THE DIGITAL LITERACY SKILLS AND COMPETENCES OF CHILDREN OF PRE-SCHOOL AGE

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ABSTRACT

In this paper, the nature of the skills and knowledge developed by young children when using tablets is explored. The paper reports on a study of young children's use of tablets and apps in the UK. A survey was completed by 2000 parents of children aged 0-5 on children's tablet use, and case studies were undertaken of six children in which their use of tablets in the home was explored. The findings indicate that parents identify a range of skills and knowledge that they perceive their children acquire using tablets. In addition, researchers were also able to identify many of the skills reported by parents through extensive analysis of over 20 hours of video data of children using tablets. The paper examines the skills and competences identified in these data in greater depth. It is argued that the majority of skills and competences relate to the reception, design and production of texts, and that dissemination of texts is the least well-developed area for children of this age group. The implications for early childhood education policy and practice are considered.

KEYWORDS

Digital skills, digital competences, digital literacy

SOMMARIO

In questo lavoro, viene indagata la natura delle competenze e delle conoscenze sviluppate dai bambini quando fanno uso dei tablet. L'articolo riporta i risultati di uno studio sull'uso dei tablet e delle app da parte dei bambini nel Regno Unito. È stato somministrato un questionario completato da 2000 genitori di bambini di età compresa tra 0-5 sull'uso del tablet da parte dei bambini, e sono stati realizzati sei studi di caso per esplorare l'uso del tablet a casa da parte di sei bambini. I risultati indicano che secondo i genitori i loro figli acquisiscono una serie di competenze e conoscenze mediante l'uso dei tablet. Inoltre, anche i ricercatori sono riusciti ad individuare molte delle abilità indicate dai genitori attraverso l'analisi in profondità di oltre 20 ore di dati visuali di bambini che utilizzano il tablet. L'articolo prende in esame le capacità e le competenze individuate attraverso questi dati in modo più approfondito. Si sostiene che la maggior parte delle capacità e competenze si riferiscono alla ricezione, progettazione e produzione di testi, e che la diffusione di testi è l'area meno sviluppata nei bambini di questa fascia di età. Vengono infine considerate le implicazioni per le politiche e la pratica per la prima infanzia.

PAROLE CHIAVE

Abilità digitali, competenze digitali, digital literacy

1 Digital literacy: skills and competences

There is growing evidence that many children are immersed in a digital land-scape from birth. Studies indicate that young children use smartphones and tab-lets to play games, watch catch-up television on tablets and replay their favourite films on YouTube, amongst other things (Chaudron et al., 2015; Marsh et al., 2015). Inevitably, children develop a range of skills and competences through their use of technology, although yet there is, as yet, little discussion of what these might be. In this paper, consideration is given to the kinds of skills and competences children develop when using tablets, drawing on a study conducted in the UK.

«Digital literacy» is a term frequently used to refer to the digital skills com-petences children and adults may acquire through the use of digital technologies (e.g. JISC, 2014). It has, according to Barton (2007), become a metaphorical term, as is the case with other phrases in which literacy is used to signify skills and competence, such as «computer literacy», «information literacy» and so on. Digital literacy can be defined as «a social practice that involves reading, writing and multimodal meaning-making through the use of a range of digital technolo-gies» (Sefton Green et al., 2016).

Digital literacy does involve the acquisition of skills, including traditional skills related to alphabetic print, but also skills related to accessing and using digital technologies. The model developed in this paper can be situated theoretically with-in the framework of New Literacy Studies (NLS) (Street, 1995), in which literacy can be viewed as a situated social practice that is shaped by specific social, cul-tural, economic and political contexts and is always ideological, that is, always carries particular meanings and is imbued with power. This is in contrast to an autonomous model of literacy in which literacy is defined as a discrete set of neutral skills (Street, 1995).

The skills and competences related to digital literacy have been defined in numerous ways (e.g. Belshaw, 2012; Dudeney, Hockly & Pegrum, 2012; JISC, 2014), each typology shaped by its author's particular understanding of literacy, which is usually used in a metaphorical sense, as Barton (2012) has suggested. In this paper, a model of digital literacy is drawn upon which is rooted in NLS and informed by research on multiliteracies (Cope & Kalantzis, 2000) and multimo-dality (Kress, 2010). That is, the emphasis is on the way in which young children create and understand texts drawing on a range of modes including the written word, still and moving image, sound and so on (Flewitt, 2013).

In considering literacy as a social practice Green (1988) suggests that there are three dimensions involved – the operational, cultural and critical. Operational ele-ments involve the skills required to read and write – using those terms in their wid-est sense, to include the reading/viewing and designing/ producing of multimodal texts. Acquiring operational skills means learning to use meaning making systems, such as learning the letters of the alphabet, or understanding generic conventions.

http://riviste.erickson.it/med

Cultural competences relate to the way in which an understanding of texts is rooted in the cultural environment in which they are created and/ or experienced.

Sociocultural theories of literacy have identified how context matters; texts and artefacts cannot be fully understood without taking account of the circumstances in which they were produced (Comber, 2016). The third element of the model, the critical, emphasises the need for critical engagement with texts of all kinds in order to identify the power relations at work when they are engaged with. All texts are socially constructed and by nature perspectival and selective of specific knowledge. As Comber (2016, p. 12) suggests, «the operational and cultural dimensions work to enculturate or socialize the learner into dominant forms of cultures». Critical skills enable children to deconstruct texts and artefacts in order to recognise and understand these dominant forms.

More recently, Colvert (2015), in her conceptualisation of the «ludic literacies» that occur in learners' engagement with alternate reality games, has adapted the model of Green (1988) to identify the way in which the processes involved in meaning-making (design, production, dissemination and reception) can be inflected by all three dimensions. This might be explained by focusing on the actions of rhetors. A rhetor is an individual who wishes to communicate a message. The message can take the form of a text or artefact. It is important to acknowledge that a text can be defined very broadly – the term does not simply refer to written texts (Kress, 2010). In the design stage, the modes in which the message will be conveyed are decided upon by the rhetor. In the production stage, the producer, who may or may not be the same person as the rhetor/ designer, creates the text/artefact using the mode and media decided upon in the design stage. The producer may or may not meet all of the original intentions of the rhetor/designer (Colvert, 2015). The message is then disseminated through the chosen media, for example paper, the internet, a combination of both, and so on. At the reception stage, the audience engages with the text/ artefact and brings his or her own understandings to that process. At each of the four stages outlined by Colvert (design, production, dissemination and reception), the operational, cultural and critical dimensions of the 3D model are important. For example, in the design stage, the designer needs an understanding of what modes and media mean in a specific cultural context. The producer requires a range of operational skills if he or she is to create a text or artefact effectively. In the reception stage, the audience brings their own critical understandings to the text/ artefact. These processes are embedded in young children's engagement with digital texts and are, therefore, important to trace.

There have been few studies that have identified young children's digital literacy skills and competences. Kazakoff (2015) has developed a model that identifies six components of digital literacy in early childhood: understanding and utilising digital interfaces; non-linear navigation; critical-thinking and problem-solving skills in digital domains; co-operative learning and play afforded by digital tools in early childhood and creative design afforded by digital tools in early childhood. However, the model is a conceptual one and there is limited

empirical evidence that would enable the digital literacy skills and knowledge of children of pre-school as they engage in all six components to be mapped. Of course, this would be a complex task, as different technologies give rise to different sets of skills and competences, whilst embedding some common characteristics. This paper focuses on a study designed to identify the digital literacy skills and knowledge of children of preschool as they use tablets, recognising the significance of context in this task. In the next section, the methodology for the study is outlined.

2 Research Design

This paper reports on a study which was co-constructed between academics, children's media industry representatives and teachers. The aims of the study were to examine pre-school children's use of apps on tablets and identify how far apps for pre-school children (aged 0-5), including apps that incorporate augmented reality, promote play and creativity.

The project had four phases. In Stage 1 of the study, 2000 parents of children aged 0-5 who had access to tablets completed an online survey in which their children's use of tablets and apps was explored. Stage 2 consisted of case studies conducted of six families with children aged from birth to five. Four volunteers from those who had completed the survey, along with two other volunteers who completed the survey following recruitment through local contacts, were selected to ensure that the case study children offered a balance in terms of age, ethnicity, social class and whether or not they had older brothers or siblings. Table 1 provides a profile of the children and families that took part in Stage 2.

TABLE 1
Demographic profiles of the case study children

Family no.	Name (pseudonym)	Gender	Age on first visit	Social Class	Ethnicity	Siblings
F1	Arjun	Boy	3.1	B2	Indian	Sister, aged 10
F2	Jade	Girl	4.11	D	White	-
F3	Amy	Girl	2.11	C1	White	-
F4	Kiyaan	Boy	2.8	A	Iranian	-
F5	Tommy	Boy	6 months	E	White	Brother, aged 6
F6	Angela	Girl	2.3	C2	White	Brother, aged 7

For all case study families, five visits were made to the home over a period of between two weeks and three months. Semi-structured interviews were under-

taken with parents on their children's use of tablets and apps and field notes were completed of visits where appropriate. Five of the children who were able to talk were interviewed about their tablet use. The children were filmed using tablets in the home and engaged in discussion about their activities. In addition, maps of the house were developed and parents and children were encouraged to talk about where children's play and creativity took place across the home spaces. Parents were also encouraged to collect data of children using tablets in between visits using their smartphone or tablets. Finally, three children chose to use Go-Pro Chestcams in order to collect their own data of their use of tablets. Go Pro Chestcams are cameras that enable the capture of actions from the participants' viewpoints, as the cameras are placed in a chest harness and strapped onto the body. They are recommended only for children aged three and over and so the youngest children could not collect this data.

In Stage Three, twelve children aged 3-5 who attended Foundation Stage 1 and 2 classes (Nursery and Reception) in Monteney Primary School were filmed using the top ten apps identified as favourites in Stage 1 of the survey. Children were videoed using the apps, primarily on their own, in a school IT room, filmed by the researchers. Seventeen hours, 21 min and 48 s of video recording were analysed. In the final phase of the study, the apps themselves were scrutinised and a multimodal analysis undertaken of them.

Ethical issues were addressed throughout the study, in line with the British Educational Research Association (BERA) Ethical Guidelines (2011). Children's assent to the research was judged through ongoing assessments of the child's body language in addition to other potential markers of discomfort (Dockett & Perry, 2007). If children appeared to be tired, then the interviews/video recording schedules were adjusted accordingly. Each family was given £100 of vouchers and the tablets purchased for the study were given to the school in order to acknowledge the commitments made to the project.

Data were analysed in a variety of ways. Responses from each question in the survey were cross-tabulated against the following variables: age of child, socio-economic class, ethnicity and gender. Descriptive statistics were produced using the SPSS statistical package. The interview data were transcribed and imported into Nvivo 10. Data were coded deductively against the three dimensions (operation, cultural and critical), and the four processes (design, production, dissemination and reception). The video and interview data were then triangulated and the most salient examples to inform the discussion relating to the dimensions were selected for this paper. In the following section, each of Green's (1988) dimensions are addressed.

3 Digital literacy: the operational dimension

Parents reported that their children had a range of digital skills that could be observed when they were using tablets (see Figure 1).
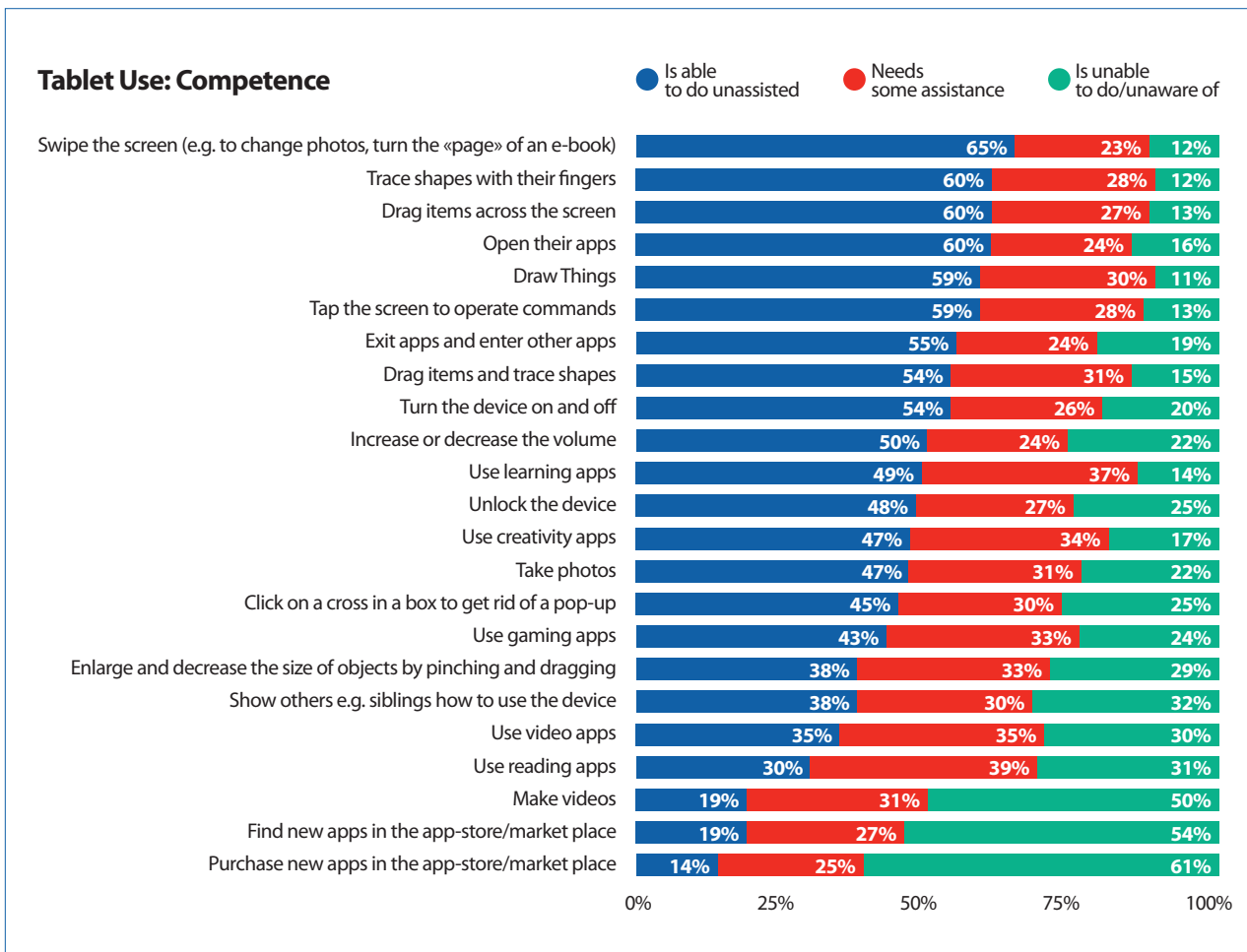
Tablet Use: Competence

● Is able to do unassisted   ● Needs some assistance   ● Is unable to do/unaware of

Skill	Is able to do unassisted	Needs some assistance	Is unable to do/unaware of
Swipe the screen (e.g. to change photos, turn the «page» of an e-book)	65%	23%	12%
Trace shapes with their fingers	60%	28%	12%
Drag items across the screen	60%	27%	13%
Open their apps	60%	24%	16%
Draw Things	59%	30%	11%
Tap the screen to operate commands	59%	28%	13%
Exit apps and enter other apps	55%	24%	19%
Drag items and trace shapes	54%	31%	15%
Turn the device on and off	54%	26%	20%
Increase or decrease the volume	50%	24%	22%
Use learning apps	49%	37%	14%
Unlock the device	48%	27%	25%
Use creativity apps	47%	34%	17%
Take photos	47%	31%	22%
Click on a cross in a box to get rid of a pop-up	45%	30%	25%
Use gaming apps	43%	33%	24%
Enlarge and decrease the size of objects by pinching and dragging	38%	33%	29%
Show others e.g. siblings how to use the device	38%	30%	32%
Use video apps	35%	35%	30%
Use reading apps	30%	39%	31%
Make videos	19%	31%	50%
Find new apps in the app-store/market place	19%	27%	54%
Purchase new apps in the app-store/market place	14%	25%	61%

Fig. 1 Competences of young children when using tablets

The majority of these skills relate to reception, in that they are the skills required to open and use tablets and apps. The actions that most children can do unassisted (swipe the screen – 65%; trace shapes with fingers – 60%; drag items across the screen – 60%; open apps – 60%; draw things – 59% and tap the screen to operate commands – 59%) are the skills most required to navigate many apps for children of this age. For example, the most popular app in this study was YouTube. In order to operate YouTube, children have to:

– tap on the icon to open the app
– swipe the screen to scroll through videos
– tap the «play» button to play the video.

These were all skills that 59% or more of under 5s were able to demonstrate. It was clear that children were able to operate touchscreen technology from a young age. Kiyaan's mum, for example, noted that, «… he was 10 months old and he unlocked the mobile phone with his finger and then it was… and then things developed since then». It seemed that barriers such as passwords were of little challenge to some of the pre-schoolers. Three-year-old Arjun's mum com-

mented, «So he'll always be on tablet, laptop or my mobile. He knows to do all, remove the password, open the password, everything».

Having mastered how to access tablets, children could then navigate many apps independently. They would have strategies to do this that circumvented the fact that they could not yet write, thus were not able to enter search terms. For example, children's favourite videos were often saved by family members and so were readily available for them to scroll through independently, and children would be recommended videos by the app, utilising the usage data the app collected on previous visits. Often, children would choose videos based on the images, as four-year-old Jade's mum commented:

Mum: She struggles to search through the internet, you know, with typing things in like with YouTube and things. But once she's on YouTube she can usually find stuff pretty easy herself. I tend to put her on the kids' section and then she'll sift through and just find videos herself. So usually picks it up quite quickly.

Interviewer: Yeah. How do you think she searches, is she just looking at the selections down the side?

Mum: Yeah, I think she just tends to look at the pictures more than anything, and looks for the ones that look the funniest or the most appealing.

It could be seen that the skills needed to engage with touch-screen technology were relatively easy for young children to acquire. This led to children attempting to use the same strategies to try and access other screen-based technologies, such as televisions, As Arjun's mum observed.

Mum: First, when he got the knowledge of touching the screen he did with the TV the same thing, he used to go and do like this.

Interviewer: Oh, and trying to open it out with his fingers.

Mum: Yeah, zoom and shrink it. But it was not happening, so he came to know not all the things can be zoomed by our fingers.

In addition to having the skills that related to reception of digital texts, some of the skills identified in Table 1 facilitate the design and production of digital texts. For example, 59% of under 5s were reported as being able to draw items on tablets. This skill was demonstrated most frequently in the study as children used drawing apps, such as Peppa Pig Draw. Children were competent in the use of a range of creative apps, including painting, making music, building with blocks and story creation. Children also created videos, or used simple photo editing apps. For example, Arjun's mum said of her three-year-old son:

... He does some editings on drawing or something like that. And he saves... he takes his own pictures, he has some app like that. He takes his own pictures and he does some editing on that.

In the observations of children using tablets in homes and the classroom, it was the case that design was integral to the production process. Children chose appropriate modes based on their knowledge of the modes' affordances. They, as Kress would suggest, chose the most suitable, or apt, mode for their purpose. Kress (2010, p. 156) argues that «Aptness focuses on "fitness for purpose": this is the best fit (the most apt) for this purpose». The process of identifying the affordances of apps appeared to be largely trial and error, with parents often reporting that their child resisted direct instruction.

In terms of disseminating texts they had produced, there was little evidence of children aged under 5 engaging in this practice. The exception in the case studies was three-year-old Arjun, who had learned how to automatically upload his achievements to his mum's Facebook account. Once his mum learned he was able to do this, she ensured that she signed in and out of the app, rather than leaving it constantly linked to her Facebook account:

Mum: The app is there but right now I have signed it off. When I do I'll just sign in and I'll go and do that. I'll not just keep it open and keep signed in, I don't do that.

Interviewer: Yes. And what happened that time, did he manage to do anything or did you manage to…

Mum: Yeah. As I said, one is there for the tracing the letters, he used to trace the letters and he used to share on the Facebook. And they used to come on the Facebook, «I'm trying to trace this letter», and everybody was telling me this.

Interviewer: Gosh, so he did that himself?

Mum: Yes.

Interviewer: And without your knowing?

Mum: Yeah, without my knowing. Then accidentally I opened my Facebook on my phone and I just saw there were two Likes or something for that. Then I came to know, «Oh this has been done by him», so I just signed it off from the tablet.

The data thus indicates that very young children acquire a range of digital literacy skills from a young age in the «operational' domain, which means that they have the technical skills and expertise to design, produce, disseminate and engage with texts as a reader/viewer. They are more skilled in the area of text reception, design, and production than dissemination, due to the technical skills required to upload texts to websites, although, as the example shared by Arjun's mum illustrates, dissemination is possible when an automatic transfer facility is embedded within the app. Whilst the range of skills young children acquire is impressive, they are insufficient to provide children with the ability to operate effectively as designers/producers and readers/reviewers in a complex digital world. Children need also to develop an understanding of the social and cultural aspects of digital literacy.

4   Digital literacy: the cultural dimension

The cultural dimension of digital literacy relates to the way in which producers and readers of texts draw on their social cultural contexts in the design/production and reading/viewing processes. All text production and reception takes place within specific cultures, and this inevitably impacts on those processes.

In terms of design and production, there was evidence in the data of children drawing on their own daily experiences as they constructed texts. For example, Jade's mum describes how she enjoyed creating slideshows of photographs which drew from her everyday lifeworld:

Mum: Yeah, just like, you know like just out loud, she'll go through them and she'll say, «So and so was doing this» and she'll make things up that were going off in the house that weren't really going off in the house, do you know what I mean? So she'll use several pictures and connect them up using a storyline...She'll do it, because you can put them on like a slideshow can't you where you can just have them like moving along on their own, and that's how she tends to do it.

Interviewer: Does she know how to set it up on a slideshow herself?

Mum: Yeah she does, yeah... they're slightly harder to work on the tablets than they are on the phone, and I tend to have to show her the slideshow on the tablet. But she can do it on her phone.

Interviewer: Oh that's lovely, I really like it. What sort of things are the stories about, can you remember anything now?

Mum: Oh all sorts of things, just like make-believe stories about princesses, and her, and her dolls and everything. You name it, she makes a story up about it.

In addition to demonstrating the operational skills required to set up the slideshow, which are not insignificant, Jade demonstrates how she draws from her own interests and lifestyle to create the slideshow. A reader/ viewer of this text would need to know something about that lifestyle in order to fully understand it; for example being familiar with the types of popular cultural artefacts and texts Jade engages with, such as Disney princesses.

In all of the case studies, parents offered rich accounts of their children engaging with their cultural worlds in this way. Whilst contemporary popular culture did feature largely, as is the case in children's digital literacy practices (Marsh, 2013), this was not always so. For example for Kiyaan, a popular pastime was searching for Iranian traditional songs on YouTube, songs that were known and well-loved by his parents from their own childhoods.

There was widespread evidence of transmedia play and digital literacy practices in which children's cultural interests shaped their use of apps, and also in which use of apps fostered an appetite for the consumption of particular cultural texts. For example, Arjun's mum described how her son moved seamlessly from television programmes to apps, and vice-versa:

> ... sometimes what happens, when he sees a programme, like Tree Fu Tom or something, he just comes down, he opens the app and he starts playing Tree Fu Tom. Like Super Why, he sees something, he thinks «This time was not enough for me», he comes down, he opens and he starts playing once again with that.

Because the children in the study were embedded within a popular cultural milieu in which particular artefacts, texts and discourses had iconic status, they were able to make meaning from many of the unfamiliar apps and digital texts they encountered. For example, some of the children filmed in the classroom had not used the «Minecraft» app previously, they were all familiar with «Minecraft» brand through exposure to it from a range of sources, such as older siblings' play, or through watching «Minecraft» videos on YouTube. They were, as a consequence, keen to use the app themselves. Cultural knowledge, therefore, shaped both reception of digital texts and design/ production of them.

In Green's (1988) 3D model, the cultural dimension also enables an understanding to be developed of how children acquire the socio-cultural knowledge that informs their everyday digital literacy practices. For example, all of the parents in the case studies reported that their child used apps such as Skype regularly, often independently, as Amy's mum commented:

Mum: … my mum and dad live in Stockport which is where I'm from, and so we Facetime most days really.

Interviewer: Yes. So does Amy ever initiate that?

Mum: Yeah, she knows how to do it and she's done it a couple of times without me knowing.

Through observing adults engage in digital literacy practices themselves, children were, thus, enculturated into the cultural practices associated with technologies. In addition, social interactions with other children sometimes led to children adopting particular digital practices, as Jade's mum noted:

> … she's slightly more into music a little bit more since she'd seen… the girl next door is really into music, she's always got headphones in be it on the tablet or on the phone, and she's always got music clips on, and that seems to have rubbed off on Jade slightly. Because she's been asking me about… she were never really bothered but she's been asking me about YouTube and putting YouTube on, so I think that's definitely come from the girl next door.

The cultural dimension could thus be seen to shape children's design, production, dissemination and reception of texts. As in the previous domain, examples of dissemination practices were limited and related primarily to the use of apps such as Skype. Nevertheless, the data pointed to the way in which the complex social and cultural lives of children shaped their everyday digital literacy practices and enabled them to develop skills and competences which ensured culturally-relevant use of touch-screen technologies.

5   Digital literacy: the critical dimension

The critical dimension of digital literacy engages designers/ producers and readers/ viewers of texts in critical thinking and analysis. Questions relating to how far texts embed or have been shaped by power relations are key to understanding this dimension, as it was originally conceived by Green (1988). Texts are imbued with the values and meaning systems of their producers, and engaging in critical analysis requires asking questions about positioning of audience and the effectiveness of text in meeting its aims, amongst other areas. As Luke and Freebody (1997, p. 193) argue, «all texts are motivated – there is no neutral position from which a text can be read or written».

In this reading of the critical dimension, critical engagement was not as apparent as the other two dimensions in the children's digital literacy practices. There were no instances, for example, in which children were observed commenting on the power dynamics embedded within particular texts. It is, however, important to note that children were not asked questions which may have demonstrated their critical literacy skills and knowledge, and it may have been the case that children did deconstruct the texts that they encountered, but they did not articulate this. It is clear from Vasquez and Felderman's (2013) work that it is possible for young children to demonstrate critical digital literacy skills when adults provide them with opportunities to do so by asking specific questions, or shaping activities in specific ways.

Further, there is a need to move beyond readings of critical digital literacy that focus on the text, to an understanding that knowledge production and transformation involves some level of criticality, as the selection of modes and media in the creation of texts requires critical engagement and reflection (Kress, 2010). Whilst this differs from the kinds of critical literacy skills utilised when examining power within texts, these are still very important skills, and important for the development of critical reflexivity. This kind of critical thinking was in evidence as children decided upon which mode or media they would use for a specific communicative act. In addition, children sometimes reviewed the texts they had produced, amending them as necessary based on their critical reflections about the extent to which the text embedded their intentions, as the field notes from a classroom observation noted:

> Catherine (aged 4) opened «Minecraft». She began by choosing a tool (a torch), but when she went back to the screen depicting the world, it was dark. She clicked on the icon of a stone in order to begin building, but it was obvious that she did not know how to use the torch to light up the terrain. She explored some of the menu options until she logged out of that world and was able to log into another, in which the world was depicted in daylight. She explored the terrain using the arrow keys, trying to find somewhere to start building. However, she ended up deep under the sea and, not wanting to build there, she exited the screen to access the control menu.

> (Field notes, March, 2015)

In navigating the app in this way, Catherine demonstrated the ability to reflect critically on her actions, trying various options to achieve her aim of building in the world, then deciding that she could not meet this aim and therefore exiting the app. Such critical reflection is required with numerous apps that promote creativity if a designer's/producer's intentions are to be met and there were many examples in the data of young children being able to refine and enhance their digital texts in this way. Whilst this reading of the critical dimension might seem very different to the one proposed by Green (1988), there is no need to view them as dichotomous. Rather, it can be argued that «critical self-reflection might be used to explore the relationship between personal, affective responses to digital texts and broader ideological concerns» (Pangrazio, 2016, p. 171). This is an approach that Comber (2016) has demonstrated is possible in relation to both print-based literacy practices and digital literacy practices in Australian primary classrooms, and is a model that can inform early childhood pedagogy and practice.

6 Discussion: processes and dimensions

The analysis outlined in this paper indicates that young children's digital literacy practices can be mapped across all four of the processes outlined in Colvert's (2015) model of ludic literacy (design, production, dissemination, reception). They develop digital literacy skills that enable them to be competent in these four processes. Table 2 offers a summary of the skills identified in this study, with consideration of how they relate to the 3-D model of literacy (Green, 1988).

TABLE 2
Domains and processes of digital literacy

		Domains of text production/reception		
		Operational	**Cultural**	**Critical**
Processes involved in text production/reception	Design	− Choose appropriate modes based on knowledge of their affordances	− Draw on knowledge of socio-cultural contexts in choosing modes	− Critically appraise modes in order to identify those most appropriate for the task in hand
	Production	− Draw things − Drag items and trace shapes − Use creativity apps − Take photos − Enlarge or decrease the size of objects by pinching and dragging − Make videos	− Draw on knowledge of socio-cultural contexts when producing texts	− Review own work to ensure it meets intentions and adjust accordingly

| | | Domains of text production/reception | | |
		Operational	Cultural	Critical
Processes involved in text production/reception	Dissemination	– Tap the screen to operate commands in order to disseminate a text		
	Reception	– Swipe the screen – Trace shapes with fingers – Drag items across the screen – Open apps – Tap the screen to operate commands – Exit and enter other apps – Drag items and trace shapes – Turn the device on and off – Increase or decrease the volume – Unlock the device – Click a cross in a box to get rid of a pop-up – Enlarge or decrease the size of objects by pinching and dragging	– Identify texts they wish to engage with through social and cultural encounters – Draw on own social and cultural experiences in making sense of the text – Relate the text to one's own life experiences	– Make judgements about texts which inform how far they are engaged with

From this summary, it can be seen that there are particular areas that are not as well developed as others the children of this age group. Specifically, many children do not engage in the digital dissemination of texts. They frequently, of course, disseminate the printed texts they produce, as they give their parents a letter, or their siblings a drawing, but the technical skills required to disseminate texts using digital means are normally too difficult for them to acquire. It could be argued that participating in Skype, or the use of similar apps, involves dissemination of (oral) texts, and there was certainly evidence that children demonstrated both operational and cultural skills in this regard.

In addition, the data indicate that children demonstrated more skills and competence across operational and cultural dimensions, whereas the critical dimension was less frequently observed in the data. It could be seen that children did use their critical judgements when choosing which apps to use, or in reviewing and amending their own work, which can lead to engagement with issues of ideology, although that was not observed in the datasets in this study. This may not be surprising if we consider the way in which stages of development impact on the acquisition of skills and knowledge. Without suggesting that a rigidly linear model of cognitive development is followed, it is the case that older children are more likely to demonstrate wider engagement in critical digital literacy practices. For example, Bulman (2015) conducted a longitudinal study children's reading of moving image media, which indicated that children's critical engagement

with the material was related to their age and their previous experience of moving image media. Older children were more likely to ask questions about film producers' authorial intent, for example. Vasquez and Feldman's (2013) work illustrates the powerful effect that educators can have on extending children's critical literacy skills but in this study, the focus was on observing children's practices rather than intervening in them in order to enhance them in any way. Nevertheless, there was evidence of young children's critical reflection in their role as knowledge producers and transformers, which are important aspects of their digital practices.

7 Conclusion

This paper has considered the digital literacy skills of young children in relation to four processes involved in text production (design, production, dissemination, reception) and three dimensions (operational, cultural and critical). It offers new understandings of young children's digital literacy skills and knowledge, which are important to document as we move ever more rapidly through the digital age. It is clear that, even from a young age, children are able to operate effectively as digital authors and readers, navigating technological worlds with confidence and competence relative to their age.

Of course, one disadvantage of examining the children's digital literacy skills and in this manner is that it necessitates a separating out of these areas. This is necessarily limited when we consider, for example, that design and production often take place simultaneously, as was clear in some of the data. In addition, in relation to the 3-D model of literacy, Durrant (2012, p. 93) suggests that it can be considered using the metaphor of three-bladed fan, in which the blades can be viewed separately when dormant, but when switched on, the blades mesh. Thus the operational, cultural and critical dimensions inter-relate, and digital literacy practices will be shaped by all three, although the weighting of these will differ across practices.

Nevertheless, what this analysis indicates is that there are some areas of young children's digital literacy skills that are more developed than others, as outlined above. There are two main points to note here. First, it cannot be assumed that all young children develop digital literacy skills in a seamless manner. The concept of the «digital native» has been widely critiqued (Thomas, 2011), and it is certainly the case that in this study, there was no indication that all children had developed the same range of skills and knowledge. For example, the operational skill that most children demonstrated, being able to swipe a tablet, was not identified as pertinent to their child by 45% parents, a significant minority. The implication of this is that early years practitioners should not make any assumptions about children's prior digital literacy competences without close observation and assessment, as that may lead to an exacerbation of difference and a widening of digital divides.

http://riviste.erickson.it/med

The second point to be raised in relation to these findings is that whilst a simplistic «age and stage» model cannot be applied to digital literacy learning, it is the case that the children of preschool age in this study were not able to demonstrate some of the skills and competences identified in older children's use of digital media (c.f. Livingstone & Sefton-Green, 2016). Rather that this being viewed as a deficit, however, it should be recognised that some of the more complex skills required to critically navigate digital texts need extensive experience and practice (Bulman, 2015), and therefore we cannot expect very young children to demonstrate some of these. Instead, we need to view what they can do from an «asset model» (Mackey & Robinson, 2013), which proposes that children of preschool age can demonstrate quite remarkable skills and knowledge, which should be acknowledged and celebrated, and then extended by early years practitioners in appropriate ways.

The study indicates that it would be of value to engage young children in reflections on the forms of dissemination for digital text that might be made available to them, so that they may choose means of dissemination in an informed manner, when they are ready to do so. The study also has implications for media producers. If producers embedded tools within apps that enabled dissemination of texts to be easily undertaken, this would be helpful. This is the case with some apps for this age group, such as «Puppet Pals» and «Sock Puppets», which allow children to share the stories they have created with the press of a button, but such a facility could be made more widespread, with the usual safety protocols being employed.

In addition, early years practitioners could develop pedagogical practices that enable young children to build on their critical self-reflection when using digital technologies and develop a «critical disposition» (Pangrazio, 2006, p. 169), in which they engage critically in all kinds of digital practices, whether that is designing/ producing or reading/ viewing. In relation to young children, the most effective ways of developing such skills and knowledge may well be through play, as has been documented by Wohlwend (2011). In play episodes, children experiment and deconstruct and re-construct texts and artefacts, which involves the process of critical reflection (Wohlwend et al., 2013).

In conclusion, this paper indicates that many children of pre-school age have well-developed digital literacy skills and knowledge in a number of areas. The challenge for the years ahead is to ensure that *all* children have opportunities to acquire and demonstrate such competences, and that children of a pre-school age are challenged to extend their skills, knowledge and understanding appropriately in order to critically engage with all aspects of digital text production, including dissemination of their creations.

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