due to their technical reliance on the mouse and/or keyboard as an input device. Operating these devices required complex fine motor and literacy skills of young children that frequently meant they could not use a computer to access the internet without adult support (Romeo, Edwards, McNamara, Walker & Ziguaras, 2003). In contrast, touchscreen technologies are highly user-friendly for young children requiring only the capacity to point, touch, and/or drag items on the screen for their operation. Digital media and apps targeted towards young children also use a combination of icon display, audio and video to provide operational instructions that allow children to access the internet independently of adult supervision.

With young children now online in ever increasing numbers research is beginning to suggest that they are no safer online than their older counterparts – particularly since there is a marked absence of cyber-safety education suitable for children aged 4-5 years (Grey, 2011). Typical risks faced by young children online include: responding inadvertently to inducements for online or in-app purchases, comprising the security of their devices through the downloading or acceptance of unexpected pop-ups, experiencing inappropriate content and engaging in contact with unknown people (Livingstone, Mascheroni, Dreier, Chaudron & Lagae, 2015). Given young children are now technically able to go online without adult support, many of these risks can (and likely do) occur in the absence of adult supervision. A problem for early childhood teachers (and parents) is that teaching children about cyber-safety presumes that children understand or hold a 'concept' about the internet. At the most basic level, this means understanding the internet as a network of interconnected technologies that allows people to share information and resources via established social practices. A recent European investigation into the digital media practices of children aged 0-8 years in the family home indicated

that children had little to no understandings of the internet, nor what it means to be 'online' (Chaudron, 2015).

The main body of research conducted into children's understandings of the internet has focussed on children aged 5-19 years (Yan, 2009). Yan (2009) investigated children's understandings of the internet according to a technical and social dimension. The technical dimension refers to the internet as a body of interconnected systems, computers and programs across the world. The social dimension refers to the use of the internet by people for communication and information sharing purposes. Yan (2009) found that children typically expressed understandings of the internet across a continuum of 'minimal', 'partial', 'extended' and 'correct' responses. The basis for a 'correct' response was predicated on research Yan (2005) conducted with adults to determine their understandings of the internet. An important finding from Yan's (2009) work was that younger children were more 'bounded' in their understandings of the internet across both the social and technical dimensions, typically viewing the 'internet' as the technology they were using at the time (e.g., the computer), rather than a networked technical and social system. More recent research by Dodge, Husain and Duke (2011) mirrored Yan's (2009) findings by suggesting that 5-8 year olds are typically 'bound' in their thinking about the social and technical dimensions of the internet.

Our own early work in the area of young children's understanding of the internet has focussed on the idea of children's 'internet cognition' or their 'thinking about the internet' (Authors, 2015). To theorise this early work we have considered internet usage from a sociocultural perspective as a social practice using technologies as tools that enable online activities. This perspective highlights the role of context in young children's likely conceptualisations of the internet because social practices and tools are contextually based. While research into children's concepts of the internet is limited, conceptual development in the area of science education is not (Harlen, 2010). Research into early childhood science education, shows that children's contextual experiences are critical to determining their understanding of a given phenomenon (Robbins, 2005). For example, the concept of chemical change is contextualised for children according to their experiences of cooking food. Young children understand that food changes state when heat is applied and it is cooked (Fleer & Raban, 2007). In science education, teachers now focus attention on children's contextualised experiences rather than assuming their concepts are 'wrong' because they are qualitatively different to those held by adults. 'Bounded' social and technical concepts of the internet may be more a function of using adult concepts of the internet as a yardstick for children's understanding than they are a reality of what children actually think or understand about the internet.

Theoretical framework

Sociocultural theory understands young children's conceptual development as tied to their contextualised experiences. All experiences for young children occur within any given context. Context is important because it gives rise to the practice of activities, and the use of cultural tools for mediating the achievement of an activity (Chaiklin, 2011). Vygotsky (1987) argues that the process of conceptual development commences with young children's 'everyday' concepts. Everyday concepts derive from children's daily practices and tool use – such as using a toothbrush to brush their teeth after eating. The opposite of an everyday concept is a scientific concept. A scientific concept provides an explanation for how and why things work, for example, 'brushing teeth removes food that can cause tooth decay'. Vygotsky (1987) showed how merging an everyday concept with a scientific concept produced a 'mature' concept. A mature concept is achieved when a child understands the reasoning from a scientific perspective behind an everyday concept – that is, 'we brush our teeth after eating because it removes food that might otherwise cause a cavity'. Mature concepts are significant

for young children because they have explanatory power (Gelman & Kalish, 2006). They can be used by children in their decision-making, reasoning and problem-solving - 'I don't feel like brushing my teeth right now, but I will anyway because I don't want to risk getting a sore tooth'.

Given sociocultural theory relates conceptual development to children's contextualised experiences, we argue in this paper that children's 'internet cognition' may be more effectively understood according to *their concepts of the internet*. For young children, this means better understanding their everyday concepts of the internet. Research shows that when teachers understand young children's everyday concepts about science that they can actively focus on merging these with scientific concepts to help children develop mature concepts (Fleer, 2009). With young children online in increasing numbers, and often 'little aware' (Chaudron, 2015) of the internet, it is increasingly necessary that children's concepts of the internet are developed as a platform for engaging them in learning about cyber-safety.

Methodology

Design

The findings reported in this paper are derived from a broader pilot-study project conducted as a randomised trial. The randomised trial involved two groups of teachers and children – an intervention group and a control group. The purpose of the pilot-study was to identify young children's internet cognition and consequent levels of cyber-safety awareness. The intervention was represented by teacher designed play-based learning experiences intended to foster young children's cyber-safety knowledge based on their internet cognition. To identify the efficacy of the intervention on young children's cyber-safety knowledge we conducted baseline and post-intervention interviews with the participating children. In this paper, we report only from *the baseline interview conducted with both groups of children* – focussing particularly on their internet cognition. This is a deliberate decision intended to concentrate attention on our understanding of young children's 'everyday concepts' of the internet.

Participants

Participants included 3 educators in the intervention group and 1 educator in the control group (n=4). Educators were recruited using convenience sampling (Cohen, Manion & Morrison, 2011). All 4 educators held qualifications at the Bachelor of Education level (4-year) or higher. All four educators also had at least 5 years teaching experience. Teachers were randomly assigned to the intervention or control group.

Child participants included 48 children in the intervention group and 22 children in the control group (n =70). Children were recruited via class invitations sent to parents/guardians. Consistent with principles from the researching with children literature (Dockett, et al., 2011), all children were invited to provide assent for their own participation. Of the 70 assenting children 36 were female and 34 were male. Children were aged between 4-5 years. Children were of mixed Asian and Western-European heritage. Participating children were from an area of middle-upper socioeconomic advantage (Australian Bureau of Statistics, 2015).

Design and conduct of the interview

Given the current lack of research into young children's internet cognition we were not able to source a pre-existing interview schedule to use with the children. The interview we used was therefore purpose designed. Findings reported in this paper were generated using the first trial of the interview

schedule. In another publication we detail the development, trial and consequent adjustments to the schedule (Authors, under amendment). For the purpose of this paper we provide a brief overview.

The schedule was designed through an iterative process of literature review and question design by participating team-members. The literature review canvassed three main bodies of literature, including: 1) young children's technology use from a sociocultural perspective (Plowman, 2015); 2) young children's understanding of the internet and cyber-safely knowledge (Yan, 2009); and 3) contemporary approaches to researching with children (Fargas-Malet, et al., 2010). An inductive analysis of the first two bodies of literature generated six main 'considerations' for interviewing young children about their internet cognition and cyber-safety knowledge. These included: a) technology as tool, b) control of technology as tool, c) social practices when using the internet, d) perceptual bounding; e) conceptual bounding; and f) cyber-safety practices in context. For each consideration, team-members brainstormed a range of questions to be asked of children. During this process team-members paid particular attention to the researching with children literature – including approaches to children's meaning-making during research participation such as: responding to narratives, using child-centred means of response, drawing, providing children with adequate opportunity and time for response (Langston, et al., 2004). A draft interview schedule was developed from the questions and child-centred approaches. The draft was circulated amongst the team and refined. The final version included nineteen questions.

Five of the nineteen questions invited children to indicate which of a range of objects (tools) and apps they thought used the internet. This was conducted using laminated pictorial objects (e.g. books, a laptop, phone), laminated life-size apps and a laminated life-sized iPad. Children's responses to these questions were recorded as 'yes/no' and used to establish familiarity of the internet and internet-enabled tools. Another five questions invited children to respond to a narrative about two young children called Harn and Ella. Harn and Ella were involved in a series of cyber-safety incidents (such as clicking on a pop-up, or responding to requests for personal information from unknown people online). These questions were recorded using a traffic light system (e.g. red for 'disagree'; yellow for 'maybe' and green for 'agree') as a Likert scale to identify children's levels of cyber-safety knowledge. Nine of the remaining questions were qualitative and invited the children to discuss their understanding of the internet, talk about who used the internet in their families and to draw a picture of the internet. These responses were used to establish young children's familiarity with the concept of the internet. Individual interviews were used with the children because the pilot-study project was designed as a randomised control.

The interview schedule used the term 'internet' in conjunction with 'web' and 'online' since the children may have been more familiar with one term than another. We recognise that these terms are not synonymous but for the purposes of the interviews they were felt to provide the children with an appropriate orientation to the focus of the study. The interview schedule was used with the children by three research assistants, each with prior experience working as early childhood educators in the field. The research assistants held regular debriefings after the conduct of each period of interviewing. This was to ensure consistency of approach in working with the children and in the conduct of the interview schedule. All interviews were conducted with the children during the course of normal programmed learning experiences in the main classroom. Interviews were conducted one-on-one with children in a quiet corner of the main classroom. The interviews typically took about 15-20 minutes to complete per child. Interviews were audio-recorded and later transcribed by a professional transcription company abiding to a signed confidentiality agreement. It should be noted that the findings reported in this paper be read with caution given they are generated from the trial use of our schedule, and in the context of a small scale pilot-study.

Data analysis

For this paper, data analysis focussed on children's familiarity with the concept of the internet. First, we calculated the percentage of children indicating familiarity with the concept of the internet in response to the question: 'have you heard of the internet/online/the web?' For this question a 'yes' response was recorded for children who provided either a contextualised practice-based ('grown-ups use it') or tool-based ('the internet is the iPad') response. 'Yes' responses from the intervention and control group were then combined. The qualitative responses from these children were then collated. These included children's descriptions of the internet, drawings of the internet, and discussions regarding family-use of the internet. In this paper we focus specifically on the 'yes' responses provided by children, chiefly because the 'no' responses did not allow significant quantity of data for further analysis. Qualitative data was deductively coded using the informing theoretical perspective of the study (Pope, Ziebland & Mays, 2000) – specifically, that sociocultural theory promotes the significance of contextualised practices and the use of tools as enabling everyday concepts for young children (Chaiklin, 2011). The initial deductive framework therefore included: 1) 'contextualised practices', and 2) 'tool-based' as sensitizing concepts for the identification of young children's everyday concepts of the internet. Children's responses to each of the qualitative questions were then broadly coded to either the category 'Contextualised practices' or 'Tool-based'. Following categorisation of the responses to either one of these two codes, an inductive analysis was conducted. Inductive analysis enables the generation of common categories within a given data set (Thomas, 2006). For each category, three main sub-categories were identified these included: 1) Family; 2) Information; and 3) Entertainment.

Findings

Just under half of the participating children from the combined intervention and control groups indicated a level of 'contextualised practice' or 'tool-based' familiarity with the internet (41%). The remaining children (59%) did not appear to indicate 'contextualised practice' or 'tool-based' familiarity with the internet.

Inductive analysis of the qualitative responses provided by children in the 'familiarity' group indicated three main sub-categories comprising children's everyday concepts of the internet. These were:

1. Family: use of the internet by and for family members
2. Information: to access and/or produce information
3. Entertainment: to enjoy movies/games for fun and/or relaxation

Table 1.0 summarises children's everyday concepts of the internet according to 'contextualised practices' and 'tool-based'. Typical responses by children for each everyday concept of the internet are also presented (Auerbach & Silverstein, 2003).

Insert Table 1.0 here

Table 1.0 illustrates children's understanding of the internet per concept. For example *family*, *information* and *entertainment* concepts located under 'contextualised practices' suggest the internet is understood by children in terms of who uses it and why (e.g. 'daddy uses the internet for work'). *Family*, *information* and *entertainment* concepts located under 'tool-based' suggest children understand the internet in terms of the technologies that enable online access, who uses the tools that

enable access and how the technologies operate (e.g. 'the internet has wavy-wiry bits that make it work'; 'Daddy makes the electricity work').

Discussion

Cyber-safety education for young children is increasingly necessary given the rate at which they are now accessing the internet and going online using touchscreen technologies (Holloway, Green, & Livingstone, 2013). Existing approaches to cyber-safety education are predicated on users understanding that the internet represents a technologically and socially connected system through which people share information and data without necessarily knowing each other (see for example: Heider, 2015). This understanding, or 'mature' concept of the internet provides a platform against which older learners are able to justify why they are taught not to talk to unknown people online, to avoid clicking on potentially virus-laden pop-ups, and why they might stumble upon (or deliberately find) inappropriate content online. The findings from this baseline phase of our broader pilot-study project suggest that young children's concepts of the internet must be understood as a significant influence on their cyber-safety education.

We attend first in this discussion to the finding that children are unfamiliar with the internet. Chaudron (2015) found that young children were 'little aware' of the internet and did not know when they were online (p. 7). In our study, the question pertaining to familiarity with the internet asked the children if they had 'heard of the internet/online/the web?' A 'yes' or 'no' response indicated the extent to which qualitative data was additionally considered for young children's everyday concepts of the internet. This suggests a possible flaw in our interview schedule design (and consequent analysis), such that the immediate question may have been inappropriate for young children rather than proving a perceived limitation in their everyday concepts of the internet. Redesigning the interview schedule so that it does not first ask children if they have 'heard of the internet/online/the web', and instead focusses on familiar internet practices and tools may show that most children do in fact hold a corpus of everyday conceptual knowledge about the internet that has yet to be identified - or effectively tapped into by existing research. This suggestion requires immediate attention given the sheer rapidity of internet use amongst 0-8 year-olds is failing to keep pace with the knowledge base regarding young children's concepts of the internet. Either there is indeed a population of children who are 'little aware' of the internet (Chaudron, 2015), or research has thus far failed to effectively identify what these young children *do* understand about the internet. This being despite our best efforts in this study to pay particular attention to the contextualised aspect of young children's 'internet cognition'.

Next we consider the finding that forty-percent of the child participants in our study indicated familiarity with the internet. Drawing on sociocultural research, 'familiarity' was defined in terms of contextualised practices and tool-usage as the site for everyday conceptual knowledge development. Everyday concepts of the internet for these children included, 'family', 'information' and 'entertainment'. These concepts challenge the notion of children's concepts of the internet being 'bounded' to the technology they are using at a given time as suggested by Yan (2009). This is irrespective of the form of technology used – desktop computer or tablet technology as the concepts pertain to the internet in terms of information or entertainment usage by family members rather than the technology per se. Instead, an everyday perspective highlights a significantly developing knowledge base about the internet in young children's daily lives. This includes everyday concepts about the internet, according to how and why the internet is used, who regularly uses the internet and the role of technological tools in internet use. For example, the child who said: '*I know what the internet is, you can get stuff off it, games and you can play on the iPad and stuff or iPhones*'

illustrates an understanding of the internet as hosting content and somewhere to access 'stuff' (information and games). Likewise, another child describing the tools that enable internet access, who uses the internet and why stated: *'You can go on computers or iPads or phones. My sister, my mum and dad use it. My sister signs her emails on it. My mum and dad write it and click it. In Australia, that is what you do*.' Here, there is a level of awareness of tools (e.g. computers, iPads, phones) that enable internet access, the social practices (e.g. emails, writing and clicking) associated with using web applications and what people (e.g. Australians) commonly do when using the internet. While our findings suggest that only some of the children were familiar with the internet, identifying young children's everyday concepts about the internet nonetheless provides a starting point for engaging in thinking about how best to provide cyber-safety education for young children.

In the absence of pedagogical knowledge regarding the appropriate provision of cyber-safety education for very young children it may be tempting for educators and policy-makers to simply adapt existing cyber-safety education intended for older children for young learners. However, understanding children's everyday concepts of the internet suggests an alternative approach. Instead of adapting existing approaches to cyber-safety education intended for older children, early childhood teachers can work explicitly with young children's everyday concepts of the internet and provide access to a scientific concept of the internet, such that young children's mature concepts of the internet are fostered. Research shows that when teachers focus attention on scientific concepts in children's science learning that they can build their mature concepts (Fleer, 2009). Mature concepts are known to promote children's problem solving, reasoning and decision-making because they have explanatory power (Gelman & Kalish, 2006) – this suggests benefit in developing young children's mature concepts of the internet as a platform for cyber-safety education. If a young child knows that the 'internet' regularly used by her 'daddy at home', or on which she 'watches movies' also comprises a network of digital technologies used by many people then she has a conceptual basis from which to understand why it is necessary to engage in cyber-safety behaviours. Figure 1.0 illustrates the potential merging of children's everyday concepts of the internet with a scientific concept of the internet so as to foster young children's mature concepts of the internet as a platform for cyber-safety education.

Insert Figure 1 here

As an analogy, children are provided with road safety education practices predicated on an understanding of vehicles and roads so that they know why it is important to look both ways before crossing the road, or why they should hold the hand of an adult. To understand the importance of road safety, children do not necessarily need to know how a car works - but they do need to know what constitutes a car and road use. In terms of cyber-safety education, children do not necessarily need to know the complexities for the internet, nor specifically how it works (in fact many adult users do not hold this knowledge). However, there is potential value in building children's everyday concepts of the internet into mature concepts so that children understand that what they are using comprises many interconnected technologies enabling social interactions amongst many, many people.

Limitations

The findings reported in this paper are derived from a small-scale pilot study. The findings are therefore not generalizable to a larger population of children. In addition, the findings are limited given were not able to further analyse the responses of children indicating 'no' awareness of the internet. We contend that 'no' responses may have been the likely consequence of our framing and

presentation of the question to the children. We discuss the limitations of the interview scheduled used with the children in further detail in Edwards, et al., (2016).

Conclusion

The rapid uptake of internet-enabled mobile technologies by young children has increased levels of internet access by young children from around the globe. Now online in increasing numbers, pre-school aged children are in need of cyber-safety education that attends specifically to their learning needs. In this paper, we have argued that prior to thinking about the provision of cyber-safety education that it is necessary to first establish what children understand about the internet. Drawing on Vygotsky's (1987) ideas about conceptual development, we have illustrated that it may be possible to learn more about children's everyday concepts of the internet and to develop these into mature concepts as a platform for early learning about cyber-safety education.

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Statements on open data, ethics and conflict of interest

Requests for data may be made to the corresponding author

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The authors do report any conflicts of interest

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