

## **Digital technology in the early years: A reflection of the literature**

### **LA TECHNOLOGIE NUMÉRIQUE DURANT LA PETITE ENFANCE : LA LITTÉRATURE EN VUE D'ENSEMBLE**

Laura Teichert and Munizah Salman

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#### Article abstract

Early childhood education is rooted in developmentally appropriate practice and play-based learning curricula. In the 21st century, practitioners experience tensions when they are unsure of how to navigate digital childhoods while being confronted with contradictory information. For instance, early learning frameworks recognize the need for children to develop digital literacy skills, yet pediatric societies recommend limiting screen time. Thus, practitioners are left without best practice guidelines that would help them embed technology into early learning environments through pedagogies that align with play-based learning. This review examines research to date on age-appropriate and playbased uses of digital technology that could more naturally fit in preschool and kindergarten classrooms while also highlighting the potential benefits of using tablets in early learning classrooms.



# DIGITAL TECHNOLOGY IN THE EARLY YEARS: A REFLECTION OF THE LITERATURE

LAURA TEICHERT *Western Michigan University*

MUNIZAH SALMAN *EarlyON Child and Family Centre*

**ABSTRACT.** Early childhood education is rooted in developmentally appropriate practice and play-based learning curricula. In the 21st century, practitioners experience tensions when they are unsure of how to navigate digital childhoods while being confronted with contradictory information. For instance, early learning frameworks recognize the need for children to develop digital literacy skills, yet pediatric societies recommend limiting screen time. Thus, practitioners are left without best practice guidelines that would help them embed technology into early learning environments through pedagogies that align with play-based learning. This review examines research to date on age-appropriate and play-based uses of digital technology that could more naturally fit in preschool and kindergarten classrooms while also highlighting the potential benefits of using tablets in early learning classrooms.

## LA TECHNOLOGIE NUMÉRIQUE DURANT LA PETITE ENFANCE : LA LITTÉRATURE EN VUE D'ENSEMBLE

**RÉSUMÉ.** L'éducation de la petite enfance est enracinée dans des pratiques adaptées au niveau développemental de l'enfant et des programmes d'apprentissage basés sur le jeu. Au 21<sup>e</sup> siècle, les praticiens vivent des tensions lorsqu'ils ne savent pas comment se naviguer dans la nouvelle réalité de l'enfance numérique tout en étant confrontés à des informations contradictoires. Par exemple, les cadres d'apprentissage de la petite enfance reconnaissent la nécessité pour les enfants de développer des compétences en littératie numérique, mais les sociétés pédiatriques recommandent de limiter le temps d'écran. Ainsi, les praticiens se retrouvent sans lignes directrices sur les meilleures pratiques qui les aideraient à intégrer la technologie dans les environnements d'apprentissage de la petite enfance à travers des pédagogies qui s'alignent avec l'apprentissage basé sur le jeu. Cette revue de la littérature examine les recherches portées à ce jour sur les diverses utilisations de la technologie numérique adaptées à l'âge et basées sur le jeu qui pourraient plus naturellement s'intégrer dans les classes préscolaires et maternelles, tout en soulignant les avantages potentiels de l'utilisation des tablettes numériques dans les classes d'apprentissage de la petite enfance.

Digital tools are omnipresent in much of Western society. In the 21st century, digital technology has become a necessary part of modern life, shifting the definition of what it means to be literate. Traditionally, literacy has been described as the ability to identify, interpret, describe, and communicate information in a print context (Yelland, 2018). However, in the 21st century, the concept of literacy has evolved into multiple literacies, including digital literacy. Screens have become a significant part of home and community environments. As adults' digital engagement has increased, so has their children's, albeit at much younger ages. Children see digital technology everywhere and learn how to communicate both offline and in on-screen mediums. Many babies are surrounded by screens before, during, and immediately after birth. It has been well documented that young children engage with digital technology daily and through a variety of devices (Chaudron, 2015; Chaudron et al., 2018; Gillen et al., 2018; Kabali et al., 2015; Marsh et al., 2017b; Plowman et al., 2010; Rideout, 2017). As Flewitt et al. (2015) have asserted, digital technology is "integral to early experiences of literacy in homes and communities" (p. 290).

Despite the need for all citizens to engage with digital technology in order to be fully literate in society, young children's access to and use of digital tools have caused concern among parents, caregivers, and early learning stakeholders. Following the early screen time recommendations of the American Academy of Pediatrics (1999, 2011), the Canadian Paediatric Society (2017) issued the following caution: no screens before 2 years of age and less than 1 hour of screen time for children between 2 and 5 years. The National Association for the Education of Young Children (NAEYC, 2012) argues that access to digital technology is an issue of equal access to knowledge in early childhood education settings, while leading advocates of developmentally appropriate curricula now argue that "rather than simply 'protecting' children from technology by limiting screen time, educators have a responsibility to promote the integration of high quality, developmentally appropriate media" (Bredenkamp, 2019, p. 77). Early learning frameworks and kindergarten curricula now include digital literacy as a required skill for young children. For example, the *Revised British Columbia Early Learning Framework* (British Columbia Ministry of Education, 2018) acknowledges that digital technology is not only a part of everyday life, but it can also offer "new and exciting possibilities for children to experiment with images, print, gesture, sound and movies" (p. 42). BC's framework views "technology not as good or bad, but as a reality of the 21st century, requiring reflection and ongoing dialogue between educators, families, and communities" (p. 43).

As early years practitioners and researchers, we ourselves have felt a disconnect between children's digital technology experiences outside of early learning spaces and the experiences we have provided to them in our programs. At the same time, we acknowledge the pedagogical possibilities of digital technology in early childhood education. Diverging viewpoints on the place of digital technology in

the early years have nevertheless left little guidance for early childhood educators and early learning practitioners. Canadian best practice guidelines – guidelines that would help practitioners meaningfully embed digital media and popular culture into early learning environments without replacing important hands-on, non-digital learning tools – simply do not exist. A lack of access to resources and professional development often stymies practitioners wishing to explore the possibilities that technology could present for early learning environments (Marsh et al., 2017a; Straker et al., 2018). In this article, we reflect on the literacy theories and policies informing screen time debates and present evidence from the literature on the pedagogical potential of digital technology in the early years. Specifically, we focus on the use of tablets and how these devices can be inclusive, child-centred, and interactive. We begin by discussing theory and policy that have shaped our understanding of literacy in the 21st century.

### RESHAPING THE CONCEPT OF LITERACY

Traditionally, within curricula, literacy has referred to the skills of reading and writing which children were expected to develop in print-based literacy contexts (Millard, 2006; Yelland, 2018). Extending upon sociocultural theory – which emphasizes the local, cultural, and social nature of literacy – scholars of New Literacy Studies (e.g., Street, 1984, 2000, 2003) began to consider the ideological underpinnings of literacy. These underpinnings were situated in cultural contexts and reflected in the cultural tools used within communities, such as those which valued oral storytelling over print-based literacy practices. Today, the ideological underpinnings of literacy extend to digital technology, such as smartphones and social networking websites (Burnett et al., 2014; Marsh, 2020). Multiple languages and multiple modes of meaning-making, known as multiliteracies, are instead valued and recognized as important in literacy development for individuals.

#### *Multimodal Literacy*

Although multiple languages are important in discussions on literacy, given the nature of this paper, we focus solely on multiple modes, or multimodality, in relation to multiliteracies (Cope & Kalantzis, 2009; The New London Group, 1996).

The term *multimodal* denotes the many ways meaning-making is embodied and expressed in everyday communication without one being more dominant than the other. Modes recognized for meaning-making often include (but are not limited to): visual, gestural, oral, and digital (Binder et al., 2015; Millard, 2006; Rowsell & Burke, 2009; Yelland, 2018). Multimodal theories centre on notions of affordance and transduction (Kress, 2003). Affordances reference the possibilities available through the different modes, while transduction allows semiotic material to shift across modes (Kress, 2003). For example, young children may choose

to compose a narrative using print materials and then shift the narration to a digital format (such as iMovie). The affordances of each material will create a particular meaning as the story undergoes changes across modes (Marsh, 2006).

As children grow and develop, they acquire skills from one mode and transfer these skills to another. For example, through their social and cultural interactions, children often first make connections between spoken words and written symbols. Yelland (2018) has suggested that “being able to select the most effective modalities to represent your idea or communicate your findings is an essential component of being multiliterate in contemporary times” (p. 856). Children make meaning of the world from the environment they are in (Gee, 2003) and, today, these environments include digital technology. This means children may use digital technology as both a medium from which to draw meaning and one in which to represent their understandings of the world around them.

### *Digital Literacy*

Although we see digital literacy as a component of multimodality (given that it enables the representation and exchange of ideas through multiple modalities), it has also been conceptualized on its own.

The term “digital literacy” is often attributed to Paul Gilster’s (1997) book, *The Concept of Digital Literacy*. He defined digital literacy as the “ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers” (p. 1). He emphasized digital literacy as a particular mindset that encompassed a multitude of texts and mediums. The concept has evolved and definitions now include the need for: skills in deciphering complex images and sounds (Lankshear & Knobel, 2008); operational skills needed to successfully use a variety of digital tools (e.g., computer, iPad, streaming TV, or smartphone) in order to navigate networked screens (e.g., cloud technologies) and use social media (e.g., Facebook; Teichert, 2018); the ability to move from one medium to another while recognizing which mode would best express the intended meaning (Lankshear & Knobel, 2008); the ability to acknowledge the audience who will access the content (Lankshear & Knobel, 2008); and the use of digital tools to record, analyze, and share observations or convey information (Binder et al., 2015; Flewitt et al., 2015; Neumann et al., 2017; Yelland, 2018).

Although being literate in modern society requires people to learn how to operate and negotiate meaning using digital technology, there are debates about the appropriate roles that digital tools should play in young children’s lives and when development of digital competencies should begin. Essentially, many debates centre on screen time. In the next section, we provide a brief history of screen time recommendations.

## SCREEN TIME IN ECE: A HISTORY

### *The American Academy of Pediatrics*

The American Academy of Pediatrics (AAP) released their first screen time recommendations, *Media Education*, in 1999. Since that time, the AAP has issued multiple iterations of their screen time recommendations (e.g., 2001, 2011, 2016), becoming the leading voice guiding parents, caregivers, early learning practitioners, and policy makers on young children's screen use. Many early learning organizations and institutions have cited the AAP's recommendations as informing best practices, including the NAEYC, the White House Task Force on Childhood Obesity, the Let's Move! Child Care initiative, the Canadian Paediatric Society, and a number of North American library associations.

The AAP's recommendations were developed in response to children's and adolescents' increased TV viewing and video game playing. With the rapid increase of portable digital devices (and their sophisticated operating features), parents and early learning stakeholders worried digital devices were displacing children and adolescents' "creative, active, or social pursuits" (AAP, 1999, p. 341) and time otherwise spent "reading, exercising, [and] playing with friends" (AAP, 2001, p. 423). Other concerns focused on the following: that the media were not promoting language skills (Brown & AAP, 2011), and possibly even contributing to language delays (AAP, 2001; Brown & AAP, 2011); that the media were distracting parents and decreasing parent-child interactions (Brown & AAP, 2011); and that increased media use was leading to a multitude of health concerns, such as obesity, sleep issues, aggressive behaviours, and attention issues (AAP, 2001; Brown & AAP, 2011). To combat these concerns, the AAP issued a series of recommendations between 1999 and 2016. The AAP recommended "more interactive activities that [would] promote proper brain development, such as talking, playing, singing, and reading together" (AAP, 2001, p. 424). These recommendations emphasized limiting young children's screen time – no screen time for infants and toddlers under 2 years of age and no more than 1 hour for children between the ages of 2 and 5 years. Parents were encouraged to "co-view" with their children and to monitor the content of programming to ensure it was "informational, educational, and non-violent" (AAP, 2001, p. 424). The AAP recommended that parents create "media-free" environments (e.g., no screens in bedrooms or at the dinner table) and to "avoid use of media as an electronic babysitter" (AAP, 1999, p. 342). The recommendations emphasized unstructured play time as it was considered more valuable for children's developing brains than engaging with digital technology.

In 2016, the AAP softened their stance on no screen time before 2 years of age and acknowledged the benefit of video chatting (e.g., Skype) as an interactive pursuit. They also recognized that limiting screen time was not occurring in many homes (Common Sense Media & Rideout, 2013) and recommended that high-quality programming be selected (e.g., *Sesame Street*) and that adults co-view

with children. They also strongly emphasized avoiding digital technology as a method of calming children, and to keep bedtimes, mealtimes, and parent-child playtimes screen-free.

### *The Canadian Paediatric Society*

The Canadian Paediatric Society (CPS) issued their first screen time recommendations in June 2017. Drawing from the AAP, the CPS recommended no screen time for children younger than 2 years and limited the regular screen time of children aged 2 to 5 years to “less than one hour per day” (p. 465). CPS recommended that sedentary screen time not be a routine part of childcare for children younger than 5 years and that homes maintain daily screen-free times, especially during family meals and book sharing.

The CPS (2017) further called for adults to minimize screen time access, mitigate or reduce risks associated with screen time, and be mindful of screen media in early childhood. In so saying, the CPS erred on the side of caution, as research could not conclude screen media changed developing brains nor could it say how much children under 5 years of age learned from being on-screen. Recommendations were also framed from the belief that digital technology use may be “habit-forming” and “early overexposure increase[d] the likelihood of overuse later in life” (p. 461).

### *Other Organizations*

In the UK, the Royal College of Paediatrics and Child Health (RCPCH) published a guideline that was starkly different from the American and Canadian recommendations (Viner et al., 2019). RCPCH suggested the evidence against screen time was exaggerated and noted much of the research focused on TV screen time. Their analysis of the literature found that the contribution of screen time to wellbeing was small, particularly when considered against the evidence of sleep, physical activity, eating, bullying, and poverty as contributing to an individual’s wellbeing. Most notably, the organization was critical of claims that screen time was toxic for health and that screen time replaced more positively valued activities, stating that “essentially no evidence” (p. 4) supported this position.

Yet, only a few months later, the World Health Organization (WHO, 2019) argued that children 5 years and younger should have less sedentary screen time and recommended strict screen time limits with notably no screen time before 2 years of age and 1 hour or less for those between 2 and 5 years.

The evidence informing screen time recommendations largely stems from clinical and laboratory-based studies, which is not often mentioned. Some scholars have also argued that the evidence supporting screen time limits is weak or nonexistent (e.g., Przybylski & Weinstein, 2019). However, these large and respected organizations – the WHO, CPS, and AAP – influence parents’, educators’, and early learning practitioners’ beliefs about the usefulness of digital

technology for young children. Tensions are further created when screen time recommendations do not align with the everyday realities of 21st century life or ignore the social learning that can occur between adults and young children using digital technology.

In sum, definitions of literacy have evolved and now include multimodal ways of creating meaning. Digital literacy is considered a necessary skill in the 21st century, yet many large health organizations issue cautions for the use of digital technology by children under 5 years of age. However, even among these leading organizations, we see inconsistencies about whether digital technology use harms or helps young children.

In the next sections, we describe our methodology. We argue for the inclusion of digital literacy development in the early years by emphasizing the benefits of encouraging digital literacy and exploring how it can align with play-based practices.

## METHODOLOGY

We initially wanted to conduct an exploratory literature review of young children's use of tablets in early learning classrooms. As practitioners based in Vancouver and Toronto, we were familiar with the Canadian Paediatric Society's (2017) recommendation to limit screen use by infants, toddlers, and preschool-aged children. We sought to expand our knowledge on screen time recommendations by examining policies developed by organizations outside of Canada. Despite these recommendations, we saw potential for the use of digital technology (and not just tablets) with young learners and wanted to know if a body of literature existed that supported our anecdotal experiences. We developed research questions to frame our search, and they were as follows:

1. Within the literature documenting children's engagement with digital technology (ages 0–6 years), what evidence exists to support the inclusion of digital technology in early learning classrooms?
2. Within the literature documenting children's engagement with digital technology (ages 0–6 years), what digital devices align with play-based learning environments?

### *Search Procedures*

We searched for relevant literature using ProQuest, ERIC, and Google Scholar databases. We began by limiting our review to peer-reviewed articles in English and emphasized studies published in the last decade. However, we did include seminal studies conducted in the last 20 years (e.g., Marsh, 2004). As a guide, we consulted Singer and Alexander's (2017) systematic literature review of reading on paper and digital devices and used a "backward-snowballing method to expand the search" (p. 1011). We followed their practice of "reviewing the reference



lists of identified articles to unearth any previously overlooked documents that appear[ed] to fit the search parameters” (p. 1012).

Early in our search, we reviewed Neumann et al.’s (2017) literature review of preschool children’s use of tablets at home and preschool, and attempted to build from their work. We took note of the authors named in Neumann et al.’s review and looked for additional research published by these scholars (e.g., Jackie Marsh, Marilyn Flear, and Karen Wohlwend). Because of their influential role in the field of early digital literacy development, we also reviewed the work of The Digital Literacy and Multimodal Practices of Young Children (DigiLitEY) initiative – an EU Commissions COST Action-funded network of researchers (see Marsh, 2020, for a detailed history of this research group).

We reviewed archived volumes—from 2010 to present issues—of the *British Journal of Educational Technology*, *Journal of Early Childhood Literacy*, and *Journal of Early Childhood Research* given these journals’ foci on either digital technology and/or young children. Finally, we reviewed Canadian early learning frameworks (e.g., *Revised British Columbia Early Learning Framework*) and the provincial kindergarten curricula (e.g., *BC’s Curriculum*).

#### *Inclusion Criteria*

Beyond our initial search parameters, several specific criteria were used to narrow our focus and to review research most relevant to our questions. We included studies conducted in early learning environments (e.g., childcare centres, preschools, kindergarten, and early learning programs) and studies focused on children 6 years of age and younger. We chose to focus our article on studies examining young children’s engagement with tablet technology since research suggests that young children can navigate tablet technology more easily than computers (Geist, 2012) and because this type of device was being used more frequently in early learning classrooms than other forms of digital technology. We now move to present what we found based on our review of the literature.

### DIGITAL TECHNOLOGY IN THE PLAY-BASED LITERACY CLASSROOM

Despite screen time recommendations, indeed cautions, for young children, as we previously noted, kindergarten and early learning frameworks are now including digital literacy and digital competence as necessary skills to be developed in the early years (e.g., *BC’s Curriculum*; *Revised British Columbia Early Learning Framework*; and Nova Scotia’s *English Language Arts Primary*). The term “developmentally appropriate” is often used by early childhood educators to justify the inclusion or exclusion of activities in the classroom (Copple & Bredekamp, 2008, p. 54). Bredekamp (2019) has since further defined developmentally appropriate as “not ages and stages, but a complex decision-making process on the part of teachers that is embedded in social and cultural contexts” (p. x). The developmentally appropriate curriculum followed by educators in early learning classrooms is

intended to provide opportunities for toddlers and preschool-aged children to develop emotional, social, physical, and cognitive skills (Gestwicki, 2011; Tecce DeCarlo et al., 2018). Moreover, children make meaning of the world and learn to acquire their basic knowledge and understanding through their social and cultural interactions (Gestwicki, 2011; Tecce DeCarlo et al., 2018; Neumann et al., 2017). It is developmentally appropriate practice to embed and interfuse learning that children acquire from sociocultural contexts to foster their thinking skills (Gestwicki, 2011; Tecce DeCarlo et al., 2018). Children also draw upon their funds of knowledge coming from home and community (Moll et al., 1992) and express their ideas in many modalities (Edwards et al., 1993, 2011), including using tablet technology (Bernhard et al., 2008; Millard, 2006). In short, advocates of developmentally appropriate curriculum and classroom environments are beginning to acknowledge that digital technology can play a role in young children's learning and development; for example, Bredekamp (2019) updated her widely used *Practices in Early Childhood Education: Building a Foundation* to include digital technology as a component of an early learning writing centre, along with a "technology center" (p. 98). Developing children's digital literacy provides children with additional ways of expressing themselves and showcasing their knowledge, which is increasingly seen as developmentally appropriate and more in line with play-based pedagogy.

A number of scholars contend that play involves digital technology, or digital technology involves play (Edwards, 2011, 2013; Marsh, 2004; Wohlwend, 2010, 2013). Edwards (2013) has used the term "converged play" to refer to play related to children's popular artifacts while Marsh et al. (2016) have adapted Hughes' (2002) definitions of play type to reflect contemporary children's digital realities. Marsh et al. defined digital play using Hughes' traditional play types. For example, Hughes described symbolic play as "when children use an object to stand for another object, [such as] a stick becomes a horse" (p. 246). Marsh et al. extended this into the digital sphere by defining symbolic play as "when children use a virtual object to stand for another object [such as] an avatar's shoe becomes a wand" (p. 246). In total, Marsh et al. redefined 16 types of play to include digital activities. They also argued that contemporary children now navigate between online and offline spaces, and although the tools used in some play activities have changed, the type of play children engage in remains the same. Wohlwend (2010) has suggested that contemporary children incorporate digital devices into their play and "pretend their way into [digital] literacies by 'playing at' using computers, iPads, or cellphones as they try on technologically savvy user identities" (p. 145).

Next, we make the case for the use of tablets in early years classrooms, arguing that tablets present children with interactive possibilities, are child-centred, can be used to create inclusive early learning spaces for English Language Learners, and may narrow the digital divide.

### *Interactive Possibilities of Tablets*

Tablets can motivate children because the devices are engaging, interactive, and provide immediate feedback (Chai et al., 2015; Flewitt et al., 2015; Fleeer, 2017a; Sulaymani et al., 2018). Many interactive apps provide instant feedback, repetition, and flexibility (Chai et al., 2015; Dunn et al., 2018; Flewitt et al., 2015; Verhallen & Bus, 2010). Scholars are now creating rubrics and criteria for apps as a way to aid educators using digital technology in early years classrooms. For example, Marsh et al. (2018) emphasize the need for age-appropriate design since the researchers found apps developed specifically for preschool-aged children better promoted play and creativity than apps intended for older audiences. They also recommend apps that allow children to develop their own text or artefact.

Yet, the possibilities for interaction extend beyond the use of apps in the classroom. Wohlwend's (2013) study, *Literacy Playshop*, positioned preschool- and kindergarten-aged children as multimedia producers rather than as passive users of digital technology. Wohlwend developed a moviemaking centre in three preschool and kindergarten–first grade classrooms in a midwestern American city. The centre included a video recorder and dramatic play toys which the children could use to create movies. Wohlwend found children explored, experimented, and refined their video recording abilities over the course of the project. The final product was not the goal; children preferred the *play* of moviemaking. Wohlwend also found that the moviemaking centre provided children with many opportunities to collaborate and negotiate shared meaning-making as they decided who held the video camera or what story they would film. Teachers scaffolded the children's narrative understandings by introducing storyboards and other narrative organizers, as well as facilitating classroom discussions, or "critical conversations" about "heroes, villains, and power" (p. 9).

Fleeer (2018) has theorized play conditions and interactivity as occurring across learning activities, not just in the digital activity setting. For example, 3- to 5-year-old children role-played storylines for their digital animation in dramatic play centres and developed storyboards at a writing centre that were ultimately used to create their digital animation. Similarly, Gillen and Kucirkova (2018) described how Ms. Hudson, an early childhood educator, supported children's digital play beyond digital settings. As an extension to a "different voice" game the children played, Ms. Hudson developed a scenario where a sad zookeeper contacted the school and asked the children for help because "all of the animals in the zoo had lost their voice" (p. 839). The children were then tasked with developing different voices as a means of helping the zoo animals reclaim their voices.

A concern often articulated is that digital technology impedes children's social development (e.g., AAP, 2016; CPS, 2017). Yet, tablets may foster social interaction between children as they learn to take turns with the device, teach each other different games, and share strategies and challenges of using the device (Flewitt et al., 2015). A growing body of literature supports this claim (e.g., Arnott, 2016;

Chaudron, 2015; Chaudron et al., 2018; Danby et al., 2018; Marsh, 2004, 2014; Marsh et al., 2017b; Wohlwend et al., 2011). Wohlwend (2015), for example, has referred to peer interactions as collaborative literacy play and has shown how young children engaged in joint interactions while using a digital puppetry app. As three young girls played the app, it was “crowded, noisy, and chaotic” (p. 155), but close observation revealed “coordinated storying, digital literacy learning, multimodal production, and play negotiation” (p. 155).

Tablets may also provide young children with opportunities to scaffold their peers’ learning and help build independence. Danby et al. (2018) described 4-year-old Jon’s initial attempts to play a Batman game on a tablet. The digital activity quickly morphed from a solo venture to a co-played and problem-solved activity, as two 4-year-old peers helped Jon manoeuvre through the game. The authors argued that “competence in gaming [was] something that [was] socially built through children’s experiences of helping each other out” (p. 969). Similarly, Kewalramani et al. (2020) documented three children’s initial encounter with the English language *Osmo Monster* game. Two of the children were monolingual Norwegian and relied on their English- and Norwegian-speaking peer to navigate the game. This game provided the multilingual child with an opportunity to translate and interpret the English language while playing the game alongside his peers.

A budding area of research is moving beyond observing tablet use in early learning classrooms and towards the interactive learning potential of the Internet of Things (Ioannou et al., 2015; Kewalramani et al., 2020). The Internet of Things has been defined as physical objects that connect to the Internet (Kewalramani et al., 2020). This entails connections between the Internet, items, and people. An example of this type of research can be found in Crompton et al.’s (2018) study of humanoid robots in an early childhood classroom. The authors described young children holding hands with the robot, dancing with the robot, eagerly talking to the robot, and generally caring for the robot (e.g., helping the robot when it fell down). They argued the robot aided the 3- to 5-year-old students’ social and emotional development as well as their language and communication skills. This is reminiscent of Ioannou et al.’s (2015) conclusion that “humanoid robots [could] evoke feelings and might be able to raise awareness of social behaviours (e.g., how to behave in certain situations)” (p. 25).

### *Child-Centred*

Tablets are small, portable, and lightweight enough for young children to carry around. Research also suggests that the more children use the iPad, the less they come to depend upon adults for assistance, thus becoming more independent (Chai et al., 2015; Flewitt et al., 2015). Moreover, children with different abilities are able to master skills with tablets because these devices provide more mobility; touchscreens are also less cumbersome when compared to keyboards and traditional computers (Chai et al., 2015; Flewitt et al., 2015; Geist, 2012).

For skills that require repeated practice prior to mastery (e.g., letter recognition), these devices provide alternate ways for children to practice (Flewitt et al., 2015).

Dunn and Sweeney (2018) have noted the affordances of iPads in young children's meaning-making. Specifically, they observed how iPads could be beneficial for teaching compositional writing to 6-year-old children because the iPad afforded the children greater choice and greater opportunities for creativity. The iPads presented the 6-year-old children with a number of options for producing their writing, such as variation in font size, shape, and colour; imbedding images and pictures; and, as one young participant said, "you can do lots of different things to make it look nice" (p. 865). These findings echo Marsh (2016), who described the integral nature of design possibilities in under-6-year-old children's meaning-making productions (i.e., children between 12 months to 6 years). Marsh showed that children selected appropriate modes (i.e., tablet writing, video, print-based) based on their background knowledge of the mode's affordances and therefore "they chose the most suitable, or apt, mode for their purpose" (p. 186).

Fleer (2017a, 2017b, 2018) has documented the creative and imaginative possibilities of the MyCreate digital animation app. In a play-based preschool classroom, Fleer (2017a, 2018) noted how, in the context of role-playing, the MyCreate app on tablets enriched the children's play. Children were deliberate in their selection of objects for their digital play, as they embedded blocks, pencil crayons, storyboards, and plasticine sculptures in the animations. Children were highly motivated and collaborative as they planned and negotiated their narratives.

Dunn and Sweeney's (2018) participant kindergarten teachers also described the benefits to 6-year-old children's written production of audio recording, autocorrect, and the speed and convenience of writing on a tablet. The teachers emphasized how these tools allowed the children to focus on their ideas while not being limited by their developing fine motor skills. The tools presented them with an alternative method to convey meaning.

Despite the child-centred affordances of tablet technology, teacher beliefs and attitudes shape the classroom environment. Teachers' conceptualization of digital technology as a tool for learning will influence whether these devices are made available in the play-based classroom (Sulaymani et al., 2018; Vidal-Hall et al., 2020). As well, tablets can become overly teacher-centred (i.e., used as a presentation tool or for documentation by teachers) which can limit students' communicative practices (Li et al., 2018), becoming the antithesis to play-based learning. Yet, as Vidal-Hall et al. (2020) have shown, beliefs and pedagogical approaches can shift. In their year-long study, Vidal-Hall et al. documented how Vicky, an experienced early childhood practitioner in England, reoriented her beliefs about digital media and their value as pedagogical tools in her play-based learning classroom for 3- and 4-year-old children. It is important that teachers receive professional development on pedagogies that can best support playful and open-ended uses of digital technology in the early years (for example, see

Kucirkova et al., 2017, for criteria in choosing apps that support early language and literacy).

### *Inclusivity for English Language Learners*

In Canada, 22% of the population speaks a language other than English or French at home (Statistics Canada, 2017). Tablets in early childhood classrooms can be beneficial to English Language Learners (ELL) because students are able to communicate with their teachers through symbols, images, sounds, and translation applications (Flewitt et al., 2015; Verhallen & Bus, 2010). Chen et al. (2017) explored the learning possibilities of mobile-assisted language learning (MALL) as a scaffold to school-aged ELL's narrative writing skills. They found the Penultimate app, on iPad, improved participants' motivation to write. The Penultimate app allows users to jot down, sketch, or write using either the Apple Pencil or their fingers. Although Chen et al.'s participants were older (i.e., 9 years old), the way in which the app allows users to sketch and/or draw would make it appropriate for younger learners who are still developing fine motor skills. As well, the app allows users to embed photographs and images into compositions, which could motivate young learners (i.e., preschool-aged children) to create multimodal compositions in either English or their heritage language.

In addition to improving ELL's English skills, tablets can be used to maintain connections with heritage languages and cultural practices (Dunn et al., 2018; Harrison & McTavish, 2018; Verhallen & Bus, 2010). Cummins (2001) has argued that languages can nurture each other and that "bilingual children perform better in school when the school effectively teaches the mother tongue and, where appropriate, develops literacy in that language" (p. 18). In contrast, when the mother tongue is diminished, "children's personal and conceptual foundation for learning is undermined" (Cummins, 2001, p. 18). The Storybooks Canada project has provided teachers with a collection of multimedia texts in multiple languages that are open-access (i.e., do not require a license) and user-friendly (Stranger-Johannessen et al., 2018). These resources provide opportunities for students to access stories in both English and their heritage languages. In a similar way, Scribjab (scribjab.com) allows users to create (e.g., write, draw, or audio-record) bilingual texts. Children may also access digital technology to develop language knowledge beyond English and their heritage language. For example, Friedrich et al. (2017) noted how a 4-year-old Karen (Indigenous people of Myanmar) child accessed YouTube to watch cartoons in Chinese and music videos of Thai and Burmese singers performing in multiple languages.

Tablets provide teachers with a way to acknowledge ELL children's funds of knowledge (Moll et al., 1992) by supporting the development of both the heritage language and English. In addition to language learners, providing opportunities for children to use digital technology in the classroom could create moments for students to be the expert, as exemplified by Compton-Lilly's (2006) participant, Devon. Devon, a 6-year-old, was a struggling reader and avoided reading and

writing. However, when his teacher acknowledged his interest in video games, and positioned him as the expert, Devon slowly became less reluctant to engage in reading and writing. By acknowledging Devon's interest and drawing on it during instruction, Devon gained confidence. Tablet technology could have a similar effect with preschool and younger children. By acknowledging children's interest in apps and YouTube videos (e.g., *Organic Learning – Educational Videos for Kids* channel), teachers can position students as the knowledgeable expert who teaches their teachers about new genres and vocabulary. Teachers can then use this knowledge as a resource and build bridges between students' digital literacy learning and their school literacy learning.

### *Narrowing the Digital Divide*

Another potential benefit of incorporating tablets into early years and kindergarten classrooms may be the ability to minimize the digital divide. Rowsell et al. (2017) have referred to individuals as “haves” and “have-nots” (p. 157). While the former have access and use digital technology, acquiring digital literacy skills, the latter are unable to access and use digital technology and have fewer opportunities to develop digital literacy skills. Rowsell et al. (2017) have argued that “when students have limited to no Internet and screen access, no technology or screen use, and no way of keeping up with other students in the class” (p. 157), students become removed from the curriculum. This phenomenon is something Jones (2013) has described as normalized “class-privileged lives” (p. 198). By using tablets in early learning classrooms, children who otherwise cannot access digital technology would have the opportunity to develop digital literacy skills. For example, children can learn operational skills by accessing and interacting with tablets (i.e., logging in, icon identification, and operation of games/apps). Although teachers alone cannot close the gap, they do have a role in not widening it. People learn through exposure and practice, and literacy skills are developed by interacting with multiple genres and texts (Rowsell et al., 2017). We echo Braverman (2016) who suggests that teachers who actively avoid digital technology in the classroom may exacerbate the disparity between haves and have-nots and leave some students without opportunities to develop digital literacy skills. When tablets are used in classrooms, children who come from homes where digital technology is scarce or Internet connection is unreliable have opportunities to engage with digital technology and develop digital literacy skills (Dunn et al., 2018; McGlynn-Stewart et al., 2017; Verhallen & Bus, 2010).

In today's classrooms, many children bring with them a wealth of knowledge and interest in digital technology. A child-centred process of learning, whereby adults and children exchange ideas to make new meaning of the world, allows children to exercise their agency and have a voice in the classroom spaces they occupy (Dunn et al., 2018; Flewitt et al., 2015; Gee, 2003; Marsh et al., 2017a; Millard, 2006).



## CONCLUSION

As Przybylski and Weinstein (2019) have argued, “this digital genie cannot be put back in the bottle” (p. 62). Research has documented young children’s engagement with digital technologies in their homes (Chaudron et al., 2018; Gillen et al., 2018; Kabali et al., 2015; Marsh et al., 2017b; Rideout, 2017). Despite evidence that some parents feel uneasy about their children’s digital engagement (Teichert, 2017; Dias et al., 2016; O’Hara, 2011), many parents are convinced of the benefits of digital technology for their children’s learning and development (Aubrey & Dahl, 2014; Gillen & Kucirkova, 2018; Kumpulainen & Gillen, 2017; Schlembach & Johnson, 2014). Some proponents of developmentally appropriate curriculum no longer question whether young children should be exposed to digital technology and advocate for educators to focus not on *if* technology is to be used, but instead on the “quality of technological tools provided for [children]” (Bredenkamp, 2019, p. 30).

Many early learning practitioners have nevertheless not included digital technology in their classrooms. This has contributed to a disjuncture between home and school digital literacy practices (Gillen & Kucirkova, 2018). Research continues to report on early childhood practitioners who perceive digital technology as having a negative impact on children’s learning and social skills (Marsh et al., 2017a; Mertala, 2017; Wolfe & Flewitt, 2010).

We argue that early learning practitioners need to move away from viewing digital technology as either “in” or must spend less time sitting watching screens “out” and begin to consider the pedagogical potential of these tools. Shapiro (2018) has likened digital technology to “the new sandbox” (p. 46). He has suggested that adults need to stop viewing the digital sphere as “a scary place into which kids escape” (p. 49). Instead, they should consider it as a “primary location in which children receive lessons in living together” (p. 49). To integrate digital technology in early learning and kindergarten classrooms, educators’ attitudes need to change (Ertmer et al., 2012; Hutchison & Reinking, 2011; Marklund & Dunkels, 2016; Palaiologou, 2016). Educators need to feel empowered to develop students’ digital literacy skills and move beyond the belief that tablets are solely distractions (Palaiologou, 2016; Straker et al., 2018; Sulaymani et al., 2018).

Stronger support and professional development for teachers are necessary for this empowerment to happen. Frameworks, such as Tecce DeCarlo et al.’s (2018) I-LEARN model (Identify, Locate, Evaluate, Apply, Reflect and kNow), can help teachers develop pedagogies for digital literacy in the early years. We suggest framing digital technology in the early years as an extension of play-based learning and teaching. For children, digital technology is just another tool to support their learning and development.



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Laura Teichert is an assistant professor in the Department of Special Education and Literacy Studies at Western Michigan University. Her research examines young children's and families' digital literacy practices in their homes and communities. Previously, Laura worked as an elementary school teacher in British Columbia and an early literacy specialist in Ontario. [laura.teichert@wmich.edu](mailto:laura.teichert@wmich.edu)

Munizah Salman is a registered early childhood educator and family support worker at an EarlyON Child and Family Centre in Ontario. She is a firm believer of transformative literacy and multilingualism pedagogy with strong intercultural skills developed through working with children and families in North America and South East Asia. Currently, she is focused on learning about Indigenous rights and the continued impact of colonialism and is volunteering as a co-chair of the Towards Truth and Reconciliation Committee at her workplace. [munizaht@gmail.com](mailto:munizaht@gmail.com)

LAURA TEICHERT est professeure adjointe au Département d'éducation spécialisée et d'études sur la littératie à l'Université Western Michigan. Ses recherches examinent les pratiques de littératie numérique des jeunes enfants et des familles à la maison et dans leurs communautés. Auparavant, Laura a travaillé comme enseignante au primaire en Colombie-Britannique et comme spécialiste de la littératie de la petite enfance en Ontario. [laura.teichert@wmich.edu](mailto:laura.teichert@wmich.edu)

MUNIZAH SALMAN est éducatrice enregistrée de la petite enfance et travailleuse en soutien familial dans un centre de famille et d'enfance EarlyON en Ontario. Elle croit fermement au pouvoir transformateur de la littératie et à la pédagogie du multilinguisme. Elle possède de solides compétences interculturelles développées en travaillant avec des enfants et des familles en Amérique du Nord et en Asie du Sud-Est. Actuellement, elle se concentre sur l'apprentissage des droits des autochtones et de l'impact continu du colonialisme et fait du bénévolat en tant que coprésidente du comité « Towards Truth and Reconciliation » à son emploi courant. [munizaht@gmail.com](mailto:munizaht@gmail.com)