



SCHOOL OF GOVERNMENT
Te Kura Kāwanatanga

Understanding children's use and experience with digital technologies

Final research report

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Executive Summary

With a particular focus on education and learning activities, the researchers wanted to understand the factors and conditions that influence children's use and experience of digital technologies in education and learning in the New Zealand context. The research also sought to understand what support might be needed for different groups of young New Zealanders in order to make the most of their online learning experiences and manage online risks.

Semi structured interviews with nearly 70 children across 12 schools from around New Zealand were conducted to help understand how primary school students (9-11 year olds) from various backgrounds use and experience digital technologies in their daily lives. The children were asked to describe what they do online, when they do it, why, what they most enjoy, what they learn, what worries them, and what they wish for but don't currently have. Our data collection was slightly biased towards regional, rural and high Maori and Pacific population areas because prior research suggested that there was likely to be the greatest deficiencies in access and use in these areas.

The literature reviewed prior to the research and our findings challenge some commonly held assumptions such as that children born into the digital age are digital natives and all have the same experiences and opportunities to use of digital devices. The research findings reveal a large variation in children's use and experiences of digital technologies that do not fully correlate with location or the socioeconomic status of the school community although these two factors cannot be entirely ignored. The findings are reported at five levels of detail: 1) a high level picture of children's online experience and use of digital devices in the form of six archetypical profiles 2) a graphical snapshot from the questionnaires the children completed about the devices they use, and how often they use them; 3) a description of the different and various school contexts the children in our data came from; 4) four high level themes from the data which address the factors and conditions affecting children's use and experience of digital technologies, namely: i) the children themselves; ii) the parents and home setting of the children; iii) the classroom teachers of the children; and iv) the children's school; and finally, 5) factors and conditions influencing children's use and experience of digital technologies explores the children's interview data in more depth alongside data from the interviews we conducted with their teachers and principals. It addresses five themes in this data: i) access to digital devices and the Internet; ii) children's activities and learning online at school, at home and elsewhere; iii) children's behaviours online; iv) home-based factors affecting access and use; and v) school factors that are influencing digital access and learning.

Not unexpectedly we found that children like using digital devices for learning and play. However their preferences for what activity, on what device and for how long vary. Some children liked to play games online. For others, if the opportunity was there, they would prefer the physical world of trees and fields to run around to the virtual world. For many the digital option is an 'and' that offers additional play options when their friends are elsewhere and it enriches their play options and opportunities. They play with friends and family online and also alone. Their activities can be physical as well as virtual. Similar observations apply to online learning at school and at home. Many children like the learning Apps they are introduced to and recognise their strengths in giving them practice and near immediate feedback but not all equally. They also generally think online Apps are fun to use and enjoy them. Not everyone prefers to read online or use a device for writing and other communication. Some mention physical things like eyes getting sore or not liking the constraints to

their expression, creativity and imagination in the Apps on offer. We conclude from this that there needs to be variety in what is available and children should be allowed to opt out of using digital devices at least some of the time to select learning, playing, communicating and creating mediums they prefer.

Preferences aside, children are also not uniform in the capability and skills they have for using digital technologies for learning, playing, communicating and creating. We noted that access to devices and opportunities to use them at home and school varied along socioeconomic lines. The lower the decile of the school attended, the more likely the children did not have a device of their own, had to compete with siblings and parents for the use of one and did not always have access to the Internet at home. In higher socioeconomic areas, children are more likely to have access to a device of their own, have a choice of devices and have time to explore and play using their devices, building their digital literacy and competence in the process. Children themselves identified a device of their own as what they would most like. For children in lower socioeconomic areas, the school-based access and digital learning is a game changer which we address in the section on optimising children's use experience and learning.

Children in the age group we studied are not big social media users and where they do have accounts they use them mainly to communicate with family members and known friends. We also found that many look forward to having a smart phone when they go to high school and see this as a desired goal. These two observations combined suggest that the 8-11 year old age group could be a good age to teach children about managing their online identity, keeping themselves safe online, and being responsible citizens online. Some schools are doing this on their own but it could be accelerated and made more universal with support.

Parents and older siblings play a facilitative role in teaching, guiding and moderation of device use. Parents generally seem set guidelines although there is room for greater guidance to be made available to parents on this. Many of the issues raised by our findings are not about the technology per se nor the schools. It is about the interaction between child, family setting and socioeconomic factors affecting the home, school context and interventions, including the classroom programme and teacher, and the technology. A virtuous cycle might see the school and parents working together to provide access and teach skills to enable safe learning and play.

The schools in low socioeconomic areas struggle to get adequate resources to enable them to provide one device for every child. If they accomplish this they do it through the assistance of charitable trusts and a financial contribution from the home. We noted that where this had occurred and there was a school-wide leadership in place about the role of digital devices in the curriculum and effective teaching and learning, children were enthusiastic, digitally literate, enjoying their learning and felt motivated to learn and experience success. In such schools there tended to be a school-wide strategy to build the confidence and competence of teachers to use digital devices for learning in the classroom. This strategy was reflected in the teacher's confidence and willingness to try new things online and the children's apparent enjoyment of learning.

We noted that for Kura and Māori medium classrooms achieving a digitally supported curriculum and learning programme is much harder and more so than it should be. Vendors of School Management systems and Learning management systems do not cater for the small Māori medium market and these school wide systems if used need to be modified at a time and financial cost to

the school. There is also a dearth of learning Apps in Māori medium, so those in use tend to be modified for the purpose by the classroom teachers at a time cost. Socioeconomic and language availability factors seem to combine in this environment to the detriment of children's learning opportunities.

We note in our data that a number of factors, particularly when they are found in combination appear to create a very rich, enabling and effective learning environment for children. These consist of the school leadership, teacher digital capability, child-centred learning and parental support.

School leadership that integrates the digital world into the curriculum and teaching and learning approach in a strategic, and not piecemeal, way appears to be part of creating an effective digital learning environment for children. That is, an approach to digital integration and intent is declared in strategic planning such as the School Charter and Plan and is backed by the Board's allocation of resources not just to the acquisition of hardware and software but also to building teacher capability. In low decile schools, a single episode of higher than usual teacher turnover can set a careful investment in building teacher digital capability building back years. For these reasons, low decile schools appear to face an even bigger task in building capability and higher levels of resourcing to compensate might be indicated.

We encountered schools where there were very structured and deliberate programmes to lift children's digital literacy, skills and competence for learning. Some of these were low decile schools and the approach seemed to be having a very positive effect on the children, their attitudes to schools and learning and their feelings of self-efficacy about their learning. One school mentioned that they had the evidence from the Me and My School survey to support this claim.

We noticed that many of the enthusiastic children who told us about their learning felt in control and empowered about their learning and this state of affairs coincided with teachers who were deliberately trying to adopt a child-centred approach, enable online learning, and provide timely feedback and challenges. The pursuit of individual child-centred learning and self-efficacy combined with deliberate approaches to building digital confidence and capability appears to emanate from school strategy and leadership, but also requires capable teachers and supportive homes.

Some schools have developed programmes to build digital confidence, competence and digital citizenship. These include keeping yourself safe online, dealing with publicness and privacy on the Internet and so on. More guidance would help the least advanced schools do more, and more effectively in this space

Parents play several roles in a virtuous system. They fund the Internet access at home and the devices that are available. Because of their economic circumstances some homes have fewer devices than others. Parents also create the safe environment in which children play and learn at home. It seems that some guidance for parents on how to do this most effectively might both increase parent's confidence and reduce their fears. Some positive examples we heard of how parents gently guide, encourage and set boundaries for safe learning suggests that parents could be assisted further to do this well.

We observed a lot of variation across schools in the use and experience of digital devices. This was not purely socioeconomic-related in that not all schools of the same decile offered their children

similar opportunities to learn in a digitally enabled way. There was also quite some difference in what it was financially possible for a higher decile school to do versus a lower decile one. This suggests that current attempts to provide equitable resourcing to schools to offset socioeconomic and other disadvantages are not sufficient to make a difference in the rapidly changing and growing domain of online learning where the types of devices and the Apps available become obsolete quite quickly and wear and tear is also a factor making reinvestment an ongoing requirement.

The findings from our research suggest that the following would be a set of first steps towards ensuring all New Zealand children are capable 21st century learners and citizens.

Treat Internet access for education and learning as a universal right

Invest in children's online access, but, more importantly, online knowledge and skills and self-management in the online environment and in particular on Social Media

Promote a personalised online learning experience (e.g. one device per child)

Invest in teaching capability (e.g. teacher curriculum) and a supportive teaching environment

Invest in strategic school leadership capability (e.g. strategic understanding of the role and integration of ICTs in the school curriculum)

Promote online understanding, skills, and knowledge of parents from lower decile schools

Improve access to Netsafe resources at schools

Research background and objectives

There is a tendency to assume that children born into a digital era where the use of internet-enable devices is everywhere – their homes, their playrooms and the schools – will by default have digital skills and knowledge. As the use of digital technologies, such as the Internet, is extending to younger children in critical activities like their education and learning, there is an increasing need for empirical research to understand children's use and experience with these new technologies in their daily lives.

Children seem to be quite different in their online behaviours compared to teenagers and older generations (Lips et al. 2015). For example, young Internet users seem to demonstrate more synchronous online activities compared to older generations (Taipale, 2015): where young people prefer real time online interactions, older generations are more comfortable with asynchronous interactions, such as the use of email (Logicalis, 2016).

Yet, what we know about online behaviours often applies to the use and experience of ICTs by older generations: we have very limited empirical knowledge of children's online behaviours, especially in New Zealand. However, what we do have are some assumptions. For instance, a popular assumption is that digital technologies will drive better education and learning for all primary school-aged children, leading to enhanced learning outcomes. Moreover, it is often assumed that youth, as so-called 'digital natives' by growing up in a world in which the Internet has always existed, automatically are very knowledgeable and capable in using digital technologies.

Furthermore, besides the prospect of enhanced learning outcomes and other benefits for children, a common assumption is that digital technologies also create substantial online risks, such as invaded privacy by both strangers and peers, cyberbullying, and access to unsolicited content. Another popular assumption is that children, as they behave differently online compared to older generations, do not care about their privacy.

These issues raise important empirical questions about the online knowledge, skills and experience of primary school-aged children in New Zealand, including their experience and attitudes towards online risks, and what support they might need in order to make the most of their online experiences. Research suggests that, although many children nowadays have experience with digital technologies, this does not mean that they inherently have the knowledge or skills to make the most of their online experiences (Boyd 2014: 176). Also, the home environment may have substantial influence on children's online use and experience (Livingstone, Haddon, Görzig, & Ólafsson, 2010; Zaman, Nouwen, Vanattenhoven, de Ferrer, & Van Looy, 2016).

Moreover, with a considerable fraction¹ of the New Zealand population having limited or no access at all to digital technologies at home, there is likely to be a huge variation in online

¹ The Internet in New Zealand survey 2015 reported to 13% of non-users and ex-users of the Internet do not do so because they do not have an Internet connection and of these 11% gave cost of having the connection as the reason. (Crothers, C., Smith, P., Urale, P. W. B., & Bell, A., 2015). Some of the children in our research cohort will come from such households, and more likely so in low decile schools.

knowledge and experience amongst children from different socioeconomic and ethnic backgrounds. For instance, available research shows that the most digitally excluded groups in New Zealand include children with special needs, Pasifika, Māori, people from low socioeconomic backgrounds, and people living in regions or communities with low Internet uptake rates (e.g. South Auckland, Gisborne, Northland).

This general background was the starting point for our empirical research. With the absence of a robust evidence base around how young New Zealanders use and experience digital technologies in their daily lives, including in critical activities like their education and learning, the research was conducted in a qualitative, inductive and explorative way, with a main focus on how children are using and experiencing digital technologies in the context of their primary school activities. A literature review was conducted to initially guide the research team in their collection and analysis of the data. Finally, the empirical findings led the team towards the formulation of some recommendations.

Research objectives

- To understand how primary school students (9-11 year olds) from various backgrounds use and experience digital technologies in their daily lives, with a particular focus on education and learning activities;
- To understand the factors and conditions that influence children's use and experience of digital technologies in education and learning in the New Zealand context;
- To understand what support might be needed for different groups of young New Zealanders in order to make the most of their online learning experiences and manage online risks.

An advisory group to the researchers covering Ministry of Education, school principals, Māori and Pasifika interests was formed and met with the researchers to discuss the research objectives and the research design before the empirical phase was commenced. A similarly composed group also had input into the analysis of the findings and the recommendations from this research.

Literature Review

A literature study was conducted in order to inform the research team on how to understand and explain the empirical data and in particular elucidate some popular assumptions such as:

- Children are *digital natives*: “born to be digital”
- Children inherently have digital skills and knowledge
- Any existing digital divide will disappear over time
- Digital technologies drive enhanced education and learning
- Children are increasingly exposed to online risks, e.g. access to unsolicited content, cyberbullying, invaded privacy
- Youth act as if privacy is dead
- Research findings from other countries are also applicable to New Zealand

Literature that focuses on research concerning young people’s experience of using digital technologies was located using search terms such as children + online/Internet/digital experience; digital natives; young people online; digital divide and young people in Te Waharoa, Google Scholar and ProQuest. Particular emphasis was placed on research into the experiences of 9-10 year old children and those from the New Zealand context. Timing was also a consideration in searching the literature as the functionality and availability has evolved rapidly in the past decade, therefore more recent research was favoured. Literature was synthesised around themes.

We first looked at the evidence of whether children born into a digital age, often referred to as ‘digital natives’, are similar or different in their digital experiences, skills and knowledge and the sources of those differences and the sources of any digital divides. We then turn to evidence of differences in specific digital experiences and competencies (Starkey, Sylvester & Johnstone, 2017). Two additional relevant themes were identified in the literature; online safety and protection when using the Internet, and parental involvement.

Digital divides

A large scale survey of 4000 secondary school students in Australia showed that they are far from uniform in their digital competence and the variance is related to the family’s cultural capital and socioeconomic circumstances (Hatlevick & Christophersen, 2013). Boyd (2014) concluded from her ethnographic study and hundreds of interviews with 13-15 year old’s networked lives in the United States, that ‘the rhetoric of “digital natives” far from being useful, is a distraction to understanding the challenges that youth face ... they do not become critical content users or creators simply because they were born in an age when these technologies were pervasive.’ (p. 176). She noted that youth who did not own their own devices were less competent and sophisticated in their consumption and creation of digital content.

Wei, Teo, Chan and Tan (2011) surveyed 600 young people across 26 secondary schools in Singapore to test aspects of digital opportunities and experiences and found significant evidence of digital divides arising at three levels. The first is the level of access to digital devices at home and at school.

The second is the level of capability to use digital devices and software and the third divide focuses on those who are able to exploit the technology in 'powerful' ways to enable them to participate in the digital world. They concluded that while school computing environments help to increase computer self-efficacy for all students, these factors do not appear to eliminate knowledge gaps between students with and without home computers. Park (2015) found skill and capability differences in young people's social media use related to socioeconomic factors and race. Johnson (2015) from a study involving 38 children in first and second grade found that their Internet use was varied. They identified three patterns of Internet use emerged suggesting three types of young users: *home-based users* who demonstrated extensive, comprehensive, and enjoyable use of the Internet at home coupled with limited and less enjoyable Internet use at school; *school-oriented information seekers* reported mainly visiting websites, both at home and at school, but school access was preferred; and *school-oriented communicators* who primarily used email, both at home and at school, but school use was preferred.

Access

A study significant to this review explored how New Zealand children aged 6-14 engage with media using data gathered at the end of 2014 (New Zealand on Air & Broadcasting Standards Authority, 2015). The findings drew on questionnaires completed within 708 households from a representative sample of New Zealand children and their primary caregiver. The research investigated children's access to, and use of, digital technologies, content they found challenging and parental rules about access. The estimated access from this study is slightly higher than The Internet New Zealand 2015 study which tells us that household access to a digital devices of some sort capable of connecting to the Internet is slightly less than 80%. And further, that of the 13% of adults who don't use the Internet, for most cost is a barrier. These two relatively recent, New Zealand studies have implications for access to the Internet for the children from these families even if the discrepancy might be accounted for by the inclusion of older, no children families in the Internet NZ study.

Access to digital devices.

Access to digital devices in New Zealand homes is increasing. In 2014, 88% of 6-14 year olds live in a home with a computer or laptop, nearly three-quarters of homes had at least one tablet, two thirds had a games console and half the children had access to a smartphone they could use (New Zealand on Air & Broadcasting Standards Authority, 2015).

In a paper reporting on the extent and sources of digital divides in the United States, Cohron (2015), noted that while the access divide is closing, particularly with the rise in smart phone use, most often relied upon by those in low socioeconomic groups, a digital literacy divide continued to affect what people could do and achieve with the use of digital devices. The growing use of smart phones to access the Internet is also a New Zealand phenomenon and has a similar effect on access for younger and lower income younger users (Smith et al. 2016).

There are variations in access between countries. A similar sized study carried out in the US three months after the New Zealand study found a comparable pattern of access to technology for 0-8 year olds (Crux Research, 2015). In this study 59% of the children had access to a tablet device, 52% to a games console and half had access to a smartphone. 48% had access to a Laptop computer and 42% had access to a desktop computer with access increasing with age. This study also explored

when children used technology and found that half the respondents reported it was used on a car trip, a result that may not be replicated in a New Zealand context. Other countries have higher levels of access which could reflect differences in cultural beliefs or affordability. For example, a study from Singapore found that in the first two years of school all children had access to mobile phones (Goh, Bay, & Chen, 2015).

Access to digital devices varies across demographic and socio-economic groups. New Zealand children living in metropolitan cities or homes with high household incomes and Pakeha children had higher access and use of laptops or PCs (New Zealand on Air & Broadcasting Standards Authority, 2015). Lower rates of access to tablets was reported by children in Pacific Island, low income and young parent families, and higher rates of access in Asian and high income families. Access and use of smartphones increased with the age of children and was higher in families that had younger parents or identified as Māori. Another New Zealand study conducted in 2011 that found 15-16 year olds from lower socio-economic groups were less likely to have a computer and Internet access at home, own their own smartphone and had to share Internet capable devices with other family members (Harnett, 2016). Access appears to be influenced by relative affordability

Older children appear to have greater access to digital technologies than younger children. In 2013, 96% of 15 year old students in the OECD reported that they had a computer at home, but this access varied across countries (OECD, 2015). The age that children gain access to devices may be influenced by parental beliefs. For example, a sample of US parents reported that believed that age 8 was an appropriate age to start using smartphones (Crux Research, 2015). As mentioned, in Singapore children were using smartphones as they started school (Goh, Bay, & Chen, 2015), although there is a difference between accessing a parent's smartphone to play a game and having exclusive access to a phone to contact people and access the Internet.

Gender differences in access and use of technology has been identified in the research literature. Girls aged 12-14 were more likely to have access to and use a smartphone than boys of the same age in New Zealand (New Zealand on Air & Broadcasting Standards Authority, 2015). In the US teenage girls use visually oriented social networking more than boys, who play video games more than girls (Lenhart, 2015). This difference may not be evident in 9-10 year olds with limited access to social networking sites or smartphones.

The type of access children have to the Internet is influenced by parental concern for online safety, time for independent access, and user skills (Tripp, 2011). Different access and use may be influenced by device cost, parental and community attitudes or beliefs (Mossberger, Tolbert, Bowen, & Jimenez, 2012) and language barriers (Warschauer & Matuchniak, 2010).

Access to the Internet or programmes in the home.

The length of time children spend on the Internet on a daily basis has been included in studies. The New Zealand media use study identified that of the children (6-14 year olds) who used media the previous day, 34% had spent more than one hour on the Internet at home (New Zealand on Air & Broadcasting Standards Authority, 2015). Other studies have recorded higher access, for example, a report from the UK that surveyed 13-17 year olds found that 93% of the participants owned a smartphone and spent on average 9 hours a day online (Logicalis UK, 2016). Such research findings are limited by what is measured, the age of the participants and data validity.

The types of activities that children do online can include consuming, creating and sharing content (Lu, Hao, & Jing, 2016) gaming or game playing (Domahidi, Festl, & Quandt, 2014) and communicating (Shapiro & Margolin, 2014). The types of Internet activities that young people engage in was explored in the media use study (New Zealand on Air & Broadcasting Standards Authority, 2015). Ninety percent of children reported using the Internet. Three quarters played games on the Internet and a similar number watched YouTube (consuming). 31% watched TV shows or movies, 21 % used Facebook and 15% listened to music through the Internet. There were demographic differences in the Internet activities with higher incidence of game playing by Asian children and lower engagement with games from younger children, Māori, Pacific Island and low income children. Girls, especially older girls were more likely to watch TV shows or movies than boys or Pacific Island children. Older children, and boys in particular were more likely to report watching YouTube, especially when compared with Māori, Pacific Island children and those from low income households. A study from Singapore found that 96% of children had access to home computers and game-playing and learning (consuming) was the biggest use (Goh et al., 2015).

A report from the UK that surveyed 13-17 year olds found that the top three content websites were YouTube, Netflix and Spotify. This study also found that 90% watch video tutorials and 25% of girls follow more than 10 brands on social sites (Logicalis UK, 2016). There appears to be variation in what is accessed online across ages, genders, cultural groups and socio-economic contexts.

Capability

Measuring children's Internet skills is complex and has evolved over time as the technology has changed and measurements of Internet skills have become more nuanced (Litt, 2013). Capability in the use of technology is developed through informal learning and starts at a young age. Bird and Edwards (2015) developed The Digital Play Framework from their study of how young children learn to use digital technologies through play.

An increasing number of young people are coding, predominantly as part of the school curriculum, and a few (7%) had explored hacking (Logicalis UK, 2016). This same study found that boys were more likely to be coding beyond school than girls. Coding clubs are a current feature of the drive to develop children's skills in computer programming. In Norway a coding club for girls is one such initiative (Corneliussen & Prøitz, 2015).

Digital competence of students varies. Research from Norway found that young people are not a homogenous group and the differences in digital competence have been positively correlated to cultural capital and negatively correlated to language integration (Hatlevik & Christophersen, 2013). However, a study of Chilean secondary school students with access to computers at home found that the students had a homogenous computer-use profile with some variation in frequency of activities across socio-economic groups (Hinostroza, Matamala, Labbé, Claro, & Cabello, 2014). Boyd's (2014) large ethnographic study, as mentioned above, concluded that young people who did not own their own devices were less competent and sophisticated in their consumption and creation of digital content.

Parental beliefs or actions and access together may influence children's digital capability. Home Internet access and parental support were significantly positively associated with Chinese middle school children's technology self-efficacy, interest in technology, perceived importance of the

Internet, and perceived impact of the Internet on learning (Lei & Zhou, 2012). Children's access and use of computers at home in New Zealand may influence their digital capability and thus their ability to participate in the digital world in the future.

Participation

An active and empowered citizen in a digital age is able to participate in digital environments (Starkey et al., 2017). Children's participation can be explored through considering how they develop their identity, the strategies or capabilities they have to enable participation, how they participate and structures that enable the participation.

How children participate in the digital world has been explored in a few studies. One such study from Portugal explored how children navigate their identity between the real and virtual space to participate in the digital world (de Almeida, Delicado, de Almeida Alves, & Carvalho, 2015). The authors conclude that the transition is not a dichotomy, but a *fluid form of de-territorialized mobility between 'virtual' and 'real' spaces* (p.1450). Developing identity is an important aspect of human development, particularly during adolescence.

An exploration of how children use netbooks to learn at home identified a limited range of Internet based strategies that children used when needing help with their school learning (Jesson, Meredith, & Rosedale, 2015), suggesting a lack of knowledge of how to participate in the digital environment to overcome barriers. The sample of students were from a low socio-economic community.

Children are participating online and interacting with others through the content they are creating. For example, through Vlogging about school (Snelson, 2015), and uploading videos and programming (Logicalis UK, 2016). A report from the UK that surveyed 13-17 year olds found that 28% have given their personal information in return for a discount or promotion (Logicalis UK, 2016).

A study of young people's (age 12-18) online networks in the Netherlands explored network activities and perceived learning potential (Ünlüsoy, de Haan, Leander, & Volker, 2013). The study found that dense networks with similar others and strong bonds with online contacts increased the perceived learning potential.

Child safety and protection

There has been significant concern raised about the risks children face when accessing the Internet (OECD, 2012). Livingstone, Haddon & Görzig (2012) warn that the perceived risk may be greater than the actual risk:

Children's safety gives rise to considerable public anxiety, even moral panic, over childhood freedom and innocence, an anxiety compounded by uncertainty about the power of new and complex technologies and the mass media's tendency to generalise from individual instances of harm. The result is a context fraught with public and policy debate polarised by highly protectionist versus libertarian positions, which, it often seems, impede both analysis and proportionate decision-making (p.5).

Safety and protection of children using the Internet is multifaceted. It includes the privacy of data and online activities (Brown & Pecora, 2014). Child safety is identified as a concern across all sections

of society and the literature includes an exploration of legislative potential to reduce harm at the governmental level (The Select Committee on Communications, 2016).

A contributing factor to the concern is that children may be using the Internet by themselves, interacting with potentially harmful or abusive content or people. When children were asked to reflect on their use of the Internet the previous day, 73% reported using the Internet by themselves, 17% watched with other children and 9% with a grown up. (New Zealand on Air & Broadcasting Standards Authority, 2015).

The children in the Media study asked 9-11 year old children what television or Internet content had bothered or upset them. The results have been collated in Table 1. The findings reflect the assertion by Livingstone and Haddon (2012) that there may be some form of moral panic about children accessing the Internet as the concerns about access to the Internet appear to overshadow those raised about television. Most children had a range of strategies they took when faced with challenging content both on television and the Internet. The same study explored what children do when they come across challenging content, and 97% of the 9-11 year olds reported that they took action; closing the browser, going to another website, walking away or telling an adult.

Figure 1. TV and Internet content that has bothered or upset children aged 9-11 years. Adapted from New Zealand on Air & Broadcasting Standards Authority (2015, pp. 93, 97).

	Internet	Television
Animal Cruelty	1%	4%
Bad language	7%	8%
Bad people / dangerous people	5%	
Blood and guts	3%	8%
Bullying	6%	3%
Content for adults / websites not for children	9%	
Death/someone dying		7%
Fighting	2%	3%
Hitting	2%	
Killing	4%	10%
Kissing	2%	4%
Naked people / pornography	15%	7%
Pop-ups/advertising on website	19%	
Rude things	12%	12%
Scary/spooky things	6%	16%
Sex	7%	10%
Shooting	4%	2%
Suffering in the world		3%

Swearing	8%	11%
Violence	8%	17%
Other (specify)	9%	16%
No (has not come across anything)	50%	33%

When 9-16 year old European children were asked about the risks that concern them on the Internet, pornography, cyber-bullying and violent content were the most concerning with about 20% being concerned about each of these (Livingstone, Kirwil, Ponte, & Staksrud, 2014). The research broke down the concerns into three categories; content risk, contact risk and other risks. The types of risks were platform specific.

The contact risks can be further categorised. Weinstein identifies two types of digital stressors for adolescents: the first is relational hostility that includes mean and harassing personal attacks, public shaming and humiliation and impersonation. The second type are from seeking relational connection and include feeling smothered, pressure to comply with requests for access and breaking and entering into digital accounts and devices (Weinstein & Selman, 2016).

The use of SNS has been found to increase the safety risk. An analysis of the safety risks EU children aged 9-16 encounter when using social networking sites found that the children using these sites face more risk than those not (Staksrud, Ólafsson, & Livingstone, 2013). Greater risk was faced by the competent users of SNS, those with more public SNS profiles and a large number of contacts.

A study of adolescents (aged 12-18 years) use of SNS found that online sexual harassment was considered more severe when it concerned personally targeted gender harassment, situations with restricted escape possibilities, the use of insulting words, non-consensual use of pictures for sex-related purposes, or frequent adult-initiated sexual attention (van Royen, Vandebosch, & Poels, 2015).

Risk taking behaviour can vary according to gender and may be influenced by family and societal context (Notten & Nikken, 2016). A study of EU 14-16 year olds found that male adolescents growing up in single-parent households and lacking co-use increased the chance of online risk behaviour, particularly in societies where Internet use is not widespread.

Age is an important consideration when considering safety risks. The literature and discourse is dominated by the risks to older children through their use of the Internet. The online risks to younger children's wellbeing are more ordinary, and more commonly relate to the uses of the Internet within their existing interpersonal relationships, and to the kinds of commercial content they regularly come into contact with (Nansen, Chakraborty, Gibbs, MacDougall, & Vetere, 2012). It may be that the 9 and 10 year olds face fewer contact risks than older children.

Parental involvement

Children using the Internet are influenced and guided by their parents and family in the home who not only provide access to devices but also mediate and control use and model online behaviours. Building on previous research, Zaman, Nouwen, Vanattenhoven, de Ferrerre, & Looy, (2016) identified a range of types of parental mediation practices through a study involving Belgian children

aged 3 to 9 years. This included restrictive mediation, co-use, active mediation, participatory learning and distant mediation. Restrictive mediation includes restricting time spent on devices, when or where they can be accessed or the content allowed to be accessed and may be enforced through technological solutions. Co-use involves the parent as a helper of the child or collaborating in an activity. Co-use and active mediation strategies overlap through the active parent-child discussions. Where this overlap occurs, participatory learning may be occurring where both the parent and child are learning. The final category is distant mediation. This involves monitoring behaviour while granting trust and autonomy. The authors questioned the term mediation believing that parents did more than mediate.

Research on learning at home, conducted in New Zealand, found that parents took a monitoring role in the use of netbooks for home learning (Jesson et al., 2015). Some reported time and content restrictions and some parents viewed online chatting with friends as social and not learning related. Few students (20%) reported parental help with learning through participatory learning.

A study from Singapore found that the most frequently employed parental control was restrictive mediation (Shin, 2015). Parents rarely practiced active mediation or co-using and rarely asked what specific things their children were doing online or checked the browsing history to track which sites their children had visited.

A study of American parents of children aged 0-8 explored how media and technology was used as a parenting tool (Wartella, Rideout, Lauricella, & Connell, 2013). This study found that parents were more likely to use toys, books or television than a digital device to keep a child occupied. Likewise when a child was upset the parent was more likely to use a toy or activity to calm the child, with 17% of parents with mobile devices saying that it was 'somewhat likely' that they would use it to calm the child. More often the mobile device was used as a reward to good behaviour or consequence for bad behaviour. Another study from the US that focused on 0-8 year olds found that 85% of parents set rules (restrictive mediation) about times or places technology can be used (Crux Research, 2015).

The study of New Zealand children explored parental controls or rules for children using the Internet. The dominant control parents reported for 9-11 year olds was restricting the number of hours the child can be online (Table 2). The survey found an alignment between rules set for the use of digital devices and those for watching television. This research had a focus on rules and controls and therefore may not have identified other types of mediation that had been outlined by Zaman et al (2016).

Figure 2. Parental controls or rules for 9-11 year old child using Internet (New Zealand on Air & Broadcasting Standards Authority, 2015, p. 119).

Examples of parental controls	% parents
Restrict the numbers of hours child can be online	47%
Only websites agreed with parent	30%
Regularly check what they are doing online	29%
Only use when adult is in the room/must have adult supervision	21%
Rules about where they can use the Internet	14%
Not allowed online after a certain time	15%

Only use Internet for homework/information/research	14%
Restrict to after they have done homework/chores	12%
Blocked access to types of websites/have filtering software	11%

Parental ideas about the relative value of digital tools and the Internet appear to vary across cultures. A study from the US identified that parents of 0-8 year olds are less likely to turn to technology as an educational tool than to other activities (Wartella et al., 2013). However, a different study of 0-8 year olds from the US found that 60% of parents agreed with the statement; I rely on technology to help my child learn outside of a school setting (Crux Research, 2015). In contrast, a study from Singapore found that parents believed that the Internet made their children more knowledgeable as *it provides an unlimited amount of information and enables the children to find information easily and quickly* (Shin, 2015, p. 655). The benefits of the Internet were seen to be the access to resources and convenience, and these outweighed the negative aspects such as the children becoming lazier.

It is not only parental beliefs, but also parental behaviours that have been found to influence children's online activity. A study of 12-14 year olds from the US found that parents act as role models for their children's Internet use (Vaala & Bleakley, 2015);

...patterns indicate that family dynamics in the home surrounding computer and Internet use play a role in family members' usage such that American parents and adolescents have similar computer and Internet use diets in terms of both time and activities (p. 51)

Technical solutions are available to monitor and restrict Internet access (van der Hof, van der Berg, & Schermer, 2014). However, few parents (one in three) in New Zealand are using technological solutions such as using software to restrict their child's access to Internet sites. (New Zealand on Air & Broadcasting Standards Authority, 2015)

However, parents are not the only influence on children's Internet use. How children find online content or activities was explored in the New Zealand media study (New Zealand on Air & Broadcasting Standards Authority, 2015). Referrals from friends was the most common source, followed by family, YouTube, teachers and television. This same study found that the children living in towns and rural areas had a preference for television and radio than their metropolitan peers. This included higher rates of accessing Internet sites linked to television programmes. As children get older the incidence of finding websites or online content themselves increases. The New Zealand media study found that by age 9, 70% of children with Internet access in the home were finding content online themselves.

Research Methodology and Design

Our research objectives led the research team to use a qualitative, explorative, interpretive research methodology.

We decided that we wanted to speak to a range of children, between the ages of 9 and 10 years old, about their online use and experiences, in school and outside of school. We used semi-structured interview questions to ask the children to describe what they do online, when they do it, why, what they most enjoy, what they learn, what worries them, and what they wish for but don't currently have. The reasons for the age selection were driven by consideration of an age at which most children are likely to have had some online experience and be able to talk about and reflect upon that experience. Given the ethical and practical issues we faced in recruiting and interviewing young people, all research team members obtained Police clearance as required by New Zealand legislation. Schools were identified by the research team as intermediary agents to select our children participants. The team opted for collective semi-structured interviews of up to nine children each and obtained parental permission for each child who participated as well as received the individual child's assent.

The data were collected from 12 group interviews in 12 different schools. Each interview was with between three and nine children, aged between 9 and 11. We used a selection grid (see Fig. 3) to slightly weight our selection of twelve participant schools towards lower socioeconomic areas, rural locations, and locations with larger numbers of Māori, Pasifika, Asian and newer immigrant students because these dimensions were all associated in the literature, including in prior research by research team members, as having significantly different Internet access, use and experiences.

A protocol was developed for the procedure to be followed with each of the schools. Taking into consideration our selection criteria for schools, school principals from schools with matching characteristics were approached by the research team and asked to participate in the research. If they agreed they were asked to select a group of 6-8 children who were typical of the school's overall population, with equal numbers of boys and girls. The schools then, on behalf of the researchers, also sought the written permission of individual parents for their child to participate. Schools were given a koha of \$250 for their assistance with the research.

The children's interviews were, except for one school, conducted in a quiet space away from the classroom, without any school staff present. The interviews began with personal introductions, an introduction to the research, and a description of what the interviewers were trying to find out and why. Each child was given an opportunity to indicate that they were happy to be part of the interview or return to class. After hearing about the research only one child decided they did not want to participate any further. Across the twelve school groups we interviewed 68 children in all (see Table 3). Some food and drink was provided for the children during the interview. After introductions, the children were given a small survey to complete about the devices they used and how often they used them (see Appendix 2). When these forms were completed, the interviewers used the forms to springboard into a round robin of questions, probing and follow-up with each child in turn about the devices they used most, what they liked doing, when they did what, what they

liked most, what they learned, what worried or concerned them, where they went for help, and what they would wish for (real or imagined). Each interview took about one hour.

Fig 3: Sampling Grid for Agents

Children's Characteristics	Location	Sample number
Rural	Northland	1
	West Coast	2
	East Coast	3
	Canterbury	4
Māori communities	Nga Puhi	1
	Urban Māori	5
	Ngati Porou	3
Urban Immigrant family: Pasifika	Porirua	6
Urban Māori	Manakau/South Auckland	7
Urban Immigrant family: Asian	Auckland	8
	Auckland	9
Urban	Auckland	11
Urban- central city children , mixed ethnic population	Wellington	10
Urban, Immigrant, lower socioeconomic	Wellington	5
Urban, central city	Christchurch	12
Kura	East Coast	3

Either before or after the children's interview we also interviewed the principal and/or his or her delegate about the general characteristics of the children participants, the school's programmes with regard to online education and learning, and the school's community environment. Our intention here was to understand the context to the children's responses and explore the potential factors and conditions influencing the children participants' online use and experiences.

Research Participants

Tables 3 -7 below provide an overview of the characteristics of the children who participated in the group interviews.

Table 3: Gender of children interviewed, number and %

Gender	(n)	(%)
Male	30	44%
Female	38	56%
Total	68	100%

Table 4: Age of children interviewed, number and %

Age	(n)	(%)
9	18	27%
10	36	53%
11	14	21%
Total	68	101%

Table 5: Region of school's location, number and %

Region	(n)	(%)
Northland	11	16%
Auckland	10	15%
Gisborne	13	19%
Wellington	24	35%
Canterbury	10	14.4%
Total	68	100%

Table 6: Decile rating of school, number and %

Decile	(n)	(%)
1	24	35%
2	5	7.4%
3	15	22%
5	11	16%
8	7	10%
10	6	8.8%
Total	68	100%

Table 7: Ethnicity of children interviewed (NOTE Not all responses are defined)

Ethnicity	(n)
Maori	6
Pasifika	15
Pakeha/NZ	11
Asian	3
Other	2
Total	37

Research Findings

Our research findings are explored in five sections. Each of the five sections represents our data in increasingly fine grained detail.

1. **Children's online use profiles** paints a high level picture of children's online experience and use of digital devices in the form of six archetypical profiles compiled from our data.
2. **Children's access and use of digital devices** proves a snapshot in graphical form based on the questionnaire the children completed about the devices they use, and how often they use them.
3. **School contexts** provides brief cameo descriptions the schools the children in our data came from and they reveal the some of the wide variations that exist in the schools.
4. **Patterns under which positive outcomes appear to emerge for children** examines four high level themes from the data: i) the children themselves; ii) the parents and home setting of the children; iii) the classroom teachers of the children; and iv) the children's school.
5. **Factors and conditions influencing children's use and experience of digital technologies** explores the children's interview data in more depth along with data from the interviews we conducted with their teachers and principals to understand these factors. It addresses the factors identified across five areas: i) access to digital devices and the Internet; ii) children's activities and learning online at school, at home and elsewhere; iii) children's behaviours online; iv) home-based factors affecting access and use; and v) school factors that are influencing digital access and learning.

Children's online use profiles

In this section we have created some archetypical profiles of online experiences of 10 year olds. They are derived from interviews and based on children that were interviewed to illustrate a range of characteristic-types found in the interview data. Each profile is derived from a different school setting and drew on what other similar children from that school or other schools told us. The names have been changed.

Daisy: the careful user

Daisy attends a school in a high socio-economic urban area. Each student at the school has access to a laptop that is funded by the school. Daisy uses her school laptop for writing, accessing information and educational games, similar activities are included in her homework. Her teachers give her feedback on her writing progress through Google docs and her parents can track her learning progress through a school learning system. She likes the access that she gets to a range of books online and reads both online and physical books.

Beyond school Daisy has access to a laptop that her mother gave her when she upgraded her own. She also uses a family tablet. She is restricted in her use of devices at home: *'Not really weekdays*

'cause I'm always getting ready... for the next day at school. It's mostly in the weekend on a Sunday or after my netball game on the weekend.' During the week she uses her laptop at home for homework only. Her family have an Xbox that she enjoys using *'because it's a really big screen and it's fun to control a big screen.'* She plays a range of games and enjoys building worlds in Minecraft with her sister. Daisy is aware of keeping herself safe online, when asked about communicating with others when playing online she said:

'I'm not saying I'm not allowed to, it's just I don't know who these people are so I feel safer if I play with a family member. Like I've got two cousins who like the computer and one of them plays Animal Jam so I can hang with him on the computer ... one likes to play RoadBloxx so I can hang with the other one too.' Limiting interactions to her family and friends applies to her use of social media too: *'I go on [Snapchat] with my cousin. My cousin's eighteen that's quite fun with her 'cause ... she lives in Scotland and she just came and I met her just this year. Cause I didn't know her, and she's really cool. And it's really nice cause you can leave a note on it and a cool picture.'* She is looking forward to getting a smartphone when she starts Intermediate school so that she can stay in touch with her parents when away from home.

Paora: the teacher led collaborative learner

Paora attends a school in a regional low socioeconomic area of New Zealand. He has a Chromebook that he uses at school and takes home for learning. Most children at his school only have access to netbooks for learning when they are at school with the BYOD option new at the school. There are strong rules at home about when the laptop can be used, learning must be first before games and his parents check his web history. His teacher has introduced him to blogging through Jelly pages, Gmail, Studyladder, Mathletics and Tuxpaint. All the children in his class use avatars as their online identities, and have their own YouTube channels. They share their learning through their blogs and YouTube channels. He is very aware of online privacy. Enjoys dinosaur games. Works with other children from the same class online to create products for both learning and fun, although he noted that when using Studyladder: *'I would never go onto games first. You just can't get off the games because they're so fun.'* He gets feedback on his online learning from his teacher and collaborates with other students through google docs. For example:

'We were both in the student council, and we had this meeting one day and it was about making your own newspaper, but ... because it was in the afternoon ... we had no time to do it together. We live really close together. We live one house away, and one night we made a shared document and made a newspaper from seven o'clock to eight o'clock, and then we had it done by the morning and we got it checked off by [the teacher] and then we printed it out.'

Paora has constrained access through time and finances. Using the laptop for learning has increased his engagement in learning at school. He would like to have access to *'A YouTube app, Minecraft that is free that is the proper one, and more dinosaur games ...'*

Ollie: the gamer

Ollie lives in a wealthy rural farming community with access to fast Broadband. At school he uses Studyladder, researches through websites and does an optional coding class. He feels that he has outgrown Studyladder as they have used it for a number of years and he no longer finds the activities challenging. There is restricted access at school to the devices and activities that Ollie is

able to do. He has been banned from using laptops at school as he and two of his friends were caught playing games on them.

At home Ollie likes to play multiplayer games on his playstation. He plays GTA, Call of Duty: Black Ops and Minecraft. He enjoys the team aspect of the games. When asked who he plays with he said: *'I have most my friends from my old school, and I usually play online with just random people from the other side of the world and stuff.'* There are rules around his game play, like no headsets when playing with random people he does not know and no devices after 8pm. He messages and talks to his friends and cousins through his Playstation.

'My mum has a rule where if on my Playstation or Xbox, if anyone says dirty - bad messages to me, we'll turn it off, and then walk over, so he doesn't keep on messaging you. So you turn it off and then you go get Mum.' Ollie would like to have access to the latest gaming platform.

Mohammed -: the YouTube entertainer

Mohammed lives in an ethnically diverse low socio-economic urban area. There is a pod of laptops that the children in Mohammed's class share and some computers available within the library. Mohammed uses the school laptops to write stories in google docs, develop mathematical skills through the Manga High website, complete online quizzes (with videos to find information when he doesn't know the answer) and watch videos on YouTube to research topics.

At home, Mohammed goes on Manga High and has his own YouTube channel. He uses a webcam to record and share amusing clips of himself with a 10 year old's sense of humour. He knows all the people who follow his channel; friends and cousins. His mother taught him how to do this. He said he has few rules restricting his use of digital tools at home, although he reported that his Dad put blocking software onto his laptop. He estimates he spends nine hours online a day at weekends. He outlined strategies he uses if people are being inappropriate in their communication with him and these include confronting them using a headset, blocking them and telling his parents.

Mohammed has used his videoing skills for his schoolwork. When his class was studying environmental issues he made a video of him going to the landfill with his family that he shared with his teacher and class. Mohammed would like to have Vegas Pro 11.0, an app for making Go YouTube Videos.

Dakota: the artistic networker

Dakota attends a school in a low socio-economic urban area. At school Dakota plays Sum dog for Mathematics learning and researches the internet through the laptops that are available. Each child in the class records and reflects on their learning progress by placing links, padlets and pictures into their own wiki. The individual wikis are used as a communication tool between the children and their teacher and their parents. The teacher uses Wiki's to guide students through learning activities. Dakota sometimes publishes the stories she writes at school and other people can give her feedback on these.

At home Dakota likes to watch videos and listen to music. She watches tutorials on *'how to make stuff'*, how to apply makeup and dance moves. With family members she lip synchs and uploads the videos using Music.ly. Most of these are private, with the occasional one public and then gets feedback from a global audience. With her Aunt, she videos her cousin lip-synching:

'... my little cousin. She does a lot of outfit ones and I just help her with recording. She shows different sorts of clothes that she has. Sometimes she has the same outfits as some other designers. For example, Rihanna's long red dress – she has the exact same cut except a small one for a 7-year old. She has the outfit on and sometimes she lip-synchs and sometimes she does one where she shows different sorts of outfits she wears every day.'

When asked about privacy, Dakota noted that *'I told her [Aunt] to go private but she wouldn't. But looking on the bright side, she is always on the leader board. She is never lower than 10.'*

Dakota and her classmates use Roadblocks at home to communicate with people around the world and she snapchat and Facetimes her Aunt who lives in the US. Dakota would like to have access to creative apps: *'I saw this App and you can download it on your laptop. It's an engineer type of App where you can make blueprints, and it also helps you understand machines. They should do one for kids.'*

Peron: the resilient user

Peron lives in a low socioeconomic suburb of a metropolitan area. The school is part of a scheme where the family can buy a netbook for school learning through a Trust. Peron is part of this scheme although he is not able to take the netbook home as he lives in multiple residences and the netbook has been requisitioned by family members when it has been taken home. At school he blogs about his learning, his achievements and his reflections, he gets feedback on his learning from his teacher and peers. He uses Google docs, Mathletics and researches through websites.

Beyond school he plays games on the Xbox with his cousins. The use of digital technology for learning is limited to school. He loves to draw on paper, he does not have access to technologies for online drawing. Peron would like a phone. When asked about what innovative technology would be useful in the future, Peron noted he would like a *'criminal warner'* app on a smartphone to enable people to keep themselves safe.

Children's access and use of digital devices

Each of the participant children completed a small questionnaire (see Appendix 2) about the devices they had access to and how frequently they used them. Figures 4-7 below provide an overview of this data.

Figure 4: Device use by children interviewed

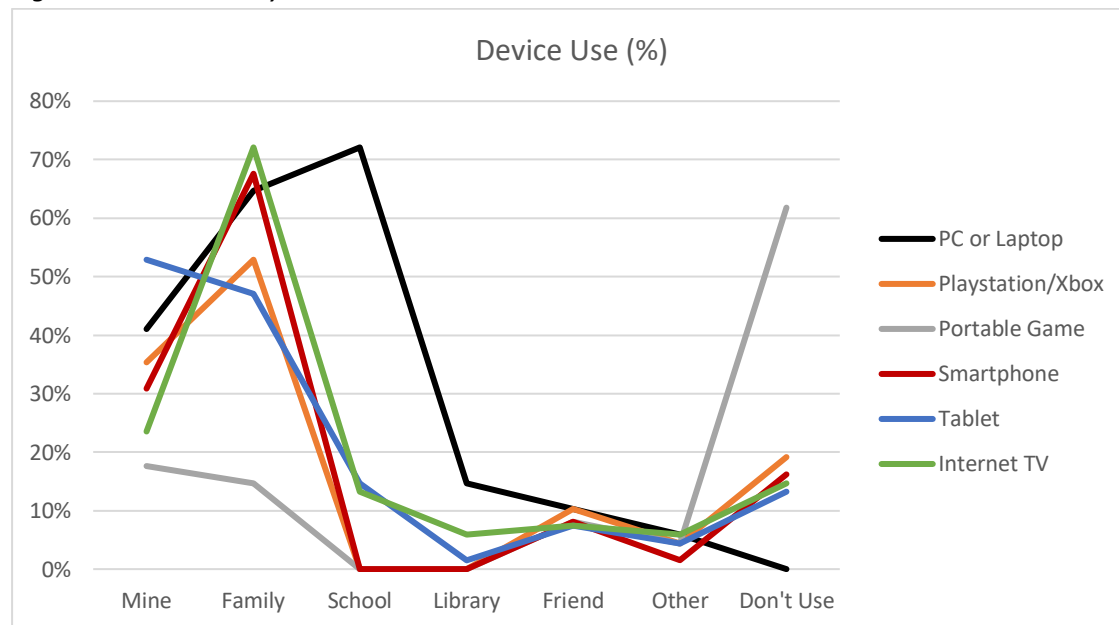


Figure 5: Frequency of device use by children interviewed

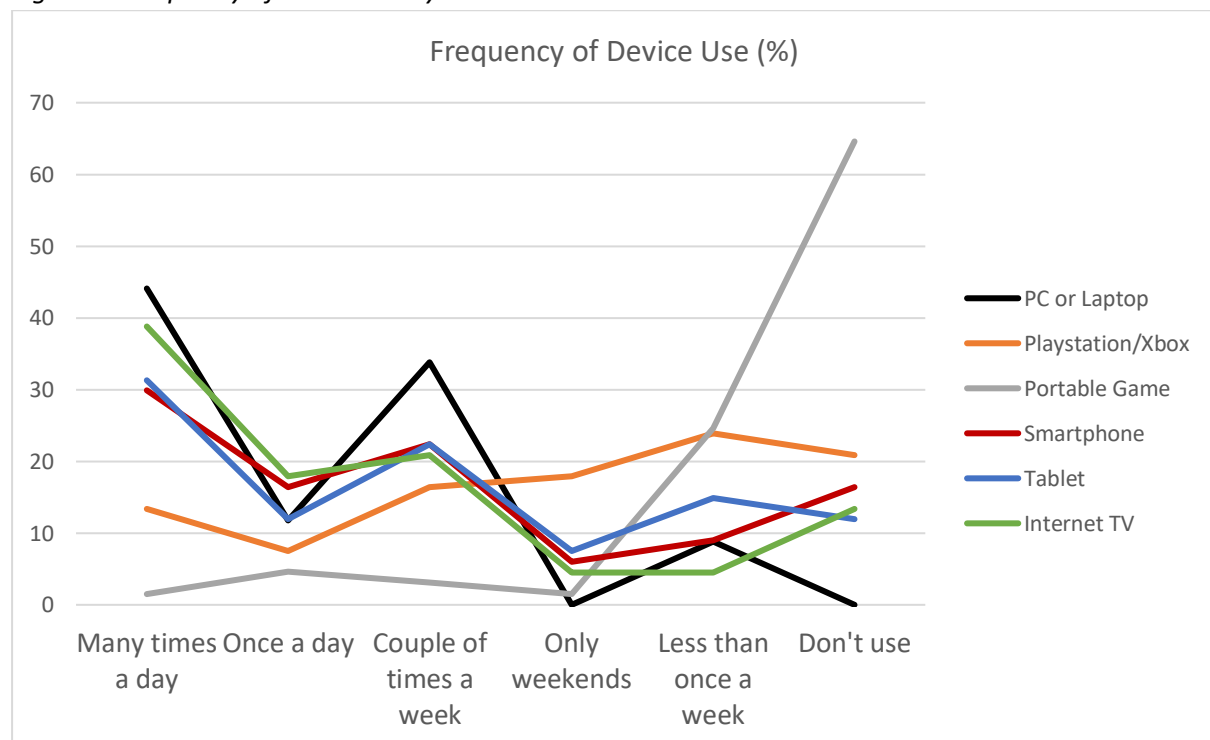


Figure 6: Access and use of own devices, by decile bracket (%)

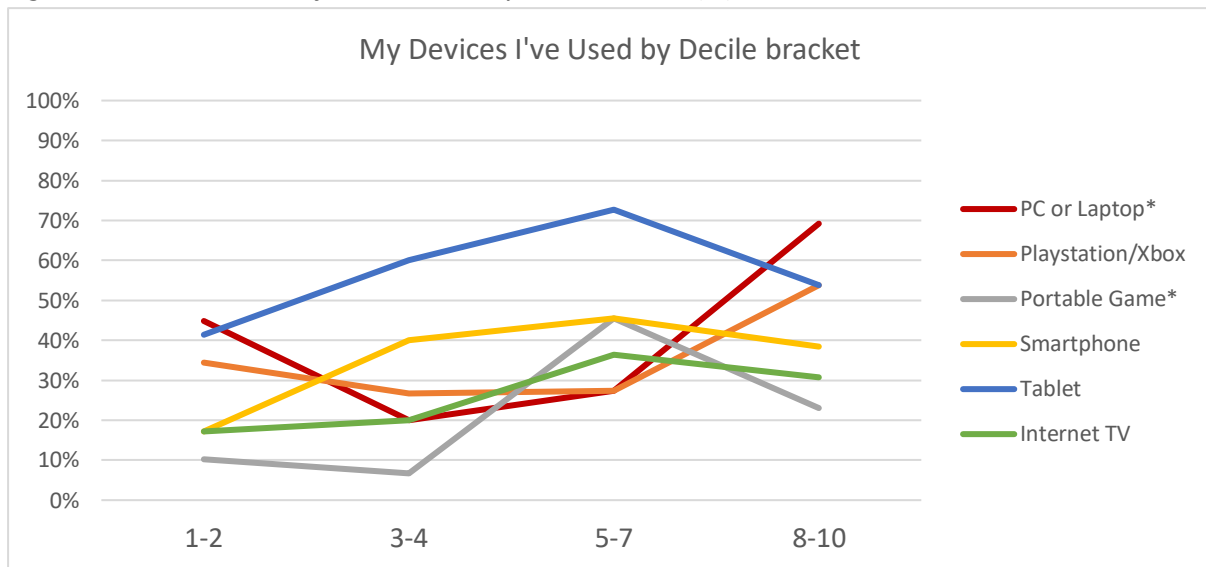
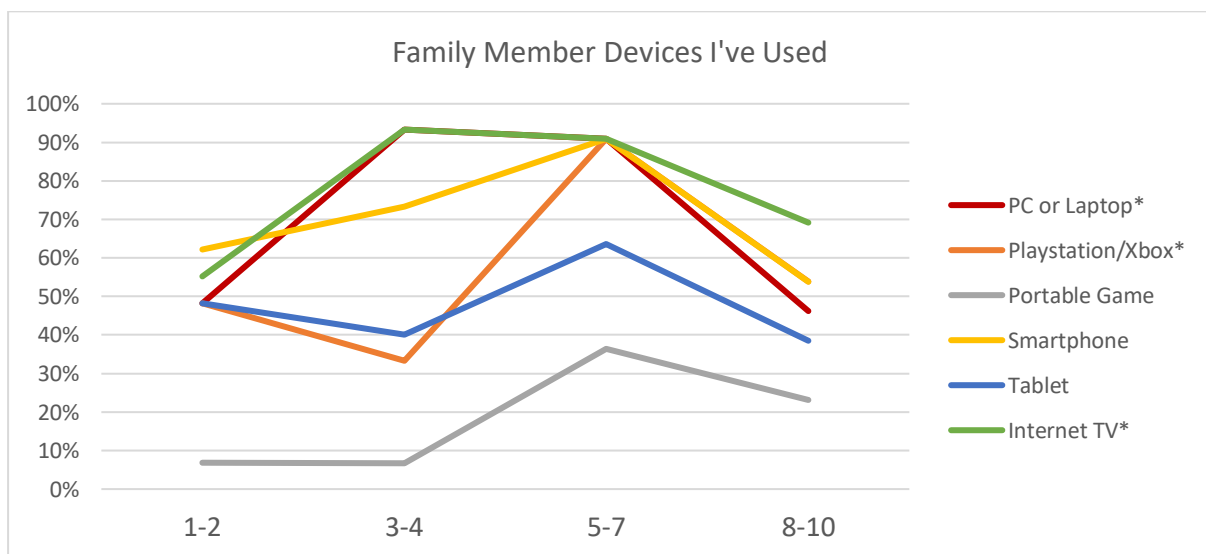


Figure 7: Access and use of other devices, by decile bracket (%)



NOTE: Deciles have been grouped as follows:

- Deciles 1 to 2 = 29 responses
- Deciles 3 to 4 = 15 responses
- Deciles 5 to 7 = 11 responses
- Deciles 8 to 10 = 13 responses

Significant results have an (*)

School Context

The school context in which children and principal and/or senior teachers were interviewed and the children accessed digital devices and the Internet is describe below in a brief cameo of each of the schools. The schools are referred to by a letter only to honour confidentiality assurances given to the interviewees.

School B

This is a new school for Years 1-6 in a growing suburban area close to one of the bigger cities. Its charter and website identify it as a 21st century learning environment. The children were Asian and European. The children used devices for a variety of purposes which predominantly involved creation of content as part of their learning every day. The school's curriculum aimed to integrate the use of digital devices and digital learning into everyday classroom learning and teaching. The school has a protected Wi-Fi network and has provided Chromebooks for each child from year 2 up. There is also a range of other devices available in the classrooms. The school tries to be paper-less where possible, by making use of Cloud storage to communicate with parents and they can generally rely on parents having Internet access. This approach extends to the classroom where Year 5-6 children use Google docs on their Chromebooks to store their own work and have access to their accounts from home.

School C

School C is situated in a provincial city on the North Island and catered for Years 1-6. The children at the school were two thirds from a Māori background and one third Pakeha and a sprinkling of other ethnicities. The school was inspired in its approach to the early year's curriculum and learning by the Reggio Emilio principles which focus on encouraging curious minds and children as co-constructors in their own learning. The Year 4-6 children regularly used their digital devices and the Internet in the classroom to create content and were explicitly introduced to a range of digital apps to help them do this. The school had a Wi-Fi network linked to the Network for Learning and an optional Bring your Own Device (BYOD) policy in operation for Years 4-6 students. Some digital devices were available in the classrooms for younger students. The school uses its website and Facebook page to post the achievements of its students for the community to see.

School D

Situated in a dormitory suburb on the fringes of one of the bigger cities, School D had Year 1-8 students. Its roll was two thirds children of Pasifica ethnicity and one third Māori. The use of digital devices and online learning was integrated into the school's curriculum. The school had a leasing scheme in place which allowed all year 5 and 6 students to have their own Chromebook for use at school and at home if they wished.

School E

School E for Years 1-6 was situated in a rural town on the South Island. The roll was predominantly Pakeha/European, one eighth Māori and a few other ethnicities. According to the principal the school was planning for an integrated curriculum but was yet to have one. The principal saw the impediments to progress towards a fully integrated approach within the curriculum lay in the attitudes of the community and in the current digital capability of the school's classroom teachers. In

keeping with the wishes of parents, the school did not have BYOD but there were computers and tablets in the classroom 'as part of standard equipment, alongside the maths equipment'.

School F

Catering for Years 1-6, School F was centrally located in a provincial city. The roll is two thirds Pakeha/European and one third Māori. The classroom teacher labelled her approach to the use of technology in the classroom as 'blended'. Laptops and tablets were available in the classroom for children to work on. Digital devices in the classroom were used in supplementary or add-on ways, e.g. for maths practice or challenge, or literacy extension. The children used google docs for collaboration with each other, and the teacher used a large screen to share material with the class.

School G

School G was a full primary school for Years 1-8 in a rural town in the north of the North Island. Its roll was almost three quarters Māori, one quarter Pakeha/European and a few other ethnicities. The children had Chromebooks available in their classrooms on a one-to-one basis. The actual degree of integration and use in the classroom programme depended on the preferences and skills of the classroom teacher and children from adjacent classes had quite different classroom experiences. All the children had Google accounts and access to all the Google apps. The teachers used the learning analytics associated with some of the Apps.

School H

School H was a Kura Kaupapa Māori located in an urban area in a larger regional town, in the north of the North Island, offering education for Years 1-15. The Kura had a few devices available for student use in the classroom, otherwise computers for student use were in a dedicated computer room which the teacher needed to book. School devices were not available for students to take home and the principal thought only a small proportion of the children had access to computers and the Internet at home. The degree of integration of digital devices into the Māori language immersion classroom programme depended on the interest, skills and willingness of the teacher to source and adapt Apps suitable for use in Māori medium e.g. to develop and practice language skills. Use of learner monitoring aspects of the Kura's management software was limited because it required teachers to translate the Māori curriculum objectives and this was very time consuming.

School I

Situated in an urban area of a larger city, School I had children from Years 1-8. Its roll was almost 70% Pasifika students, 25% Māori and the remainder a minority of Asian and a few Pakeha students. The school had looked to charities and brand-led programmes to obtain computers and other devices for use in the classroom and had undergone several changes in the types of devices and Apps available because of these changes in affiliation. There were trolleys of devices (Chromebooks, Notebooks and tablets) shared between adjacent learning pods. These could be used to suit a teacher's programme although many appeared not to use the devices because they were broken or uncharged. The children reported that their use has been restricted. Use in the teaching learning programme appeared to be individual teacher-initiated rather than whole school-led and lack of teacher capability and the cost of and access to professional development according to the principal was an issue.

School J

School J, with children from Years 1-6, was in a long-established urban area of one of the larger cities. The roll was one quarter Māori, one quarter Pasifica, one quarter Pakeha/European and the remaining quarter were mainly Asian. The school had some Chromebooks, iPads and Macbooks in each classroom bought with school and grant funding. The number of devices available was insufficient for one for every child and the school was considering introducing Bring Your Own Device (BYOD). The school was part of Māori student success group and shared online resources with five other schools. Teacher turnover had made it more difficult to stay on top of ICT professional development of teachers.

School K

School K was in a larger city with children in Years 1-8. The roll was 54% Pasifica students, 23% Asian, 9% Māori and 14% other ethnicities and no students reporting as European. The school had purchased/leased devices for classroom use with Year 5 and 6 students with sufficient for one for every child in years 6-8. A senior teacher had oversight of how the school was incorporating digital devices and apps into classroom programmes.

School L

School L was located in an outer suburban area of a larger North Island city. More than two thirds of the roll was Pakeha/European and the remainder was Māori (20%), Pasifica (10%) and Asian (5%). The school had sets of Chromebooks for use by the students in class although not sufficient for one for each student (there was approximately one device per three students in years 5 and 6). Neither could the students take school devices home, although they could use their school Gmail account to sign into their school account from a home device. The learning programme in the classroom deliberately taught digital citizenship and digital skills such as searching, curating and presenting content online.

School M

In a suburban area of a larger city, School M had Years 1-6 and a roll that was almost half Pakeha/European, a quarter Māori, a quarter Pasifica, and the remaining quarter largely Asian with a few other ethnicities. The children like using their Google docs accounts to create content, embed pictures, and share their work with classmates, their teacher and sometimes others, including parents. The school had a senior teacher with responsibility for the integration of digital learning into the curriculum and her focus was on building the competence and confidence of the classroom teachers to integrate technologies into their classrooms and use the digital analytics to monitor and improve learning progress of students. The emphasis on digital learning in the classroom had followed on from an explicit focus on this in the School Charter and Plan. At home the children sometimes did schoolwork but also liked to read some genres online (because of availability) and play digital games with family and friends. Girls and boys alike like 'a bit of gore' and also like to engage their imagination and creative side online.

Patterns under which positive outcomes appear to emerge for children

This section answers our research questions through the systemic level patterns we saw in our data. Our focus was on identifying the patterns under which positive outcomes appeared to emerge for children; any identify blockages we could identify; and what kinds of assistance, applied where and how, seemed to reinforce the opportunities children currently have and the likelihood of more positive outcomes in terms of children's digital experiences and learning. We have arranged the data with respect to:

- 1) the children themselves;
- 2) the parents and home setting of the children;
- 3) the classroom teachers of the children; and
- 4) the children's school.

Children's use and experience of digital technologies

All the children we spoke to had some level of access to digital devices both at school and at home. However the variety, duration and personalisation of that access was very varied. At one end of the continuum some children had their own devices which they used at school as needed throughout the school day and at home when they felt inclined (within the general parameters established by parental rules – see more on this in the discussion below on the home). This scenario was more common in higher decile schools. There were variations on this scenario in that the device might not be owned by the student but available for use during the school day. At the other end of the spectrum, the children have shared access to a Chromebook, laptop or similar at school for specific and limited times during the school day and only limited access to shared devices outside school. This scenario is more common in low decile schools. Although we should emphasise here that both scenarios exist, along with the variations in between, in all schools. The conclusion we draw from our conversations with children is that for most they have less access to digital technologies than they would like, and in particular less opportunity to explore a device in their own time than they would like. When we asked the children what they would wish for to help them learn, many said their own high-spec tablet or Chromebook.

Children enjoyed using digital devices for both their school work and play. They liked writing and creating documents on the computer, doing maths games, and finding out something they wanted to know about both for hobbies and school work. The enjoyment factor seemed universal, although we admit that this could be a bias in the way schools selected the children we interviewed to favour the more enthusiastic. In various ways the children all referred to the control and agency the online world gives them over their own learning: being able to go at your own speed, follow up what you want to, skip the bits you already know don't care about, find something that interests you.

Children also liked reading online because they can get access to books in genres that they liked and that are not so available otherwise. They also enjoy reading a traditional book. When we asked if

there were things they preferred to do offline even though they could do them online, many favoured the physical book and most favoured playing with a friend face-to-face rather than online.

The online world is an alternative playroom for most we spoke to. They played games on PlayStation, or an equivalent, with friends, rarely strangers. They liked competitive and action games like FIFA, NBA and Call of Duty (even though some were R18 games). They liked sites like Music.ly and YouTube where they can follow music they like or follow other interests like particular animals or a hobby. Some even post their own YouTube videos or record their lip-synching of their favourite song for the world to see. Children also liked the creative world of Minecraft and quite a few like doing coding using Scratch. A lot of children used learning apps from school at home like Studyladder, Mathletics, and Sumdog.

Most are aware of being secure online and were quite pragmatic about their privacy, making a deliberate decision about when they would be visible and when they would use a pseudonym and limit the access to known friends only. A number admitted to an unpleasant experience of encountering a stranger in their online space. They were again matter-of-fact about how they dealt with this by either blocking the other user or logging out themselves. If they bothered to tell parents it was usually after the fact reporting of what they had done.

The total amount of time each day spent online varied. In a school where children have their own device, this might be used many times a day, throughout the day. In other schools although there might not be a device for every child, devices were shared across classrooms to enable access for a smaller amount of time. Children in some schools only used a computer or other device as a kind of special treat and access time is therefore even more limited. Time spent at home also depends on device availability. Device ownership seems to be important here – being able to choose to use your device on a whim to do what you fancied. Even then it seems that children with their own devices self-manage their own access and will often favour time doing something else away from their device.

Parents and home setting's influence on children's access to, experience and use of digital devices

Generally parents control access to devices and online time at home. Some parentally-set rules are the norm and the number of children that we encountered where there appeared to be no parentally-set parameters were few. It is common for devices to be limited to certain times and conditions (like only until 7pm, only after chores have been done) and kept away from bedrooms. Weekends tended to have more relaxed restrictions.

While there appeared to be Wi-Fi access in the homes of many of the children we interviewed this was not something that could be taken for granted. Some parents have clearly instigated restrictions on what apps can be accessed and the children largely seem to respect these. Sometimes a parental smart phone was the only home access, or the Internet TV. The variety and type of devices in the lower decile school homes were more limited and younger siblings have to compete with older siblings for access time and generally lose out on the more desirable devices. Generally it was only in the higher decile schools that children had their own home device. Parents and siblings play online games with children, and afterschool play can include online games with friends.

Teacher and classroom influence on children's access to, experience and use of digital devices

We noticed the effect that deliberate teaching about the online world has on children's experience, confidence and competence. The teacher does not need to be an online expert. The children are quite accepting that a teacher might be learning with them. We noticed that confident teachers simply put in place routines for management of the devices and for the children-experts to become tutors to their peers. These teachers also had good logistical systems in place to store, charge and check devices daily and keep them repaired as needed. Where such logistical systems were missing, we noticed that use was more haphazard and plagued by problems which affect both the teacher's motivation to use devices and the children's enjoyment also because of frustrations with malfunctioning equipment.

Teachers who are deliberately trying to introduce online tools into their teaching and learning programme appear to enthuse the children and develop their skills and confidence. We noticed this in the language and descriptions by the children about what they did and the extent to which to children appeared to have some control over their learning.

School influence on children's experience and use of digital devices

A pattern we discovered was that confident and knowledgeable children using digital devices for a range of purposes occurred in schools which had built digital learning into their school plan and their school curriculum. This meant that irrespective of decile, the school had made a strategic decision at board level to make devices available to their children for their learning and had followed this through in a committed way. The devices and the supporting infrastructure might be purchased or leased. One per child was more likely in well off areas, while lower decile areas had fewer devices, had a lease to buy scheme which parents opted into, and were dependent on grants. A downside of the grants and assistance programmes available to low decile schools was that what the schools leased or purchased was driven more by the granting process and less by an overall consistent school strategy. As a result, low decile schools might be more tempted to make shifts in the hardware and software they are using and this undermines the confidence that teachers might have acquired on the previously used devices.

A second feature of the school-driven strategic priority was investment in teacher professional learning and how classroom teachers can incorporate digital technologies into their classrooms. A high priority afforded to digital learning was usually accompanied by a senior teacher having responsibility for the area and taking a lead on the professional development front. Clearly professional development for teachers remains an issue. Most lower decile schools mentioned both the need for this, but also the unaffordability of it, especially when viewed in the context of all the other priorities and a low decile school.

Figure 8: Schools Summary

School	Location	Decile	Student Roll	Devices	Curriculum
B	New suburb close to one of the bigger cities North Island	10	Years 1-6 Predominantly Pakeha/European and Asian	School-provided Chromebooks for each child and a range of other classroom devices such as tablets, PCs smart TVs etc.	Use of devices and Apps integrated into curriculum objectives and classroom practice.
C	Provincial city North Island	3	Years 1-6 Roll: 2/3 Māori; 1/3 Pakeha/European	The school has a recently introduced a BYOD policy for Year 4, 5 and 6 students. There is some community resistance to wider introduction in the younger years. Computers in Homes has increased device access at home to about 80% of children.	Devices, mainly Chromebooks, are being used in the classroom to supplement learning activities. Deliberate teaching strategies also teach about how to, and encourage, create digital content. The children are deliberately taught about digital citizenship and a range of digital literacies from searching, creating in words and pictures, displaying, curating and so on.
D	Dormitory suburb on fringes of to one of the bigger cities North Island	1	Years 1-8 2/3 Pasifica; 1/3 Māori	Year 5 and 6 students have Chromebooks offered to them through a Charitable Trust at a price families can afford such that nearly all Year 4-8 students has their own Chromebook. These can be taken home by Year 5-8 students provided the care agreement signed by the students and the parents can be honoured. Students without their own Chromebook have access to a pod of school-owned devices.	All the students have a school Gmail account and use it to store their work on Google docs. The school has a programme to teach the children to use their Chromebooks responsibly, and all teachers are able to do this. Teachers also integrate the Chromebook use into their classroom programme. Children search create, curate and display their digital content for others to see, comment on and help them improve it, based on teacher and peer feedback.

				Home Internet access is neither universal nor constant, because it is one of the first things to go when there is financial pressure at home.	
E	Rural town South Island	8	Years 1-6 Roll: 80% Pakeha/European, 16% Māori	The children have access to iPads and Macbooks in the classroom but not one each. The School's survey of their parent community found that parents did not want their children completely immersed in ICTs.	Aspirations for an integrated curriculum approach are impeded by parental buy-in and teacher capability. In the meantime, while also building teacher capability, the school is focussing on the children being digital citizens. All children have Gmail accounts which are used to access applications and store student work. Teachers have moved towards doing their planning digitally and collaboratively.
F	Provincial city North Island	6	Years 1-6 Roll: 30% Māori, 63% Pakeha/European, small numbers of Asian, Pasifica and other ethnicities	The school has Chromebooks, laptops and tablets on trolleys which are shared among classrooms. As well, teachers have computers and a large screen to share content with the class. Many of the children have access to devices at home such as laptops, game devices, tablets and smart phones.	The school has appointed a senior teacher to lead the introduction of digital device use as part of the classroom curriculum. She refers to the approach in her own classroom as blended. She uses devices for Maths and has tried a number of Apps and is happier with some than others for the variety and challenges they give to students. All the students have Google accounts and enjoy using Google docs to share their work with each other and the teacher who comments on their work. The teacher might even do this sometimes when the children are working on Studyladder at home.
G	Rural town	2	Years 1-8	The three classes of 9-11 year olds all have a Chromebook each in their	The school is part of a cluster with five other schools and one senior teacher has

	North of North Island		Roll: 67% Māori, 29% Pakeha/European, small numbers of other ethnicities	classrooms. One classroom teacher estimated that about 30% of his class do not have Internet access at home.	responsibility for the digital curriculum across all the schools. There is a deliberate programme of cyber safety and cyber citizenship in the school based on a programme borrowed from another school. The school has all the Google Apps available and these are used in the classroom although the extent of use varies with the teacher. One estimated he would use the devices and Apps as part of his teaching programme about 50% of the time.
H	Urban area of a larger regional town North Island	1	Years 1-15 Roll: All Māori students	The school had a few devices available for teacher and children to use in the classroom. Two banks of computers in separate dedicated rooms could be booked by the teachers for particular activities. Maintenance of these in good working order is an ongoing challenge for teachers. Only about half of the school's families had Internet access at home and achieving this level has been assisted by the Computers in Homes programme. The school turns its Wi-Fi network off after 6pm and at the weekends to prevent misuse.	There are only a few devices in each classroom and the dearth of Maori medium content limits classroom use. Committed teachers spend a lot of time finding Apps suitable for use in Maori medium learning.
I	Urban area in larger city North Island	1	Years 1-8 Roll: 68% Pasifica, 24% Māori, 2%	The school has a lease programme which makes notebooks, tablets and Chromebooks available for each classroom although on a shared not a	All the teachers in the school have laptops funded by their Board and they have data projectors in their classrooms. Teacher confidence and competence to use digital Apps in the classroom was a

			Pakeha/European	one-to-one basis. School devices are for school time use only. The principal estimates that only about 40% of the children have Internet access at home and devices they can access. Among the children interviewed, gaming devices were the most common and were usually shared with other family members.	limiting factor in how much digital learning went on; the children have Google accounts and use Google docs sometimes for creating but the most common classroom use is searching for information.
J	Urban area of a larger city South Island	3	Years 1-8 22% Māori, 24% Pasifica, 24% Asian, 22% European/Pakeha, 6% other ethnicities, mainly new immigrants.	The school has devices for sharing among students in the classroom (iPads in junior classrooms, Chromebooks in the more senior classes some Macs from an earlier purchasing era) and is considering introducing a BYOD policy. Chromecast is available in the classroom along with a large screen. The principal thinks that around 90% of the children's homes have Internet access.	The school has introduced Google docs across the school and implemented a programme of upskilling teachers on effective classroom practice using digital apps and devices. It is part of a Community of Learning Cluster and a cluster of schools focussed on Maori student success.
K	Urban area in larger city North Island	3	Years 1-8 9% Māori, 54% Pasifica, 23% Asian, 14% other	School has one device for every child in Years 7 and 8 but only shared devices on a mobile trolley shared between classrooms in Year 5 and 6. A school survey of parents evidences that around 90% of the homes have Internet access.	Learning apps are used in specific areas such as Sunshine readers in the junior classrooms or MagnaHigh Maths across the school. The children create their work on Google docs and share with their teacher but the dashboard facilities are not in use.
L	Urban area in larger city	5	Years 1-6 68% Pakeha/European,	School has Chromebooks which are used in class time and shared by students. Grant applications have	The school has a lead teacher taking responsibility for integration of digital technologies and digital learning into the

	North Island		20% Māori, 10% Pasifica, 5% Asian	been used successfully to grow the number of devices the school has. Each student has a Gmail account and Google docs is used for content creation, curation and sharing. About 4-5 children out of 30 in a class are estimated to have no Wi-Fi at home.	school's curriculum. She takes steps to deliberately teach digital citizenship and practices into her classroom and integrates the use of Google docs into her programme. She is aiming to have her students think independently, monitor their own learning and take responsibility for their learning. She is looking at how to support of other teachers and develop the capability to do more of this across the school.
M	Urban area in larger city North Island	5	Years 1-6 43% Pakeha/European, 24% Māori, 25% Pasifica, 6% Asian	There are school devices available for use in the classroom on a ratio of about one between two students but adjacent classrooms sometimes share to give greater access. There are also some iPads and interactive whiteboards in the classroom.	The school has a designated senior teacher leading incorporation of digital learning experiences and strategies into the school's curriculum and learning programme and use of digital devices in the classroom. There is an active programmes of teacher professional development and learning to support the integration of digital learning into the classroom curriculum of individual teachers.

Figure 9: Summary of themes

THEME	STUDENTS	PARENTS	TEACHERS	SCHOOLS
Children's online behaviour	Wide range of social interaction including: - gaming friends and family; - few online acquaintances; or social media accounts.	Many parents controlled behaviour through access to online tools and set rules for access to devices, Apps and the Internet at home and protection of online identity.		Cyber safety practiced in all schools through different approaches.
	Phone and tablet seen as desirable online access devices currently out of reach.			
	Children familiar with social Apps were also likely to be aware of their online privacy.			
	No preference for online versus offline recreational activities.			
Children's Online Learning Activities	Students were active participants in their learning in schools with a principal/policy-led approach.		Principal-led approach saw teachers using online tools to monitor student learning teaching effectiveness.	Degree of the embedding and integration varied greatly.
	Enjoyed independent learning and working at their own pace.		Poor leadership saw teacher practice dependent on how adaptive the App was.	Principal-led educational philosophy and school policy ensured use of devices and Apps in everyday teaching and integrated approach.

	Enthusiastic about sharing work with peers and teachers through email accounts on online tools.		Limited access to quality Apps due to cost.	Poor leadership saw the use of digital devices as an episode and a useful add-on.
	Games were a popular tool and led by fads including: - extension games used at school; and - action games.		Teachers provided direction and expectations for online learning.	Some schools had specific online focused recreational clubs.
	Gaming was seen as fun as well as extending skills and competences.		Teacher feedback easier and more immediate.	Google docs a popular tool with schools to share work with home.
	High enthusiasm for digital learning in some schools.		Some teachers deliberately taught digital learning apps skills but not common.	
	Evidence of peer to peer teaching and learning.		No identification of required skills or guidance for teachers on how to develop them.	
	Common use of online vocabulary by students in schools where online learning is embedded.		Teachers used gaming to teach digital skills and basics of coding.	
Children's Access to Digital Devices	Device for each child is desired by the children but uncommon.	Devices supplied or purchased through school or by parents.	Device for each child and embedding in learning programme encouraged everyday use in a range of learning activities.	Wide range of devices available.

	Access to a range of devices at home.	Home income and home values appear to affect device availability	Systems of sharing where devices were limited.	Differentiations: - freedom of access; - time available; Embedding of digital experiences.
	Number of devices and exclusivity of use correlated with the socio-economic circumstances.			Unreliability of network for learning.
Home-based factors	Wide range of devices and online activities used at home and focused on their wide range of interests.	Parents more liberal with device use when school learning was involved.	Some teachers set home learning, monitored progress, encouraged and offered challenges.	Device leasing programmes through school allowed device use at home supporting home learning.
	Some continuation of school-based learning in the home.	Some sharing of school work with parents.	Teachers saw both benefits and challenges of too much access at home.	
	Devices often shared with siblings in low socio-economic communities limiting home time on devices.	Some online project work with their children.		
	Unsafe encounters online were rare and overall students dealt with them sensibly and had knowledge of cyber security.			

School factors	Children's enthusiasm direct reflection of their teachers' confidence using digital technologies.		Often a particular teacher led digital learning.	Curriculum leadership influenced positive learning experiences.
			Overall mixed teacher confidence. Teachers wanted professional development with the support of senior management; skilled teachers; experts; multi-school clusters; or in-school leadership.	Variable teacher capability and high staff turnover were significant challenges for some schools even with strategic intent and leadership.
			Teachers saw that using digital technologies increased approaches to support individual student needs.	Leadership of digital learning and building teacher capability in some schools shows positive effects; where focus in school's plan is limited or side-lined by day to day management issues, there is little sustained effect.
			Some teachers are still apprehensive about the use of online monitoring tools.	Some schools or teachers use online tools to monitor student progress and administrative tasks and communication with parents.
			Teachers want more affordable resources linked to the New Zealand Curriculum and NZ learning context.	Schools in lower socioeconomic areas struggle to fund and maintain classroom devices.

			Teachers want access to familiar material to incorporate easily into their digitally integrated or blended programme.	
			Digital catalogues without access to content are of limited use.	
			Lack of materials in Māori is an added problem for Māori medium classrooms.	

Factors and conditions influencing children's use and experiences

This section provides greater detail from the rich data provided by children in the group interviews about the factors and conditions influencing their use and experience of digital technologies and from the interviews we conducted with their teachers and principals. It is organised around themes that emerged during the analysis of the data. At the highest level these are:

- 1) access to digital devices and the Internet;
- 2) children's activities and learning online at school, at home and elsewhere;
- 3) children's behaviours online;
- 4) home-based factors affecting access and use;
- 5) school factors that are influencing digital access and learning.

A high level summary of these themes is found in Figure 9.

Access to digital devices and the Internet

At school:

In all the schools we visited, the children had some level of access to digital devices in the school and their classroom. The devices included laptops, Chromebooks, Notebooks, tablets, Internet connected TVs and digital whiteboards.

What differed across the twelve schools was 1) the freedom of access, 2) the amount of time the devices were available, and 3) the degree to which digital experiences in the classroom were embedded in the every-day teaching and learning activities rather than as a separately defined activity. For some children, their digital devices were an integral part of their everyday learning activities in the classroom while in many cases they were a special or isolated event.

A device for every child is the exception rather than the rule:

Every child having a device for their own use that they could use at any time as part of their learning was encountered in only three of the schools in our research. There appeared to be two main approaches to having a device for each child in the classroom: either school or donated funds had been used to purchase or lease of devices; or parents had purchased a device which the child used at school, along with school-owned devices (usually called a 'bring your own device' BYOD policy – e.g. school C). We encountered low, middle and high decile schools in this category (for example schools B, C and D).

In schools where there is a device for every child, and the use of the devices is embedded in the learning programme, everyday use in the classroom for a range of learning activities is common.

Half the time at school we're using our Chromebooks because that's normal. Half of our learning is on the device, because it's got the drive, the Gmail, the apps that you can use to build things when we did it with Miss that's not here right now.... We do most of our writing and stuff on it as well... We don't normally write in books anymore. Several children, School C

In schools where there is not a device for every child, there is often some sort of system to allow sharing between classes and children:

We've got 3 HP laptops, 10 Chromebooks, 6 netbooks and one old Toshiba that doesn't really work.... Every second Friday when we're doing our technology thing, there isn't enough for everyone so we normally have to pair up and share, or go to another classroom.... We also have the running iPad pod and the Acer Chromebook pod. The teachers can book them. A COW, computers on wheels – there's one there. Children, School F

For Year 5 and 6 we try and have one between two, in terms of laptops. So, my classroom; I've got 14 laptops, and four of the other classrooms in my team share a little suite between the two classrooms, and there's 14 in there as well. So it works out to be one between two. Then, every class has two iPads. All the classrooms have interactive whiteboards. Year 4s and 3s have smaller pods of laptops; about six per classrooms, and two iPads. Our Year 1s and 2s have four, and two iPads. Senior teacher, School M

Importantly, as the school cameos in a previous section and Figure 8 show, these patterns of access and use do not entirely follow from the socio-economic status or location of the school community.

At home:

Children had access to a range of devices at home (see Figures 5-7). The number of devices and the exclusivity of use by the children generally correlated with the socioeconomic circumstances of the children's home (as reflected by school decile).

My favourite thing to play on is my Chromebook, because we don't have a TV. We only have my Chromebook. Mum has two laptops, and we have a family computer. The best thing that I like to do on my Chromebook is I like to create things, like on my drive and stuff. Girl, School C

I have to do chores to earn my time. I have to earn my time of playing on my tablet. Boy, School C

Children's online activities at school, at home and elsewhere

Internet classroom learning:

The degree of embeddedness and integration of children's use of devices in the school curriculum and the teaching and learning programme in classroom varies enormously. At one end of the continuum, as a matter of principal-led educational philosophy and school policy, the use of digital devices and learning Apps is built into everyday teaching and learning programmes as part of an integrated approach to curriculum. Students are encouraged to be active participants in their own learning. Teachers use the learning Apps' analytics to monitor student learning progress and teaching effectiveness.

At the other end of the continuum, the use of digital devices in the classroom is an episode and perhaps a useful add-on to the existing classroom curriculum and practice depending on how adaptive the App is.

We do Mathletics for maths. We do Sunshine Online for reading, and we do a lot of writing. If we're doing an inquiry, we'll research. At the moment we're doing earthquakes and stuff, and we're going to do oceans and things as well. We use Google Docs. ... We just write about what we're learning on it, and so we research on the computers and we write down the information we found, and then we share it with the class when we've finished on a slide. Children, School L

I use the technology in Maths ... so they'll use Studyladder and Sumdog just to support what I've been teaching them so it gives them some practice.... In the literacy side I have a couple of students who use a technology Lexia, which is a reading program from Britain I think. They use that to boost. They also use Sunshine on Line. They choose where they can go and I step back from that and they choose their levels. And if it gets too hard they pull out and go and find something else to do. Whereas Lexia they can't move until they've nailed that level. And it takes them right back to absolutely the basics of pre-reading and builds them up. So if they've got any gaps, hopefully it fills those gaps. Teacher, School F

The quality and cost of the learning Apps available for classroom use is an issue. Some teachers cannot have access to what they consider a superior learning App because of its cost to the school.

They were really excited by and absolutely loved Matific. And the thing I really loved about Matific was I could have two children working on Matific on the same problem but they couldn't spy and see what was happening because they are working with different numbers. And the next time they'd log in they'd have different numbers again. Whereas Studyladder tends to be all the same, so sometimes is very repetitive. I've never been 100% convinced with Studyladder if they've really got it whereas I knew with Matific because they were being pushed by different numbers – I knew that was really going to test them. Teacher, School F

In response to the question, 'do you think using your devices on the Internet in the classroom helps you learn' the children often referred to the independence of finding out about something for themselves, working at their own pace using the Internet.

I think we learn by researching new things, and also if you know a lot about something and then you find something [new] out. Like we're learning about disasters, and my group is doing about lockdowns, and what to do at home and at school. We go through drills at school, and then we know what to do, but sometimes it helps us to know more, and how to stay calm and just what to do. Girl, School L

The children who have access to their own Gmail accounts for use in the classroom and regularly use Google docs to store and share their work with their teacher and their class mates are particularly enthusiastic about this:

We have these Gmail accounts with Google docs and it's really cool for [our teacher] because she can see the work that we do online. Because we've got Google docs you can save your folder. So I come home with stories that I'm working on and I go on and show [my mother], because my brother has a Chromebook. It's really good because she can see what I'm doing and I don't have to bring my reading or writing book home. Girl, School F

Oh, we use YouTube because once [our teacher] introduced us to somewhere that you can find - like, there's one and you can get a couple of seconds off it, put it into

a slide, and then. On the YouTube thing it only comes up with videos that you can use, so it's not copyright. With those I use Gmail, YouTube, Blogger, Jelly Pages, sometimes Tux Paint and Docs even though it's not up there, but I use. Docs.

Children, School C

Children from schools with a device leasing programme benefit by being able to take the device home and they use it to do learning at home such as Magna High maths or reading.

Digital playground - Internet is another playground for recreation:

I like to play the games that contain a bit of gore---Other than that I just play other normal games like Sumdog. Girl 1, School M

Normally when we get home I always like to jump on the computer.... Either I play with my brothers and sisters or Roadblocks. We play on two computers, against each other. Girl 2, School M

Children also like activities that engage them in action like Music.ly, Xbox and Playstation games.

On Musical.ly? ... You lip-synch songs and funny things, and you just watch people, and it's really funny. Boy, School L

I have an Xbox and a Playstation. I usually play Call of Duty and sometimes I like to play GTA with my cousins, and I play a bit of Minecraft when my cousins aren't looking. But most of all I usually play on the Xbox. There is a lot of kind of family games and games that I can sometimes download. Using the microphone and headsets....Its only family members that we got ours to use online with me. Girl, School M

And there are clearly fashions and different preferences around the country. In some parts Minecraft was the game of choice while in other Musical.ly had taken over.

Minecraft is like so three years ago. This year it's Musical.ly. Musical.ly and Scram Scram. Boy, School L

Schools also organise clubs which children elect to participate in. Several schools had coding clubs as one of their recreational activities, still with an eye to the skills acquired this way.

Coding club - started off this year. There's quite a lot of opportunity for jobs in that area particularly around Christchurch – that came up in our cluster. So we've just created that coding club. We are hoping it might eventually be able to find its way into the curriculum. Principal, School J

Learning through games:

Even though the children chose an activity on the Internet because it was fun, they were also aware that some games extended their skills and competencies.

Yeah, I think they're [online games] a good way to learn, but not all the time. If you feel like playing a game more than you feel like learning, and you do and you get caught, that means it can get taken off you. Some people in my class have had that happen to them, for playing a game called Tanki whatever. I do play it, but I only play when I'm allowed. Girl, School C

[On Minecraft] You can build stuff and then you can fight people. And you get this stuff like diamonds and gold and emeralds.... We learn creativity and a lot of building instructions and sometimes you are going to rule the world. Girls, School M

... To add on to hers, Minecraft is sort of like science but in computer games. It's also really cool. Boy, School M

I like to do study, and some coding on the laptop.... We design our own games [using Scratch].... Quite a few of us are playing dinosaurs and space games [the sort of ones where the dinosaurs move around and you control them] Yeah. Usually they're like a mini game that they start with you have to figure out how many steps it would take for the thing to get to the thing it can jump over. Girl, School E

Control over own learning:

Children seemed to like the self-paced activities they do in the classroom.

Studyladder and research.... It's [Studyladder] like this website where you go on it and you can do different types of topics, like where you can help improve your learnings, and there's all different ones like music, maths, reading and science. You earn points and you can earn certificates for each spend point that get. Girl, School E

On Studyladder you complete a task out of 10. If you might get nine points to spend on stuff like a room you can decorate, and use those points to get it. Boy, School F

The good thing about Studyladder is you have pets and other stuff. It knows when we're at school. If you click on a pet and try to change it, it comes up – sorry, you're only allowed to change it out of school. Girls, School F

It's just a lot different, because you're noticing it, and you can go and see that she's [the teacher] been and stuff. And that's improved a lot. I've got better, and I only started at the beginning of last term I think it was, basically from doing that, and Joshua uses it, too. Girl, School C

Children's behaviour online

Online communication:

Although the majority of the children we spoke to had school Gmail accounts, we did not find any who used this account to communicate with anyone other than their classmates and teachers. Some also had another account which they used at home, mostly for signing into games. A few used Skype to communicate with family, usually under parental supervision or at least permission. Quite a few students, predominantly girls had Snapchat accounts they used to stay in touch with friends out of school time. Most said they did not have Facebook accounts and acknowledged they knew they were too young to do so but a few admitted that they used a parent or older siblings account.

A Snap Chat account. Boy, School K

An Instagram account, a Snap Chat account and a Facebook account. Girl, School K

Children with family overseas, especially new immigrant children, stay in touch with family members their own age in their country of origin.

Facebook, Instagram, Twitter. ...[on Facebook] Just go around, look at other people photos ... friends and family. I still have friends in my home country. So we connected together. Girl, School J

Some children talked about their online activity as quite confident, self-aware controllers of their own online space and what they choose to do there.

Yeah, but I don't really use Twitter that much; maybe even only once a month. I don't really like Twitter. Girl, School J

I had a phone before, but now I don't. So I used it to Tweet.

I: What sort of things would you tweet?
I mainly tweeted for my YouTube channel. ... Gaming videos. Tablet of games and then post it on YouTube. ... Five or six [followers] ... not people I know ... they sometimes make comments. Boy, School J

Offline versus online:

Today's 9 and 10 year olds might have grown up with the Internet and digital devices but this does not mean that they automatically have a preference for all activities being digital. Many children mentioned that they preferred to read a printed book. And, that they preferred to play at real games, outside. Their choice was also guided by the alternatives available.

I read online when I am bored. I read some genres, like scary stories [online]. ... I like reading facts about animals and famous people on line. They are easier to find there than in the books. ... I really like reading online about history – like ancient times. You can't find books about them and they are easier to find (online). ... I really only like reading online if I am reading something that is not in the books, So we usually have books that have animals with facts from one to 50 or a dictionary or even other story books. But what I really like on devices is all the scary stories. But I only like to read them with my cousin because he gets scared. He quite a scaredy cat. Children, School M

I'd rather go somewhere like a big trip somewhere. Girl, School L

When I'm watching YouTube I'm usually watching scooter videos and then I get jealous and I go outside and practice all the tricks on my scooter. Boy, School L

I have this huge drawer full of books, and I've read them all many times, but I have a Kindle, which is where you can read books online. When you read it, it's not as good as actually reading it on an actual book, and sometimes I will be reading it, and then I'll go to the library with my brother or my mum, and I'll see the book that I'm reading on my Kindle in the library, and I think that's better to read, and sometimes... Girl, School L

While doing school homework online was mentioned by many, a few would rather not because it takes away the conflict with siblings for time on the home device.

Doing my homework [on a piece of paper]. ... It's just that my sister always distracts me whenever I'm trying to do my homework on the computer [because she wants the computer] Girl, School K

Uncomfortable/unwelcome experiences and getting help:

We asked each group of children if they had ever had anything happen when they were online that made them feel uncomfortable. Affirmative responses to this question were relatively uncommon and the children were remarkably unfazed by something unwanted occurring and usually dealt with it themselves and told a parent afterwards.

Some guy on Musical.ly private-messed me, saying that - I deleted his private message, but for some reason he set up a message account with me, and said his name was killer_123 and he said - it was a bit creepy but I'm not afraid - he was like, I can see you - I'm watching you - I can hear you. I just took him off. Boy, School L

Examples we were given included: others posting videos featuring you without your permission;

It was when my uncle was putting a video of me on YouTube when I was dancing to a random song, I don't know.... He just did it. And then my friends saw it.

I: Did you ask him to take it off?

No.

I: Did you want to ask him to take it off?

Yes but ...Boy, School K

encountering language or content they don't like e.g. bad language and swearing; and in a few cases being hacked while playing games online:

I was playing Minecraft on the computer and there was hashtags coming up saying blah blah blah and I typed up 'go away'. But then he just kept on sending me, staying on the same server. And then it got really annoying. He seemed to be a hacker because he found out what my name was, what my last name was, where I lived and I just felt really scared. Boy, School F

The interviewers always followed up such an example with the question: What did you do about it? Where do you go for help? The children generally had a positive and confident response, such as tell parents; block the other person; switch off the device.

I told my mum and dad and they reported it to the police. Boy, School F

Also in Muscial.ly, in the comments section you can report people and type up why you're reporting them and you just send it to them. Girl, School F

Only one or two children had heard of *Netsafe* but most had had someone talk to them about cyber security.

My mum told me about it but on the Internet it can happen a lot. Mum said to always be alert on the Internet about stranger danger. Girl, School F

I think it was last year a guy named Mr Grey came in and talked about cyber safety and everything. I think it was his daughter who got cyber bullied.... He talked about 'you never know who's behind the screen'. Girl School F

It would be cool if the school had an ad-blocker, because sometimes when we're on Jelly Pages, ads come up that are not really even appropriate. So then we have to go straight the teacher and it's [a nuisance]. That's why we don't use Jelly Pages that often. ... The ad-blocker would know that there is something rude on it; it would be un-clickable. So you couldn't click on it. Girl, School C

Enthusiasm for learning:

Children's enthusiasm for digital learning bubbled into the interview in some schools when the children were asked about their favourite device or activity.

Mine would probably have to be my laptop ... you can go on you Gmail and add on more work and stuff, and edit stuff. My drive where we do lots of learning at school We do writing on it and stuff I've got all my writing drive, math drive, spelling drive, information drive and spare drive. Boy, School C

I like doing steps on it [my Chromebook], because it's really fun. We do nearly every day. Girls, School C

It's just a lot different, because you're noticing it, and you can go and see that she's been and stuff, and that's improved a lot better, and I only started at the beginning of last term I think it was, basically from doing that, and Joshua uses it, too. Girl, School C

On Studyladder there's games or set tasks, which you can choose one. I normally do the set tasks first and then I go onto the games, because the set tasks are actually really fun.... Otherwise I go on the set tasks for about 10-20 minutes and then I go over to the games and stuff.... Yeah, I would never go onto games first. You just can't get off the games because they're so fun. Several children, School C

Last holidays I trialled something with my class; a slide journal on the Wiki. We just trialled it with eight children, and I was just absolutely blown away by the uptake, the enthusiasm, the amount that they did, the creativity that they showed, the problem-solving. It was just so exciting, and to think that they were doing that in the holidays. First day back this term we reflected on it all, and they commented on each other's slides, and they loved that. I asked them, if we were to do this again what would you suggest? They came up with a couple of suggestions, so we're trialling that this term, and we've already started talking about it, and they're buzzing. Senior teacher, School M

Peer to peer teaching and learning:

Teachers also noted children's higher level of engagement when working online.

They are so engrossed and they're usually working in pairs. ... We say, who are you going to work with, off you go. And that seems to be working, and they're loving it. And it's lovely walking around and listening to the conversations between the children and hearing them say, 'oh I don't know how to do... oh I know how to do that', and he [the child expert] will just go up and share it. They're learning to step back and not take over. You see some of them pull the laptop and they want to do it, 'nananana. Talk them through it, then do it'. They can find that quite tricky because they have to learn how to explain what they know about the technology in a way that somebody's going to get it. That's been working really well. Senior teacher, School F

Children's use of vocabulary of the online world is common:

In schools where there is a very deliberate approach to incorporate digital access and learning into everyday classroom activities, the children have absorbed the vocabulary of online searching, creation, curation and presentation into their vocabulary and use it freely in their discussion with the interviewers about what they do online and what they learn from it. For example, the children at School M describing what they do in class when they are creating Wikis and blogs:

We use the laptop to embed something in the Wiki. Like padlets and pictures. Girl, School M

No, it's videoed and you can choose to make it private. It's not mainstreamed but you can choose to mainstream it so that everyone in the world could see it

Or the children at School C describing how they created a pseudonym for themselves:

We also made an avatar. We downloaded them into our drives, so that we could change them if we wanted. Girl, School C

Social interaction online:

Many of the games the children liked, allowed them to interact with others playing the same game online. Yet most only played with people they knew, mainly other family members and classmates.

I play Minecraft and Call of Duty and Halo with my brother. We play two player. Then sometimes he plays all to enemies, and I get scared. Girl, School M

Everything public that I have is usually family members. Also, games like Minecraft – they have creatures and you make games up. You can go into places and play games and use real money to buy which is Roblox. You can buy outfits, armour and special character pieces. Boy, School M

A few will happily interact with others they meet online.

Roblox. You can play with everyone around the world. You can make comments and then it like pops on their heads. ... It's like a speech bubble and then it has what they wrote. Two children, School M

Some of the children had social media accounts including ones with an age requirement. Their contacts on these appeared to be mainly family members and known friends.

My favourite [device] is probably my iPhone.... I have all my social media on there, and I can message my friends whenever I want to. On Snapchat, and Instagram. Girl, School E

Messages and FaceTime to keep in touch with... My friends.... I write messages to my friends on the Playstation. Children's exchange, School E

Most of the time when I'm on Instagram, I just use it for messaging my friends that have it. So, since I don't have a phone, I can message them on there, or on Musical.ly. Boy, School L

The ease of access to social media apps on smart phones makes the phone one of the most favoured and sought-after devices yet to be acquired by the children.

Mine [favourite device] is probably my phone. ... Sometimes I play games on it, but then other times I'll probably ... Snapchat me [her friend] a lot. Girls, School L

I've got Instagram. ... I basically just take photos of my cat, and me in my pool, and random stuff. Girl, School L

I've got like 18 separate Google accounts, Instagram, Tumblr and Musical.ly. ... I lip-synch songs on Musical.ly. Boy, School L

Privacy awareness:

Children familiar with social Apps were also likely to be aware of their online privacy and choose their privacy setting deliberately

You can upload it but you can also make it private so that only people you allow can see it ... [or] you can live stream so everyone in the world can see it.... It's like when you video, you don't want it to be posted around the world. You can save it in your own account and then people can't see it. Girls, School M

There's this app called Musical.ly and you can choose if you want to keep it private, and I have to keep it private but I want to keep it private 'cause I only let people follow me if I know them. Because I don't trust other people. Girl, School F

I make my parties private, so I have to invite people so strangers don't join, but [my friend] just leaves them wide open and anyone joins when they want. Boy, School L

On Musical. ly and Instagram and Snapchat. I can only let people who I know, or see them watch... they ask you if they can follow you or do that sort of stuff and you can say yes or no. Girl School L

Home-based factors affecting Internet use

Out of school Internet use:

The children interviewed talked about a range of devices and activities they like to do on the Internet at home. Favourite devices tended to relate to activity.

The two devices that help me most are the computer and my iPad. Sometimes when I go on the iPad, I either do the learning games that we are supposed to do or like researching the things that we are supposed to do. ... The iPad, because you can go on games that help you with your maths. Then you can go on Google and help you with your research. ... Out of all my family devices I choose the laptop. Because you can have access to the wiki spaces and stuff. On your smart phone you can't really see it because it is really small. ... iPad because you get more games, learning games. And it's mine, so I can use it anytime I want. ... I would go with the laptop because I can download some of the games that my dad lets me use or lets me download. Because there are some games that help you with your learning that can't go on any other device except the laptop. Children, School M

Activities included searching on interests, e.g. animals; music (mainly girls); making videos and uploading on YouTube; playing games (Mine Craft, sports games and often 18+ rated).

Some like Hour of Beauty or girl ones. ... Like some tutorials on how to make stuff or make-up, how to do makeup.... I like some of the action stuff. I like more of the artistic stuff.... Sometimes I use the ideas and mix it with a bit of my imagination. Girls, School M

I watch YouTube and stuff on it, and I play on Facebook [my dad's account]. ... Fighting sometimes, and sometimes baseball and stuff. Boy, School J

They also use the Internet to keep up with their out of school interests such as sport, dancing, music.

I like to listen to music and usually check up on my dance sites and that, and see if there are any updates or stuff that I need to know about. Girl, School E

It's music in an App. You have to lip-synch it, and it videos you lip-synching it. [If you upload it] people around the whole world can see it if they have Musical.ly. It's like Facebook. Girl, School M

Continuation of curriculum-based learning at home:

Learning begun in the classroom sometimes continues at home and many children mentioned that their parents were more liberal in their rules about device use at home when learning was involved.

Some of the time I use it for learning to catch up, if I'm ever behind. I'm always catching up, then most the time I'm just using it for games, but then sometimes we use it for homework or Mathletics. ... You can use your Mathletics account which we pay \$10 for. ...I use it for my homework, because we have words that we need to research the meaning of. ...I usually use it for homework and Mathletics, and then sometimes if we're a bit behind on researching things, I'll go onto Google docs and research something and put it in. I usually only use the computer just for homework, and we do sheets that we do at school, but if we have a computer or other technology we can use it and it's called Prototec. It's like when you work on your stage that you're at, and try to get to another stage. I just use it for Mathletics as well. Children, School L

I go on mathematics and make YouTube videos. Boy, School K

The last couple of weeks have been on a project, so you know the Rio 2016? We've got a project on that, and we had to write some stuff [about it on the computer]. Boy, School J

Some teachers set work that can be continued at home.

Rio project – we had to make a brochure ... it was fun. ...Writing and put in pictures. ... Designing it. [Finding out on the Internet] What culture they speak there, and recipes. Girl, School J

Sharing school work with parents:

School work gets shared with parents more as an exception than as a rule.

Only if it's like a story about a family member that...If it's only something that we've made and we're really proud of, we'll go show them, but we won't show them a lot. Children, School C

In terms of the senior school, we do use Google Drive as our main system... that is where the school and home partnership can work. The kids often do lots of work at home, show their parents and track it. We also have our blog where the kids can write a blog and put it up, and parents access it that way. Senior teacher, School L

We have Student Led Conferences (SLC) twice a year where parents come in, and the children take their parents through their work and their learning, and they share the Wiki then. So at this stage we haven't opened up the Wikis, because we just didn't want teachers to feel pressure. We just wanted this year to be a year of play, in a safe contained environment. So we haven't yet invited parents to join our Wiki, but that's certainly the direction that we'll head. So, at this stage, the parents can really only view it if they're looking over the shoulder of their student at home, or if they come to an SLC, and then they have access to it. Senior Teacher, School M

Parents use the Internet access at home to extend children's learning:

Quite a few children mentioned some project they liked to do with their parents that included an element of online research and learning.

Usually on Friday I help my mum bake. ... So, on YouTube we watch how to do... [we look for a recipe]

I: So do you start with something you feel like eating and then go, can I find a recipe for this?

Yeah, and then after we find a recipe we go shopping for it. Girl, School J

Parental guidance and rules:

Many parents set rules for access to devices, Apps and the Internet at home and the children seem to expect and accept them.

I can play at any time but I have to stop when my mum tells me to stop. Or once its been past like 2 hours I am not allowed to play with it. ... When it's past 6.30 we are not allowed to go on any devices. Just TV. But at the weekend we can go on them whenever we want. ... Only when we are cleaning up our rooms and stuff. We are not allowed on any computers or devices until we are finished. ... If we like get caught doing what we are not supposed to do, then my dad takes it and hides it in his room. Sometimes it is chores or homework. Otherwise I just play on it until 6.30. Sometimes I take it to bed and play under the sheets (giggles). ... I do have some rules but it's normally after 9 o'clock you can't go on unless you are doing research or things like your homework or projects. Children, School M

For instance which devices:

Well, I have my homework and stuff on my Chromebook, but I either have to ask, or do work, to go on other stuff. Child, School C

Well, yes I'm not allowed to go on my Chromebook unless I ask, and my Mum and Dad have checked it off, and make sure it's alright, but the same as [my friend]; if it's learning-based and it's home-learning and stuff, I'm allowed on it if I need to, like after school. Girl, School C

Which Apps:

I always have to check with my parents because they look on my history, and check if I've been on appropriate things. She always checks my games and I'm not one of those people looking for games, because I'm always getting a big scared because there's cyber-bullying and stuff, and I don't want that to happen. Girl, School C

No social media until I am 13. Girl, School J

At what times:

No R13 games or anything ... and then just don't go on it 24/7. ... Depends what day it is, really. The weekend I'm allowed on for a bit longer and later, but weekdays I normally get off about six - after dinner. Boy, School L

Well, normally on a weekday, if we have homework we have to finish all our homework and then go on it. If it's a nice day I don't like spending too much time on it, and I'd rather be outside. Girl, School L

I'm only allowed to probably play it in the weekends, but the rules are just like not allowed to play it after seven, and if we wake up at like six o'clock in the morning, we can't play it, even though I asked. Boy, School L

I have a rule that we don't play games until Friday, and use the whole week for homework. Girl, School J

In what places:

My Nan doesn't like it in our bedroom, because she thinks we'll go on it, but we don't. So at night she takes it and puts it in the lounge. Girl, School L

And, for how long at a time:

You have to have parent permission to unlock some stuff, like treehouses. Girl, School C

On Studyladder you have to have a membership to do more things and get some items. Whereas on Sumdog, which is what I prefer, it has the pet things that you unlock when you've completed some tasks, it always knows when you're at school. You can go into your house to buy suits and new looks. Boy, School C

Parents also reinforce messages about protecting online identity.

My mum said don't give out to people that you don't know, like show your photo, because they might make fun of you, and Photoshop your face - do stuff that is bad. Girl, School J

Parents also use access to control behaviour:

Me and my siblings fight a lot, so when we're really naughty we're not allowed. My mum turns off the Internet and she takes all the technologies. Girl, School C

And teachers see both the upside and the downside of too much access at home.

Most of the children in here would have access to tablets or laptops or even some would have access to smart phones as well. I think a couple may even have smartphones. I have minimal input into how much time they have on them at home. I have one child in the class in particular who gets a lot of time on computers and it's very obvious in the class sometimes when he's had a late night. I know what he's been on by the conversation, and I know there's not a lot of boundaries. So he struggles a little bit with boundaries in here. But he's pretty good with the web in the end. Senior teacher, School F

Collaborative play and learning:

Some children used their devices at home as a form of mental gym:

He likes working on our randomness stuff.... That's this slide we made that's just real random, and it's just me, two friends and my brother [at home].... Yeah, so we like working together with each other.... He's got a slide that, it's got a whole lot of pictures on it and he said, one isn't a Pokémon.... Yeah, like you pretty much make something and share it.... That's like our randomness slide. Interchange between two boys and a girl, School C

Or performance stage:

[On Music.ly] you lip-synch songs and funny things and you just watch people and it's really funny. Girl, School L

Google docs is used in some of the schools to write creatively and share stories, do blogs, keep learning diaries and this flows into out-of-school time.

We were both in the student council, and we had this meeting one day and it was about making your own newspaper, but you only had - because it was in the afternoon ... we had no time to do it together. We live really close together. We live one house away, and one night we made a shared document and made a newspaper from seven o'clock to eight o'clock, and then we had it done by the morning and we got it checked off by [the teacher] and then we printed it out. Children, School C

Sharing devices with siblings:

Although there are devices at home, many children do not have a device of their own and must share with siblings and parents. This is more common in low socio-economic areas with the effect that the time spent on devices at home is quite limited.

Sometimes I do research about animals because I like them and I do Manga High.... Maybe in the weekends.... We can only use it for ten minutes or five [to share with your brothers and sisters]. And parents ... they use it a lot. Girl, School K

School factors that are influencing digital access and learning

School Leadership:

Children's enthusiasm appeared to the interviewers to be a direct reflection of their teachers' confidence, skills and competence with using digital technologies in the classroom.

Curriculum leadership in the use of digital technologies in the classroom was an important factor influencing the experiences children had at school.

It's part of our strategic plan ... it's about preparing children for a future. Helping them to be connected learners.... We've also linked that with our appraisal system, so teachers are accountable. Senior Teacher, School M

We're using Google apps for education. So what we're after is for the children to learn anywhere at any time. We're predominantly trying to get the children to flip from home to school. So if the teacher has a project/topic they're learning, they can access those resources and continue to log in to their Google account at home and work on it there. ... In reality we need to create better school online environments that feed that learning at home and school better and enabling the kid's platform to share their learning on it. I think in [a couple of classes] we're probably using it exactly how we want to use it. Principal, School J

Often a particular teacher had been given responsibility for leading digital learning in the classroom and they often expresses a particular philosophy mixed with the pragmatics of classroom management.

My lead here is ICT – that's my lead role in the school. I like ICT in the classroom to be blended – I don't want it to be the full focus in the classroom. I tell the children, if everything was suddenly to go pfft and we lost all the Wi-Fi we still need to be able to work in this classroom

and if we're totally reliant on that gadget, we're stuffed. So it has to be a mix between the two and I find I actually get some better writing from them pen to book. Because as soon as I put them on the computer to do any writing, they're fussing with fonts, and they're fussing with backgrounds. So guys, just write. Whereas pen and paper, that's all I get – I just get writing. Senior teacher, School F

Variable teacher digital capability remains a significant challenge within individual schools even with strategic intent and leadership.

We've got a kind of vast range or big spectrum where people sit in terms of how comfortable they are with ICT and I think as a school we're having to just move forward and go, you've got to jump on this kind of bandwagon and we're trying to support staff to do that. So it started out with me running workshops on how Google docs worked, or something like that, to the point where now, as a staff, we've got everybody on the drive and all our main systems and things are on there. So ... they have to learn, because otherwise you do have people that just stayed back, and it kind of starts to affect the classroom if they're not sure. Senior teacher, School L

In some of the schools we noticed that leadership of digital learning in the classroom and building of teacher's digital capability in this regard simply struggles to get the time, attention and money needed either because it had not been made a priority in the school's plan or because it was crowded out by more pressing day to day management issues.

In the end, I think the weakness of our school is that we don't have a strong IT strategy.... We're smashed over the head with reading and writing and maths and national standards, and now we've got communities of learning, and now we've got science and technology has come in, and they don't understand we're already drowning. So you're just pouring water on people who are fatigued. You've got 40 weeks, which for me as a principal goes in a blink; for them it's like forever because the waves keep rolling in. You have to do this - you have to do this. So we're just trying to find smarter ways of doing it really. So, we did go on a little contract. ... The facilitator didn't connect with us, so in the end we just dropped out of it ... I thought the content of what they were trying to do was good. It was just the wrong time for us to try and figure this thing out. Principal, School I

School curriculum:

Several schools had a deliberate strategy to increase children's active participation and control over their own learning and saw the use of digital apps in the classroom as a way of enabling this.

We've done quite a bit around student agency this year. We are having a discussion about how the older kids could have an account on LinkedEd and start commenting on their own work and sharing their own work. So they could say 'this is my best bit of writing this term'. I'm lining that up. Principal, School J

I think when it comes to the juniors it's more of a support network. That's why we find the iPads really beneficial; it's helping them develop independence, so the activities and things are based on things that they can do by themselves, and so it is more of a side-line.... Then as we get into the senior school, it's a lot more; they take a lot more ownership and they learn a lot more roles. So they are using Google Drive. They're doing their own Google Drive, they're doing their own research, and they're doing a lot of their literacy stuff on the computer, so it's kind of the things that they wouldn't normally be able to do in a book, is when you use

the Chromebook. So it's not like we're swapping - they get to write on the computer, because they don't want to write in their book; it's the things that they shouldn't be able to do with just a book. So it's the researching, it's the PowerPoint - the presentation side of things, which you can incorporate into your literacy. Senior teacher, School L

From my teaching perspective, our focus this year is all on self-agency, so a lot of work, and when it comes to ICT it's just around implementing it to support what we're doing, as opposed to having that focus.... So they're tracking their own learning. They're monitoring it.... My classroom programme's been around what I can do to get these kids to kind of think critically, independently and kind of take care of their own learning, and monitoring. Senior teacher, School L

Some schools deliberately exploited the children's attraction to digital games to teach digital skills and the basics of coding languages.

The class next door, we work together every alternate Friday. So tomorrow - we're going to open the doors and get the children coding. And they love it. We've got a couple of experts in here [in the class], and the other teacher has got a couple of experts too with Code Combat, which is pushing their coding skills, because Scratch is just pushing blocks. And Sploder is pretty much just creating Minecraft - blocks and everything. Whereas Code Combat, you have to physically write the code. And if they don't write the code correctly, it doesn't work, and they can't move off the level. So we created a class account for that, and it's just been lovely watching the children take over from that. Because I don't know enough about coding to teach it, but I've got enough expertise in my classroom to let them be the teachers and sit back as say, okay you teach me. Senior teacher, School F

Teachers provided instruction about how to search effectively online.

When we use our Google docs we usually search up the topic like what we said, and then sometimes people can paste it onto their Google docs and write it in their own words. Then, they change up all the info, and write it in their own words so it's not copyright, and then most the time when you're done, you can put a photo on it. You can copy photos and put them on, and everything ... you're not allowed to put inappropriate photos on there - just learning photos. Boy, School L

Teacher feedback on student work made learning easier and more immediate for children.

It's mostly like for reading and telling the next steps. Like reflecting on things you have done: Us and our teacher. And other people who have a Wiki-based account. Girl, School M

They're using less books because as I say, they share all their stuff with me [electronically]. And I find it easier to type a comment than write a comment. I can highlight things. We have our colour scheme here - tickled pink if you like something, green for growth if there's areas they need to work on - so they know all those colours.... So when they've done a piece of writing, you'll go in and if there's good sentence starters or something, she'll highlight that instantly tells them, oh I'm doing that right. If this is an area I need to work on that's highlighted in green, and that's right through the school, and starts right from when they're little ... goes right through the school and then when they move into digital it's there too. Senior teacher and principal, School K

Sometimes we publish our stories and things like that... We have SLCs (Student Learning Conferences) and then our parents come. Sometimes our teachers check it and read it. ... I like getting feedback like that. Student, School M

Each classroom has their own Wiki. Some classrooms have shared their Wikis with each other, because we really want to get that cycle going where we share, review, comment, give feedback, and then go back and re-work it. Sharing Wiki's across the classrooms really allows that to happen in a meaningful way.... It's the fifth wall of the classroom ... a place for sharing finished work.... We see it more as a learning tool that allows that collaboration. We are, part of our cluster, and we are looking at sharing our Wiki's down the track with another school, so we can really get those relationships going, to build the collaboration, but it's about creating work for a purpose that other children and other people can then view and give feedback on. So then we can all grow our learning and understanding.
Senior teacher, School M

Some teachers made a deliberate attempt to teach the skills needed for effective use of digital learning apps but this is far from universal and there is no identification of the skills that might be developed or guidance for teachers on how to develop them. It seems that teachers make their own way.

We don't have anything set in the school, but personally I do. It's like when you have a beginning classroom, and it's the same with ICT; you have to do everything - you revisit it every year and it's a constant. So it's the digital citizenship, it's the explicit skills. I'll open a doc, I'll put it on the TV and I'll be like, okay making bold - change it - make it bigger - teach them how to screenshot, teach them how to do that, have little referral sheets to look back on. So all that stuff is explicitly taught kind of at the beginning and then from there we kind of just touch base, and someone else will then become an expert in the classroom to show somebody. Senior teacher, School L

Teachers think there could be more central guidance on the development of students' digital skills.

As part of the strategic plan ... we've identified a student profile, so unpacking the attributes of what a successful digital literate learner looks like, but in the e-Learning team we did start talking that it would be good to benchmark some things so that teams have something to work towards. Senior teacher, School M

Some teachers continue to monitor what their students are doing in their Google docs at home and might even offer some challenges or encouragement.

They also know if they decide to work on Google docs at home, at any time I can just pop up and give them feedback even though they're not on a school device, because I've got access through the dashboard whenever they're at home.... I have done it a few times and I've had some interesting little conversations and that's quite nice at home because I'm not worrying about a class then and I can pick one or children that maybe I didn't touch base with. And sometimes you go, 'oh you flew under the radar', and you can put a little note in there of your expectations.
Senior teacher, School F

Network for Learning:

A more reliable network afforded through the Network for Learning was appreciated in schools, but teachers' perceptions based on past frustrations continue to affect teacher's eagerness to try new things and have to be overcome.

We've had an unreliable network in the past, and I think a lot of teachers tried stuff and then they ran into problems, and so it created a barrier. We've been upgraded, and our system's all really good now, but it's about helping teachers see that they actually can have some confidence in the technology. It's not going to fail on them. So, that's one hurdle that we've had to overcome. Senior teacher, School M

Teacher confidence:

Some teachers appear both competent and confident in their use of digital technologies in the classroom. Some express a lack of confidence in the level of their own knowledge. In the case of some teachers, fears about their own digital competence stops them trying new online learning in the classroom, while others are confident enough as teachers that they are willing to learn with and from the children.

It's just about helping them to see how they can make links with technology and curriculum. It's a lot of learning. A lot of teachers, older staff are afraid to take risks; something pops up on their screen and they're like, aargh I don't know what to do - they're not brave enough, or they're learning to be brave, to just troubleshoot and it's okay. So, we're overcoming those barriers. Senior teacher, School M

That's the whole thing too – the expertise thing. I'm certainly not an IT expert at all. I mean I know how to do Google docs and that's because we had a person come in and do some training with us and set it up for us. And I quite enjoy it, so I've kind of taken it on a bit more. I'd quite enjoy, I think, doing a bit more but it's just a matter of me getting it. Senior Teacher, School K

I definitely love watching the children working together. Like yesterday they had the iPads – and I'm still learning on the iPads – and we were problem-solving how to get a picture from Google into the document, and I was 'hmm, I think you do this' and we were progressing along a path. Then, 'oh, expert in the classroom who knows how to do this' and I got the expert, he came up, 'you do this, you do this, you do this' and took the children through the process and away he went. And I like that. I'm happy to step back and let them be the experts. Then we were talking about the importance of looking for creative commons for pictures, because that way we guarantee they're safe to use and we're not going to get done for using the All Blacks pictures. I am pretty good on Google docs, but I had totally not seen on the research bar ... had no idea, of this little black arrow, if I drop it down, I can change it from full license to creative commons license. Genius! And one of my children knew that, so they just stood up and told everyone where to find it and went round and checked everybody had got it, and changed it. So I love that. Senior teacher, School F

Digital competence:

Using digital technologies in the classroom increases the number and variety of teaching approaches available for the teacher to respond to the teaching and learning needs of the individual child.

Teachers are happy to learn new things and welcome the leadership of senior and more skilled teachers, either through a multi-school cluster arrangement or in-school leadership.

We're part of a cluster – there's our school and five other schools – so we have a lead teacher that delivers the programme to our cluster. So she is visiting us on a weekly basis. Part of her role is to keep us upskilled with all of the programmes. That's one of my biggest problems I have with it, there are so many programmes out there. Which ones do you use? Classroom teacher, School G

Bringing in an expert education consultant on the use of digital learning technologies gives a steer and a confidence boost to help lead teachers within an individual school.

That's the whole thing too – the expertise thing. I'm certainly not an IT expert at all. I mean I know how to do Google docs and that's because we had a person come in and do some training with us and set it up for us. And I quite enjoy it, so I've kind of taken it on a bit more. I'd quite enjoy, I think, doing a bit more. Senior teacher, School K

This year we've employed a consultant, and I'm hoping that we're going to have them for the next few years, so quite intensive PD. He's working in classrooms alongside teachers and children with the technologies they have. So it's really personalised.... Even in the last seven months, we've seen a huge shift. We've started operating Wiki's, and teachers just feel empowered. It's just increased their confidence tenfold.... We're at that stage now where they've explored a lot of things, and now it's coming back to the linking with the curriculum; when and where we use these tools to really benefit our students. Senior teacher, School M

Professional learning might equally be peer-led at the school level.

It's more I have an ICT team; we meet a couple of times a term and from there we're like, okay well how are you guys going - what do you need? Then, we'll put a workshop out and I'll say, look I'm going to do this if you guys want to come along. So it's kind of opt-in/opt-out at this stage ... it's also kind of within my syndicate - the senior syndicate, I do a lot of stuff there where I will be like, I'm using Google Classroom - I'm going to show you guys how to do it. They don't really have a choice. I show them, and then we start to collaborate a little bit more ... in terms of next year... it's a little bit more structured, so that we will all be doing planning online and things like that, and then we will hopefully develop some support networks in there and see what that looks like. Senior teacher, School L

Teachers liked that digital apps increased children's enjoyment of learning and they used them to good effect. They also moderated their use of the digital technologies available to them, to retain the benefits of interpersonal, face-to-face connection with the children in their classroom.

For the children, they love being able to share. Once they get their head around 'someone else is working on my doc' oooh. They quite enjoy collaborating with that. I use Teacher Dashboard more to pull up if I want to work in the doc with the child sitting beside me. I'll pull it up on here, so that it's very visible to the class that I'm working with that child. The thing that I don't like about working in Google docs and Teacher Dashboard, which is why I don't work in it all the time, is that I do not want stuck typing all this lovely feedback to the child sitting over there, or over there. I want a conversation with you which is another reason why I like the books because I can sit alongside you, we can have a conversation, we can write we can talk. Whereas I find once I get really stuck into a Google doc and I'm

working with a child my focus is so on my computer instead of my class, and I struggle with that. That is less personal; less relational. So that's the downside. The upside is the children do love it for that collaboration. Senior teacher, School F

Learning from doing:

A few schools or teachers were making use of the analytics available to them through the Google Apps or other platforms.

A new entrant child comes in; they have a tiny little assessment.... Many of them are competent in many areas and competent in other languages – so we try and establish a literacy profile on them. At six weeks the parents are called in, and part of that is setting the parents up with Sunshine online. The teacher showing them – they're not going to bring a book home, so this is their reading. So right at the start we are showing them how to use Sunshine online. And the parents, for those who have got it, there'll be the odd one who wouldn't, they love it. And they'll all come in and say to the teachers, can you put some more books in their folder? Whereas none of them ever came in before and said can I have some more books. So it is of use. Don't know if it's just a novelty factor – perhaps it is – but it's going really well for us at the moment. Principal, School K

We are constantly coming back to the data. We have Teacher's Inquiry meetings (TI), where we're focussed on our children in our tail - and the other end. We all, as a team, own those children. So it's not just me as an individual classroom teacher struggling with my children, but as a team we're looking at what does the data show us; does it triangulate well - does it all make sense, or are there some gaps and questions? Then, as a team we're always thinking, what more can we be doing? Then, if we as a team don't have the answers, then we take it to the lead team. We've actually got a Google document, so we all see these children and we have photos. So we have a reading TI document, a maths and a writing, and that has all the children in the senior team on it who are in the tail, or at the other end. So we all sit with our computers, and are able to see the children, and have all the data right there. We have these meetings once a term for each curriculum area, but then in between we're constantly checking in with each other. Senior teacher, School M

Other teachers are yet to be convinced of the value to be obtained from digital classroom analytics

You can look on [the teacher dashboard] and see who is doing what. I can do that by looking around the room. And I'd far rather do that than sit at my desk going, 'oh, you're working and you're not'. Senior teacher, School K

Some had considered it as an option but the value over the actual cost had resulted in deferment of the decision to proceed.

We looked at Te Hapara and then ... we didn't go ahead with it. Well initially we looked at it and had to pay for a whole year, and it was like October, so we thought no. A waste. Hold on for next year. And then we never did. Principal, School K

The use of technology and digital apps in schools, as well as opening up new possibilities for learning in the classroom, can also bring about changes in school administration and communication with parents:

I don't see the change so much in the teaching as in the planning and the organisation, admin stuff that goes with it. We have our own little intranet here which teachers put stuff. If someone wants to put something in the newsletter

they'll put it in that folder. But [as a teacher] you're still up in front of the class teaching – roaming around, teaching, conferencing and all of that stuff. Principal and senior teacher, School K

Teacher turnover:

Teacher turnover was undermining the strategic leadership intent to implement digital learning in some schools.

We had a core staff who went through the TCITPD project and really upskilled everyone and got them going, then we've had quite a changeover. So we've lost a bit of the momentum as in the deliberate use of it school-wide which we're trying to recapture back. Principal, School J

Cost and availability of resources for classroom use:

Teachers are looking for more and affordable resources linked to the New Zealand Curriculum and learning context. Teachers want to be able to access familiar material which they can incorporate easily into their digitally integrated or blended programme. Digital catalogues without access to content are of limited use. And lack of materials in Māori is an added problem for Kura and Māori medium classrooms.

I would like to have access to a lot more resources online. NZMaths have just started to change things. With the Figure It Out books when you went to look at them on NZMaths you could only see the front cover and I notice they're starting to put the pages in there, which is so much better. I can print from there too. So when I'm planning I can drop a link into my planning. In the classroom I can click on the link, print, boom, done. And that's what I like – the one step thing. In blue sky thinking I would like the same in Journal Surf. I want to be able to pull up a journal, flick, flick, there's my thing, that's the article I want, scan through, yes I want them to investigate that word, this is going to work. Then I know when I come here. I can go onto Journal Surf now but I'm only getting a brief synopsis of what's in that article or story but I want to actually look inside it. So I guess it's having more resources online that are the physical resource, not just a picture of the front cover. Senior teacher, School F

Schools in lower socioeconomic areas face particular challenges in funding and maintaining the classroom devices in working order.

We might put in \$120,000 on our leasing program; that's a hell of a lot of dough, and in 36 months I've got nothing to show of it. You can take your bloody devices back, because they're starting to konk out, and they don't recharge. Principal, School I

Network filtering:

As might be expected, schools filtered the information available on their Intranet available to the students. Most relied in the filtering provided by the Network for Learning, while a few had their own firewall and blocking.

Principals and classroom teachers often mentioned the frustrations presented by the relative unsophistication of the key words used in blocking algorithms. On the other hand the children appreciate not having to deal with inappropriate material. Some mentioned pop-ups that they wish could be blocked.

Cyber safety:

Cyber safety received attention in each of the schools but we encountered some different approaches. One city school decided to treat cyber safety education proactively as a home-school partnership topic. They also followed up in the classroom to ensure that the children knew how to protect themselves online.

We've had home-school partnership about that [cyber safety]. That was actually really well attended as well. And we had somebody come in – he works down at [a secondary school], he's in charge of IT there. So he came in and ran our home-school partnership for parents and a few of the kids attended as well.... And I did a follow-up in my class because I've got the Year 8 students and we actually followed up and had a look at some of the things we looked at in the home-school partnership meeting. Just to bring that awareness up. Senior Teacher, School K

We are unpacking our cyber safety poster. That's come from Netsafe. We've slightly made it our own, and we are in the process of unpacking that with the children, constantly referring to the 12 different things to be aware of, that makes a good digital citizenship. We've shared that with our parents via a newsletter right at the beginning of the year. We used it again in our Student Learning Conferences, because we were very aware that it's new learning for our parents, too.... I think a lot of parents just see computers, iPads and tablets as toys, because that's in part how a lot of children have been using them, but we're trying to show them, actually there's a lot more to it than just being a toy. Senior teacher, School M

Other schools face more difficulty enlisting parents in a partnered approach.

We have an expectation chart with our expectations on it. It's a constant battle to be honest. At school we've got it pretty well wrapped around, but at home.... I worry that some of our parents would think, 'oh he's on the computer, that's great'. Whereas really he's on the computer and that's possibly great, or possibly terrible depending on what he's actually doing on it. I don't think some of them would have any idea about what they can do and see on there. Principal, School J

It seems that cyber safety is often introduced by a visiting speaker or provider from the Police or other consultants. Follow up in the classroom and reinforcement might occur or not.

At the upper level of the school we've had people come and give presentations on cyber safety. But it is something we need to constantly build into the programme. Principal, School J

They get some of that through the Keeping Ourselves program ... also brings in cyber safety and it looks at bullying through Facebook or texting; all that sort of stuff. So we give them some resource there, but I don't know if the teachers continue to prompt. Principal, School I

So, at the moment, if we find out they've got Facebook, we ring the parents and say, did you know your kid's got Facebook - did you know they're not supposed to have it? ... Kids are sneaky today. They just get these things and do it behind their parent's backs, but what's happening now is the hurtful things that are said, and the vulnerability of the kids and their low self-esteem - so we had numbers of good kids cutting themselves this year. We couldn't believe it. We couldn't believe that they would let comments hurt them so much. It's just by a fluke that you actually find out this is going on. Principal, School I

School Guidance and Controls:

Some schools also control program and App access time. For instance the classroom teacher might limit access to certain Apps to home or school time.

You can only go on the learning games at school time and the pet and fun games after school. Girl, School C

We do have some rules and regulations around the use of the laptops. There's got to be a teacher in the room; and they're all put away, locked away at the end of the session. ... They've got their own number so they have the same one every time. So if there is suspicion that something is going on we can easily just check that one. Senior teacher, School K

Discussion of the findings and recommendations

In the previous sections we have explored the range and variation in children's online experiences. Even though all the children interviewed are of a similar age and have lived their entire lives in a digitally enabled world, and take this type of world and the devices and opportunities it offers for granted, their experiences, opportunities and desires to use digital devices are quite varied. An assumption that the year of birth translates into uniform experiences is clearly fallacious. It would also be wrong to assume that these children also acquire digital skills, and at the same level of competence, just because the general environment in which they live is digital and they have all used digital devices. In this section we discuss the implications of the variations we saw in our data and make some recommendations about what this might mean for system level interventions particularly through primary schools.

Children's activity and learning preferences are not uniform

Primarily the children like using digital devices for learning and play. However their preferences for what activity, on what device and for how long vary. Some children liked to play games online. For others, if the opportunity was there, they would prefer the physical world of trees and fields to run around to the virtual world. For many the digital option is an 'and' that offers additional play options when their friends are elsewhere and it enriches their play options and opportunities. They play with friends and family online and also alone. Their activities can be physical as well as virtual.

Some similar observations apply to online learning at school and at home. Many children like the learning Apps they are introduced to and recognise their strengths in giving them practice and near immediate feedback but not all equally. They also generally think online Apps are fun to use and enjoy them. Not everyone prefers to read online or use a device for writing and other communication. Some mention physical things like eyes getting sore or not liking the constraints to their expression, creativity and imagination in the Apps on offer. We conclude from this that there needs to be variety in what is available and children should be allowed to opt out of using digital devices at least some of the time to select learning, playing, communicating and creating mediums they prefer.

Preferences aside, children are also not uniform in the capability and skills they have for using digital technologies for learning, playing, communicating and creating. We noted that access to devices and opportunities to use them at home and school varied along socioeconomic lines. The lower the decile of the school attended, the more likely the children did not have a device of their own, had to compete with siblings and parents for use and did not always have access to the Internet at home. In higher socioeconomic areas, children are more likely to have access to a device of their own, have a choice of devices and have time to explore and play using their devices, building their digital literacy and competence in the process. Children themselves identified a device of their own as what they would most like. For children in lower socioeconomic areas, the school-based access and digital learning is a game changer which we address in the section on optimising children's use experience and learning.

Social Media use

We noted that most of the children in our data are not big social media users and where they do have accounts they use them mainly to communicate with family members and known friends. We also noted that many look forward to having a smart phone when they go to high school and see this as a desired goal. These two observations combined suggest that the 8-11 year old age group could be a good age to teach children about managing their online identity, keeping themselves safe online, and being responsible citizens online. Some schools are doing this on their own but it could be accelerated and made more universal with support.

Parents moderate children's online experiences and use

We also noted the facilitative role of parental and older sibling teaching, guiding and moderation of device use. Parents generally seem to set guidelines. Some are more rule-guided such as no devices until chores are done, not more than two hours a day, only in this room, not this programme. Others are more enabling in their approach by setting outer boundaries and thereby creating a safe space in which to explore, for example Mohammed in the children profiles, where the father had enabled parental controls on the family's Internet and blocked some programmes. This latter type of parent moderation encouraged exploration and creativity in Mohammed's use and experiences.

Optimising children's use and experience of digital technologies in the primary school environment

As noted above many of the issues raised by our findings are not about the technology per se nor the schools. It is about the interaction between child, family setting and socioeconomic factors affecting the home, school context and interventions, including the classroom programme and teacher, and the technology. A virtuous cycle might see the school and parents working together to provide access and teach skills to enable safe learning and play.

The schools in low socioeconomic areas struggle to get adequate resources to enable them to provide one device for every child. If they accomplish this they do it through the assistance of charitable trusts and a financial contribution from the home. We noted that where this had occurred and there was a school-wide leadership in place about the role of digital devices in curriculum, in effective teaching and learning, children were enthusiastic, digitally literate, enjoying their learning and felt motivated to learn and experience success. In such schools there tended to be a school-wide strategy to build the confidence and competence of teachers to use digital devices for learning in the classroom. This strategy was reflected in the teacher's confidence and willingness to try new things online and the children's apparent enjoyment of learning.

We noted that for Kura and Māori medium classrooms achieving a digitally supported curriculum and learning programme is much harder and more so than it should be. Vendors of School Management systems and Learning management systems do not cater for the small Māori medium market and if used these school wide systems need to be modified at a time and financial cost to the school. There is also a dearth of learning Apps in Māori medium, so those in use tend to be modified for the purpose by the classroom teachers at a time cost. Socioeconomic and language availability factors seem to combine in this environment to the detriment of children's learning opportunities.

Enabling factors and conditions

We note in our data that a number of factors, particularly when they are found in combination, appear to create a very rich, enabling and effective learning environment for children. These consist of the school leadership, teacher capability, child-centred learning and parental support.

School leadership is defined here as leadership that integrates the digital world into the curriculum and teaching and learning approach in a strategic and not piecemeal way. That is, an approach to digital integration and intent is declared in strategic planning such as the School Charter and Plan and is backed by the Board's allocation of resources not just to the acquisition of hardware and software but also to building teacher's digital capability. In low decile schools, a single episode of higher than usual teacher turnover can set a careful investment in digital capability building back years. For these reasons, low decile schools appear to face an even bigger task in building capability and higher levels of resourcing to compensate might be indicated.

School programmes and digital capability

We encountered schools where there were very structured and deliberate programmes to lift children's digital literacy, skills and competence for learning. These included keeping yourself safe online, dealing with publicness and privacy on the Internet and so on, but some went further to develop specific online literacy, skills and competency. Some of these were low decile schools and the approach seemed to be having a very positive effect on the children, their attitudes to schools and learning and their feelings of self-efficacy about their learning. One school mentioned that they had the evidence from the Me and My School survey to support this claim.

Child-centred learning

We noticed that many of the enthusiastic children who told us about their learning felt in control and empowered about their learning and this coincided with teachers who were deliberately trying to adopt a child-centred approach, enable online learning, and provide timely feedback and challenges. The pursuit of individual child-centred learning and self-efficacy combined with deliberate approaches to building digital confidence and capability appears to emanate from school strategy and leadership, but also requires capable teachers and supportive homes.

Home environment

Parents play several roles in a virtuous system. They fund the Internet access at home and the devices that are available. Some homes because of their economic circumstances, have less of these than others. Parents also create the safe environment in which children play and learn at home. It seems that some guidance for parents on how to do this most effectively might both increase parent's confidence and reduce their fears. Some positive examples we heard of how parents gently guide encourage and set boundaries for safe learning suggests that parents could be assisted more to do this well.

Education system environment

We observed a lot of variation across schools in children's use and experience of digital devices. This was not purely socioeconomic-related in that not all schools of the same decile offered their children similar opportunities to learn in a digitally enabled way. However, there was also quite some difference in what it was financially possible for a higher decile school to do versus a lower decile one. This suggests that current attempts to provide equitable resourcing to schools to offset

socioeconomic and other disadvantages are not sufficient to make a difference in the rapidly changing and growing domain of online learning where the types of devices and the Apps available become obsolete quite quickly and wear and tear is also a factor making reinvestment an ongoing requirement.

Recommendations

The findings from our research suggest that the following would be a set of first steps towards ensuring all New Zealand children are capable 21st century learners and citizens.

Treat Internet access for education and learning as a universal right

Invest in children's online access, but, more importantly, online knowledge and skills and self-management in the online environment and in particular on Social Media

Promote a personalised online learning experience (e.g. one device per child)

Invest in teaching capability (e.g. teacher curriculum) and a supportive teaching environment

Invest in strategic school leadership capability (e.g. strategic understanding of the role and integration of ICTs in the school curriculum)

Promote online understanding, skills, and knowledge of parents from lower decile schools

Improve access to Netsafe resources at schools

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Appendix 1: Interview protocol

Digital Natives: Group Interview – Detailed Protocol

1) Group formation

The interview group will be put together by the principal/agent on our behalf (see separate protocol for this part of the process)

2) Parent/caregiver briefing and consent

There is an information sheet for parents and a consent form for them to sign. The information sheet provides a contact email and phone number for the researchers in case parents have further questions. It is assumed that this part of the process has been completed prior to the commencement of the children's interview. In the absence of a parental/caregiver consent, a child will not be included in the interview process.

3) Children's briefing and assent

On the day of the interview, the children will be assembled in the place where the interview is to take place.

Food and drink is to be provided for the children by the researchers. This should be ready at the time they assemble. Suggestions: the researcher arrive with some plastic cups and a large bottle of juice and some water, plus some fruit, some cheese and a packet of plain and a packet of sweet biscuits. Ask the children to help themselves to something to eat and drink and then sit down.

One of the researchers will then brief the children about the research. Try to use the simplest language you can to get across your messages about what the research is about, who it will help.

The briefing should cover the following points:

- What we want to know = what children like them with the help of the Internet; what devices they use; what apps they like, and why and how they use them.
- Why we are doing the research = to help the government, the Ministry of Education, and teachers know how best to support children like them to learn using the Internet.
- The interview proper will take about an hour.
- We will ask questions; we will give everyone a chance to talk, but only one person at a time.
- We want to record the interview but we will destroy the recording after we have finished our research.
- Also we will not use anyone's name or say anything in our research that will identify an individual, their school, or their family.
- Ask if there are any questions the children want to ask before the interview begins.
- Explain that we are asking their agreement to participate. They can ask to leave the interview at any time if they are not happy to continue, and that we are asking for them to sign the paper to say they have agreed.
- Collect up the consents

This introduction should take no more than 5 minutes. The children could continue eating and drinking during the introduction.

4) The interview

We begin the interview by giving the children the two-sided questionnaire. This part of the process should take about 5 minutes.

Ask the children to write their name on the sticky label and put it where the researchers can see it.

Then turning to the form, ask them to put their age last birthday in the top box and then tick the box for whether they are a boy or a girl.

Then ask them to turn the paper over to the side with the pictures and then one by one ask them to do the following:

- 1) to tick or circle all the devices listed that they use regularly (i.e. at least once a week)
- 2) to tick the box for who owns the device they use
- 3) to tick the box for how often they use the devices they have ticked i.e. lots of times very day; one a day; or one or two time a week
- 4) to stop and put their pens down when they have done that and turn their page over again.

While the children are filling in the boxes, the interviewers should move around, to help children who are struggling with the task and surreptitiously keep an eye on which individual children are giving what answers. This is both to avoid so any possible embarrassment arising from subsequent questions (e.g. look out for the child with few or no ticks) and get a preliminary view to help with asking the next set of questions.

When all the children have finished and turned their papers over, gather in the questionnaires. The researcher who gathers in the papers, should do so in order and number/name the papers, so that during the interview, a number can be noted by the interview recorder against key student comments.

Start the questions. The interviewers might try asking alternate questions. One asks and follows up, the other listens. When the person asking the questions get to the end of their question, the other person takes over, beginning first with following up on any gaps they noticed in the answers to the previous question, before asking their question.

Interviewer Questions to explore in group conversation:

I can see from when you were filling the ticks that some of you have an (name a common device)

Do you share these with other people?

Where/when do you use devices [Prompt: at school, at home, during playtime, at friends or relative's houses, at the marae, at the library?]

In the past 24 hours how did you use the devices (what were they used for?)

[leisure/play, organising, school learning, school work, informal learning, creating something, communicating with friends, communicating with family, communication with others, anything else?] Did you learn anything when doing this?

Prompt: In the past 24 hours who have you interacted with online and why?

In the past 24 hours when did you use device(s) and about how long each day to you spend using your devices? Who sets the limits – you, your parents, your teacher, your friends, something or someone else?

Repeat the questions above for other devices.

What activities do you like to do most?

Which activities help you learn? For example, help with your school learning or things you want to find out, or random stuff...] How do they do that?

Do you sometimes need help to do what you want to do?

Do your parents or teachers set any rules or limits about when or what devices or apps you can use? What sort of rules? Are there any devices, games or sites you are NOT allowed to use?

Have you ever felt worried about something that has happened to you online? What did you do about it?

Where/ who do you go to for help?

Are there any activities you like to do that you would not do online?

[Give each child a Postit note] If could have any device/game/app you wanted what would you choose? Write on the Postit.

Then follow up with: Why/how would you use it?

Ending the interview

You will be able to judge from the children's behaviour whether you might need to bring the interview to an end sooner rather than later.

In general this formal part of the interview with questions and group responses should not go beyond 1 hour.

Appendix 2: Children Questionnaire

1. How old are you?

Tick box to answer



2. Are you a girl or a boy?

Girl

☐

Boy

☐

Look at the pictures of different devices that can connect to the internet.

- Tick the devices that you have used.
- If you have used the device, put a tick in the box for who it belongs to
- If you have used the device, put a tick in the box for how often you use it

Remember only answer the questions for the devices you have used.



	Tick beside all the devices you have used.	Who owns the device you use? (you can tick more than ONE box) ☒	How often do you use this device? (tick ONE box) ☒
☐	 Computer or Laptop	Mine ☐ A family member ☐ School ☐ Library ☐ Friend ☐ Other ☐	Many times a day ☐ Once a day ☐ Couple of times a week ☐ Only week ends ☐ Less than once a week ☐
☐	 Playstation, Xbox or Wii	Mine ☐ A family member ☐ School ☐ Library ☐ Friend ☐ Other ☐	Many times a day ☐ Once a day ☐ Couple of times a week ☐ Only week ends ☐ Less than once a week ☐
☐	 Portable Game (eg Game Boy, PSB)	Mine ☐ A family member ☐ School ☐ Library ☐ Friend ☐ Other ☐	Many times a day ☐ Once a day ☐ Couple of times a week ☐ Only week ends ☐ Less than once a week ☐
☐	 Mobile smart phone (eg iPhone)	Mine ☐ A family member ☐ School ☐ Library ☐ Friend ☐ Other ☐	Many times a day ☐ Once a day ☐ Couple of times a week ☐ Only week ends ☐ Less than once a week ☐
☐	 Tablet (eg iPad)	Mine ☐ A family member ☐ School ☐ Library ☐ Friend ☐ Other ☐	Many times a day ☐ Once a day ☐ Couple of times a week ☐ Only week ends ☐ Less than once a week ☐
☐	 Internet (wifi) TV	Mine ☐ A family member ☐ School ☐ Library ☐ Friend ☐ Other ☐	Many times a day ☐ Once a day ☐ Couple of times a week ☐ Only week ends ☐ Less than once a week ☐
☐	Something else	Mine ☐ A family member ☐ School ☐ Library ☐ Friend ☐ Other ☐	Many times a day ☐ Once a day ☐ Couple of times a week ☐ Only week ends ☐ Less than once a week ☐

