

New Technology, Gamification and Future-Focused Education

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Abstract

In this literature review the role between new technology and future-focussed education is examined critically. There is an emphasis within global education initiatives towards promoting an increase in digital access within learning environments. This review analyses the context of this access and assesses how some studies describe the impact towards developing digitally literate learners. The development of technology and media within society has led to a variety of innovative practices that could be implemented within the curriculum; this review provides some examples of studies conducted around these new learning modes.

Keywords: *Future-focused learning, Digital technology, BYOD (Bring your own device), Digital literacy.*



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Introduction

Digital technology is a fixture within modern society that all learners would have interacted with at some point within their lives. It is, therefore, clear that educators have to understand how the current system is encouraging digital access within schools and, furthermore how this system could be innovated to incorporate a future-focussed approach to teaching and learning. New Zealand schools are embracing the importance of providing digital access, but this literature review seeks to understand just how much the current system reflects the learner experience outside of the learning environment and the ways we can adapt the curriculum to reflect this understanding. This discussion around the digital divide in education is important because it highlights the discourse between digital access at home versus at school. An important skill that is discussed here is digital literacy – the ability to learn and develop an understanding through digital texts and media. The studies within this review focus upon how learners currently understand this concept and how it is or can be taught within schools.

Understanding Digital Access

The range of digital literacy knowledge amongst New Zealand learners can only be understood by first understanding digital access amongst learners of a variety of socioeconomic backgrounds. In [Hartnett's \(2011\)](#) two-phase study on the digital divide within New Zealand 787 Year 12 students were surveyed

in regards to whether they had access to a computer at home, the Internet connection at home and if they owned a cell phone. This study then progressed to a collection of follow-up semistructured interviews to a gain a qualitative understanding of how learners interacted with this technology and how their schools reflected the type of digital access they were accustomed to. The study sampled schools from a range of deciles, with about 5 to 6 schools per decile.

[Hartnett's \(2011\)](#) study showed that there was a significant amount of digital access amongst all learners who were surveyed. From the survey it was determined that 92.2% of all learners had access to a computer, 87.9% of learners had access to an Internet connection at home and 92.5% had access to a mobile device. Hartnett's findings demonstrate that those without digital devices tend to come from a low socioeconomic background; however, despite this it is still worth noting that an overall majority of learners have access to a wide variety of digital devices. In the interview phase of the study there is an example of what this digital access meant at the time of this study for learners of differing socioeconomic backgrounds, with learner 23 from a low decile school stating “she [Mum] uses it [the laptop] every single day too, we take turns...it's actually shared a lot”, which contrasts greatly to another interview with student 21 from a high decile school who stated “we [including the student's brother] both have a laptop and we both have a smartphone” ([Hartnett, 2011, p. 647](#)). This equity divide and how digital technology is used by New Zealand learners is worth noting when thinking about why we should be implementing new technology into the curriculum. All



learners, regardless of their socioeconomic backgrounds indicated that this technology is already an aspect of their lives at home. The curriculum within schools needs to reflect this access learners are constantly being exposed to; if their learning reflects what they are familiar with then, according to a constructivist view, an increase in engagement would come from all learners. Hartnett's study also uncovered how New Zealand learners from all socioeconomic backgrounds felt at the time of the study about the digital access that they have while at school. Student 2 from a low decile school states that "a few classes have better technology but in the few, it's still kind of old", while Student 19 from a high decile school describes the relationship between technology at school and at home as "disjointed" and says that "you know there's not enough computers to go around at school" (Hartnett, 2011, p. 647). There is evidence that access to technology is not the same at school as it is in learners' home lives. The education system could benefit from extending access within schools and begin investigating how digital literacy can be explored within the learning environment.

Although this literature review will be questioning how digital technology and literacy can enhance the curriculum it is worth noting that a lot of the literature gathered on new technological practice is primarily from the United States of America. It is, therefore, important to get a general understanding of digital access in the United States of America as well to see the similarities between New Zealand and American households. The study performed by Common Sense Media (2013) delivers details about digital access in 1,463 United States of America households. The study found that 96% of the households have a television set with approximately a third of the children within the study having a television in their own bedroom and access to online streaming services. In relation to mobile devices 75% of learners in the United States of America had access to some form of electronic device, with some 72% having used such a mobile device for a media related activity. Interestingly 63% of those surveyed use mobile devices for playing games and nearly a third of those surveyed use mobile devices to read, a major increase from the 4% in 2011; however, despite the increase in e-reading it is still less common than a mobile device being used to watch video, play games, and use apps on. Furthermore the parents of the children were the ones surveyed, meaning that this data has the potential for inaccuracies and is not a complete representation of learners' access. This data provides a context for the literature to come and links strongly back to New Zealand contexts as well. It is noteworthy that digital technology has a significant presence within the family home across a range of social contexts. As educators we must consider how this use of technology in the home can correlate to how we use technology in the learning environment.

Digital Technology is Reshaping Literacy

Literacy is a very broad term that encompasses the ability to read, write, to understand, and evaluate language. This idea is so fluid because it no longer can simply apply to reading and writing skills; rather the definition has expanded to encompass oral and digital literacy too. Digital literacy is a growing medium that is expanding alongside digital access; this is why it is important to understand how being digitally literate can benefit learners.

Jesson, McNaughton, and Wilson (2015) performed a study examining whether by creating digital learning environments with a one to one access to a digital device would learners' reading and writing skills be improved. The study centred around six Auckland primary schools that were each in the lowest decile and had a significant proportion of Pasifika and Māori learners. These schools are members of a cluster that originally had seven participants but has since grown to twelve schools; in 2011 these schools developed an educational trust to implement the one to one digital device model. Jesson et al. (2015) measured student achievement in relation to reading and writing skills, critical literacy skills, and increased knowledge of multi-modal texts. The study itself is broken into two phases. The first phase was around profiling, in which the success of the digital learning environments are assessed through standardised testing accompanied by learner and teacher interviews. The second part of the study related to implementation of redesign, in which results are gathered to assess whether the information from the first phase has improved the digital learning experience. The first phase showed that overall learners were not meeting expectations in relation to their reading and writing levels; however, it was noted that there was progress expected in reading between the February 2012 and November 2012 observation period. Furthermore a benefit of the qualitative component of this study highlighted that teachers, observers, and learners all noted an increase in engagement and a decrease in behaviour management. This higher level of engagement allowed students to develop the ability to compare "multiple digital sources to enable synthesis and evaluation for higher levels of comprehension and more advanced writing." (p. 214). The second phase highlighted that students were still advancing in their reading skills at an expected rate; while writing skills were "at an average rate significantly greater than expectation" (p. 216). The second phase also saw an 11% increase in the teaching of critical literacy skills as a result of the digital learning environment model. This digital learning cluster has enabled a group of learners to engage with literacy in a manner that has heightened not only their comprehension, but their ability to interact with literacy critically.

Charles, Burt, and Williams (2010) provide a case study of an Auckland primary school and describe some effects that are comparable to Jesson et al.'s (2015) observations in their focus schools. The significant difference is that Charles et al. (2010) are United States of American academics visiting Point England Primary School, a decile 1A primary school, to perform qualitative observation; whereas Jesson et al. (2015) used a mixture of quantitative and qualitative data sourced through years of observation and analysis. Charles et al. (2010) was given access to quantitative data gathered by Point England Primary School and included this research into their case study. This digital learning environment has increased learner writing scores "[having] risen by an average of four times the expected growth in one year for students in years 4 through 10" (Charles et al., 2010). Furthermore, observations of a sample group of 27 learners from Point England Primary School, who engaged in podcasting within their classroom, saw improvement in their attitude towards reading and standardised testing confirming an increase in reading ability. From Charles et al. (2010) and Jesson et al. (2015) it becomes clear digital learning environments which

enable learners to have constant access to a digital device can improve reading, writing, and critical literacy skills.

The digital learning environments that have been discussed thus far have shown that providing access is a great aid to learners. It must also be noted that it is how this technology is used and engaged with that can have a significant impact upon learners. Currently schools focus on a number of methods that can enhance the digital literacy experience; however, there are some activities outside of the classroom that learners engage with which provide potential for literacy development skills. Black's (2009) critical ethnographic study of three learners highlights a different way of perceiving digital literacy learning. The ethnography participants comprised an English language learner and two others from transnational backgrounds, all of whom engage in online fan-fiction writing. The three learners studied all wrote fan-fiction based off the same television show and had come to communicate with one another online and in-person. Because of this the three have developed a globalised platform from which to reciprocally read and peer review one another's work. Black (2009) noted that these three writers would self-identify as novices or English language learners within their works, creating a platform within which the reader might become the expert and provide feedback. Significantly the fan-fiction forum provided outlet for the three learners to experiment with language; not only were they developing their knowledge of English literacy but they would use the platform to express their own transnational identities, writing in Japanese, Mandarin Chinese, and Romanised Mandarin. This use of language was seen as additive elements of writing; and the online forum provided the three learners with a space to develop, explore, and present their transnational identities. Black's (2009) ethnographic study is important because it acknowledges the ways priority learners, such as English language learners, use technology outside of the learning environment and presents the potential of exploring new contexts for digital literacy. Through the use of online forums the learners were able to "critically engage with the linguistic, cultural, and ideological materials" (p.423), lending them agency over their own learning. The Black (2009) ethnography is a demonstration of the ways in which we can use the digital learning environments, described by [Jesson et al. \(2015\)](#) and [Charles et al. \(2010\)](#), in new ways that enhance the development of collaborative and critical literacy skills.

The Future of Learning

Future-focussed pedagogy must respond to the increase in digital access by engaging with technology in new ways. [Aliagas and Margallo \(2017\)](#) studied how the use of interactive storybook apps enhanced the reading comprehension skills of children within four different Spanish families, where the children ranged from 18 months – 5 years of age. The study itself is framed as an ethnographic study in which data of the effectiveness of the app-based storytelling was gathered through observation, recording, and interviews. In Case 2 [Aliagas and Margallo \(2017\)](#) note that Chloe, the subject of the case, uses the *theatre* function of the app to recreate the story of *Snow White and the Seven Dwarves*; this function allows the learner to position marionettes on the screen to act out important scenes within the story. Although Chloe's mother would read the story aloud, Chloe would be interacting with the mobile device to construct a visual representation of

what would happen next. As the story progressed, however, Chloe took ownership of the storytelling, "shifting from the role of storyteller to that of an author." (p. 49). In Case 3 Lucia, the subject of the case, read *The Stolen Stars*; a choice based game in which there were consequences to decisions made. This led to an experience in which Lucia would walk away from the device out of concern or try to delegate the responsibility of decision-making to her father. This reaction was brought out of the feeling of ownership of her reading and decision-making; with support she advanced the story-telling process. Lucia's interactive experience showed how an immersion with the first-person narrative, combined with agency over the storytelling process, led to heightened engagement. This ethnography ([Aliagas & Margallo 2017](#)) challenges the read-aloud early literacy skills model; instead positing the idea that immersion within a digitally interactive story is a more engaging means of developing early literacy skills. While this ethnography only details a collection of select case studies, there is evidence to show how digital technology can be utilised to support emerging literacy skills.

[Dezuanni, O'Mara, and Beavis \(2015\)](#) present another application for interactive game-based learning in the form of the popular video game, *Minecraft*. These researchers observed the implementation of *Minecraft* into the curriculum of an all-girls middle class Anglican school in Australia, with the target group being eight to nine year olds. Beyond observation data [Dezuanni et al. \(2015\)](#) also have a focus group of eight learners who they interview to ascertain the effects of video game learning. Learners were able to develop safe social spaces both within the learning environment and in the virtual space of the *Minecraft* server; learners wished to "become recognisable to each other as knowledgeable *Minecraft* players." The ability to take risks or problem-solve becomes a significant element of the class mentality; learners who display these qualities are positioned as a class expert. The interviews highlight that learners need to develop certain language skills to communicate effectively about the game; furthermore they must also develop an understanding of acquisition, programming, and creation in order to gain the full benefits of the more complex aspects of the game. Learners will develop an understanding of resources and design models, as well as gameplay strategies, which can enhance their experience and this leads to the development of digital curatorship skills. As learners gather these digital resources and skills [Dezuanni et al. \(2015\)](#) conclude that *Minecraft* holds the potential to allow students to become learners.

[Aliagas and Margallo \(2017\)](#) and [Dezuanni et al. \(2015\)](#) provide a positive example of future-focussed learning at a younger age, however once the curriculum begins to branch out into specific subject areas there are further alternatives and possibilities for how technology can be engaged with. There is an argument for video games being used to assist with science-based learning, presented by [Marino et al. \(2014\)](#), as well as [Israel, Wang, and Marino \(2016\)](#). [Marino et al. \(2014\)](#) examined 57 students with learning disabilities from four middle schools, with the intention to critically examine whether the use of video games in the science curriculum enhanced learner achievement. The resulting levels of engagement in the science-curriculum classes has grown noticeably and learners even express that they play the games at home, even sharing these experiences with their families. Although this study did not show any change in learner achievement, there was a clear increase in engagement and

collaboration with learners stating “that they appreciated the variety of options not typically included in science instruction” (Marino et al., 2014). The later study by Israel et al. (2016) is in fact a continuation of the Marino et al. (2014) study and it even using the same science-based games for the learners to trial. In later study three middle schools are used with roughly 366 learners surveyed and observed; the data once again being a blend between quantitative and qualitative. The study presented similar results as the researchers found that learners were more engaged with video game-centred activities.

Akpinar & Aslan (2015) is also focussed upon how game-based activities can support learning within his curriculum area; with the argument that probability mathematics can be taught through teaching computer programming. This study focussed upon 18 fifth grade and 12 sixth graders; the school itself did not judge learners based upon ability so there was a range of individuals within this focus group. Progressive Achievement Tests (PATs) were collected one week before the first digital programming activity; learners would then be progressing towards using the programming tool: *Scratch*. The Scratch sessions would be broken up with “30 min of hands-on Scratch programming instruction and 50 min of developing games” (Akpinar & Aslan, 2015). The activities then progressed towards learners being given four different programming tasks over a 5 week period that led to the final post-test assessment. At the end of the study the PAT scores were compared using both Cohen’s *d* values and Wilcoxon signed rank test to evaluate the change in student achievement. As a result of the intervention learners now had a predominantly positive achievement rate, when prior they had been working below the national average.

Conclusion

The rising number of households with digital devices provides a convincing case for one to one digital access within schools; learners voice a need for a greater connection between technology use at home and at school. The implementation of one to one digital initiatives within school has proven to have a positive effect on reading and writing skills for learners. There are also further ways of expanding our way of perceiving digital literacy that can aid learning. Furthermore the process of interactive apps, video game-based learning, and computer programming are new initiatives that have proven to heighten learner engagement and, in some instances, achievement in Science, technology, engineering and mathematics (STEM) subjects. Digital technology stands to provide a lot of benefits to education but can only be implemented effectively through learner self-belief and taking some risk.

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