

BYOD (BRING YOUR OWN DEVICE) AND ITS IMPACT ON TEACHER PEDAGOGY: A NEW ZEALAND CASE STUDY

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BY GENEVIEVE RAE

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ABSTRACT

The practice of students bringing their own device to school BYOD (Bring Your Own Device) has now become reasonably common in New Zealand primary schools after being first introduced in the late 1990s. It has become a strategy that schools can use to provide 21st century learning opportunities for students without having to provide school-owned devices. This study raises important questions for teachers and schools to ask themselves before implementing BYOD.

This study explores the experiences of three New Zealand primary school teachers as they introduce BYOD into their classrooms. The case study sought to understand what factors impacted on their ability to implement new pedagogical practices and how professional learning might help support teachers with BYOD.

The literature review examines national and international literature on the implementation and impact of BYOD. It discusses how and why teachers do or do not engage with ICT in classrooms and how BYOD impacts on their practice. This case study utilises SAMR (Puentedura, 2006) and TPACK (Mishra & Koehler, 2006) in order to analyse the data and discuss the findings. The findings suggest that, in order for teachers to maximise the potential of BYOD, professional learning and technical support is essential. The teachers experienced a number of challenges as they introduced BYOD, yet all managed to persevere and remain positive as they trialled new teaching methods, and utilised new programs and applications.

The study concludes by making a number of pertinent recommendations that can be actioned by schools in order to ensure implementation is smooth and successful. It is very important that teachers are supported adequately by the school and are given opportunities to engage in relevant and timely professional learning.

CHAPTER ONE - OVERVIEW

INTRODUCTION

The New Zealand Curriculum (NZC) directly refers to the need for schools to use technology in their classroom programmes by stating that “schools should explore not only how ICT can supplement traditional ways of teaching but also how it can open up new and different ways of learning” (Ministry of Education (MOE), 2007, p. 36). When the NZC was introduced in 2007, it enabled a more flexible school-based curriculum reflective of the changing emphasis on technology in society and 21st century skills for a future focused classroom (MOE, 2007). By 2017, the Ministry of Education expected all New Zealand teachers to utilise e-learning strategies and technology in their teaching approaches (MOE, 2007). Teacher professional development is an essential part of this technological change in education, as is access to devices for both teachers and students. One way for schools to ensure all students can have access to devices is to introduce school-based BYOD (Bring Your Own Device) programme. This encourages and enables students to bring their own device from home to use as a learning tool at school.

BYOD IN A NEW ZEALAND CONTEXT

The Ministry of Education uses the website TKI (Te Kete Ipurangi) as a portal to guide, support and inform New Zealand schools on e-learning developments and research. Many of the resources on TKI point to the potential for transformational education change when students are able to bring their own device to schools, giving them better access to a device that they can easily use to support their learning. It is a valuable resource for New Zealand schools and teachers as many schools are adopting BYOD. The MOE informs New Zealand educators that:

Digital devices have the potential to expand and enhance interaction in the classroom, enable more real-world activities, improve learning environments, and engage students in new and exciting ways. Opportunities for collaboration and problem-solving are expanded beyond the classroom in an online environment. A learner-centred curriculum that includes 1:1 digital devices supports greater flexibility in learning pathways, empowering students to learn in a more personalised way with increased control over their own learning. This can help students engage more deeply in their learning and lift their achievement. (MOE, 2015c, n.p)

Digital technologies are increasingly being used in educational settings and are impacting teaching and learning practices on a global scale (Innovative Teaching and Learning (ITL) Research, n.d.; Johnson, Adams Becker, Estrada, & Freeman, 2015; MOE, 2014). Primary schools in New Zealand have also been progressively adopting the use of digital technologies in classrooms over the past two decades (MOE, 2014; MOE, 2015a), and developing strategies that enable students to bring and use their own digital devices in school settings.

The adoption of BYOD strategies in schools provides opportunities and challenges for school leaders and teachers, impacting parents/whānau, school policies, and teacher pedagogy (Johnson et al, 2015; MOE, 2014; MOE, 2015b). It could be assumed that by adopting a BYOD strategy, a school is indicating their desire to have more 1-1 digital devices in classrooms, in order to increase individual access time for students. It could also be assumed that the teachers in the school believe that having

1-1 digital devices will add value to student learning, and impact teacher pedagogy, as they are able to implement a broad range of learning and teaching strategies that are 'digital dependent'. The case study central to this research aims to describe and explore the impact BYOD has upon the pedagogical practices of three teachers at a New Zealand primary school who are trialling and implementing adoption of BYOD. This study will investigate how the teachers introduce BYOD for the first time, and explore how, what and why they make pedagogical changes (if any) during this introductory year. It will also seek to understand what factors impact on the teachers' ability to implement these pedagogical changes. This study aims to provide the reader with an in-depth understanding of range of pedagogical changes that may be evident when introducing BYOD within a New Zealand primary school classroom. This study uses TPACK (Technological Pedagogical Content Knowledge) and SAMR (Substitution, Augmentation, Modification, Redefinition) (Puentedura, 2006) as theoretical lenses through which to examine the links between teacher knowledge and pedagogy when introducing BYOD (Mishra & Koehler, 2006).

DIGITAL TECHNOLOGY IN NEW ZEALAND EDUCATION

The New Zealand Ministry of Education (MOE) recognises that educational changes were needed for education in the 21st century. It is considered that these changes could be enabled by the use of digital technologies in classrooms (MOE, 2014). The MOE's Statement of Intent 2014-2018, priority one states: raise teaching and learning quality, by "strengthening the capability of teachers and school leaders to integrate the use of digital technologies with effective teaching and leadership practices" (p. 18). Priority five also states that creating modern learning environments recognises the importance of technology combined with quality teaching practices and the engagement of the wider school community by "making online learning environments and digi-technologies integral to high quality teaching and learning to better engage children and students, and their parents, families, whānau and communities" (MOE, 2014, p. 22).

As of March 2015, the MOE has been providing a service to schools, namely the Connected Learning Advisory (see definition of terms), to aid in the use of, and integration of, digital tools into the teaching of the NZC (MOE 2015c). The introduction of this service indicates that the MOE now recognises that teachers need guidance and assistance with these particular changes in education. This is reiterated in Enabling e-Learning (see definition of terms), (MOE, 2015a; MOE, 2015b), as support for teachers is identified as a key component to effective e-learning in classrooms in developing teacher pedagogy to design learning experiences.

Another one of the Ministry Initiatives described in Enabling e-Learning is the Network For Learning (N4L) Managed Network (MOE, 2017). N4L is a state-owned company set up to improve infrastructure and support broadband connections to all schools. This network was specifically designed by the MOE for New Zealand state, state-integrated, and partnership schools to access and began in 2014. The connection costs are fully funded for these schools. The network allows schools to use a secure data network with fast and reliable internet access. It also provides filtering and network management. Without this technical infrastructure, schools would not have the capacity to support BYOD in many instances. This is further evidence of the MOE's efforts to support schools to manage many devices safely and at minimal costs (MOE, 2017).

The NZC specified the use of ICT to encourage new ways of teaching and learning and the use of digital technologies to support all curriculum areas (MOE, 2007). E-learning is a term used to

describe this method of teaching and learning. The NZC vision is that students become connected learners and confident ICT users (MOE, 2007). One of the principles of the NZC is to be future focused (MOE, 2007) and a component of this is ensuring students are digitally able. Therefore, schools must embrace ICT and equip students. BYOD is one way of ensuring students have access to devices. It is recognised that digital technologies “change the way students learn, the way teachers teach, and where and when learning takes place” (MOE, 2014, p. 4). The MOE suggested that schools should be able to provide ICT equipment where possible; however, it also recommended BYOD when stating: “we think it reasonable to expect parents and whānau to meet the cost of digital devices. Best international and New Zealand practice demonstrates that more responsibility and care is taken with digital devices when parents own them” (MOE, 2014, p. 11). The MOE recognised that ICT must change the way teachers teach; however, the methods teachers can use to ensure effective teaching and learning are not specified. Bolstad et al, (2012) identified that just putting devices into classrooms has not revolutionised education and give four recommendations, two of which refer directly to pedagogy – “providing inspiring ideas and opportunities to connect ideas; and supporting innovation” (p. 6). Recent research by the 2020 Communications Trust (Johnson, Wood, & Sutton, 2014) had indicated that over 70% of principals surveyed “agreed that digital technologies were positively affecting teaching and learning, but only 14% of schools feel that all of their teachers have the necessary skills to effectively manage student use of personal digital devices for learning” (p.7). Therefore, there is an immediate need for research in this area. The use of digital devices is recommended by the MOE, 1-1 if possible; however, the reasons why and the methods teachers need to use to integrate the devices are not clear. Further research into this topic is necessary.

It is imperative that the introduction of BYOD is investigated, as this is one way New Zealand schools can improve students’ access to digital devices. Bringing a personally owned device to school can impact significantly on teacher pedagogy. It creates the opportunity for teachers to embrace different pedagogies, such as, blended learning (Powell et al, 2015) and flipped classrooms (Rotellar & Cain, 2016). It is envisaged that these methods could aid teachers to utilise the technology effectively. Research in this area will give valuable information for New Zealand teachers to be able to understand how and why pedagogy changes (or does not change) in order to effectively use BYOD in the classroom. This study requires an appropriate framework to understand the complex decisions and work of teachers in bringing together effective use of technology and different pedagogical approaches. Therefore this study has used TPACK (Mishra, & Koehler, 2006) as a theoretical lens through which to examine the links between teacher knowledge, pedagogy, and confidence when introducing BYOD. Alongside TPACK, SAMR (Puentedura, 2006) will also be used in this manner. TPACK and SAMR will be examined further in Chapter Two.

BYOD JOURNEY: THE RESEARCH SETTING

This case study will be situated at school A, a decile ¹8 full primary school with a roll of 360 situated in a suburb within 8 kilometres of a city centre in the South Island of New Zealand. The school first piloted a BYOD strategy in the year prior to this study, with one Year 5-6 class over two terms (20

¹ “School deciles indicate the extent the school draws their students from low socio-economic communities.” (MOE, 2016a, n.p).

weeks). The pilot was extremely important in the development of BYOD for introduction to the rest of the students. As a result of the pilot, the school-wide wireless system was upgraded, as was a security and monitoring system for students to access the Wi-Fi. The pilot influenced decisions around device selection and specifications, as well as development of a digital citizenship programme. Student use agreements and policies were part of the pilot and were refined for the implementation of BYOD. Two community information evenings were held prior to implementation and the results and implications of the pilot were shared with the staff and community who attended. This case study will investigate how three teachers at the school introduce BYOD in the second stage of the implementation (during the year following the pilot), and will explore how, what and why they make pedagogical changes (if any) during the introductory year.

RESEARCH QUESTION(S)

The aim of this case study was to develop an in-depth understanding of some of the pedagogical changes three teachers experience when introducing BYOD within a New Zealand primary school classroom for the first time. The key research question is:

How does the introduction of BYOD impact the pedagogy of a teacher in a primary school context in New Zealand?

The sub questions are:

- What factors impact the teacher’s ability to implement (new/existing) pedagogical practices?
- What do teachers do differently when incorporating BYOD into their practice and why?
- What professional learning is required in order to integrate BYOD effectively into the classroom?

DEFINITION OF TERMS

The New Zealand Education Review Office (ERO, 2016) provides a glossary of terms for New Zealand educators. The following terms will be used in the research and some are defined by ERO as follows:

<p><i>Bring your own device/technology (BYOD/T)</i></p>	<p>Bring your own device/technology. Refers to the practice of permitting or asking students to bring their own mobile devices (laptops, tablets, and smartphones) to school, and to use those devices to support, research, and to record and present their learning. They will usually be allowed to log onto the school network using their device. (ERO, 2016, n.p)</p> <p>This term will be used in the research to refer to any and all devices students may bring from outside school. BYOD is the acronym used in this research.</p>
<p><i>Devices</i></p>	<p>“Term used to describe a digital technology such as an iPad, smart phone, tablet, laptop, Chromebook” (ERO, 2016, n.p).</p>

1-1 Device	This term will be used to refer to students in one classroom having access to a digital device individually i.e. one per student.
Pedagogy	“The principles, practice and art of teaching” (ERO, 2016, n.p). The Oxford University Press (2016, n.p) defines pedagogy as “the method and practice of teaching, especially as an academic subject or theoretical concept.”
Information Communication Technology (ICT)	“Are all the technology related devices used to communicate. You will often hear more up-to- date terms like digital devices or LwDT (learning with digital devices.)” (ERO, 2016, n.p).
E-learning	E-Learning (Electronic Learning) is defined by ERO as Learning that is facilitated and supported through the use of digital technologies. It covers a spectrum of activities from supported learning, face-to -face teaching in conjunction with e-learning, known as blended learning, to learning entirely online. It can be self-paced and can occur in or out of the classroom or at home. (2016, n.p)
Blended Learning	Learning that occurs when at least part of the content and instruction is delivered via digital and online media. Learning will also occur in other ways, including with the teacher in person. Students have some control over time, place, path, or pace of their learning. (ERO, 2016, n.p)
Flipped Classroom	A way of teaching that reverses the usual practice where subject content is taught in class and students complete homework related to that to develop their understanding. In the flipped model, instructional content is delivered to students, usually online (E.g. short video clips), outside of class time. The lesson time is then used to workshop the material through discussions, working exercises or on projects. This is a form of blended learning as the content students receive is usually digital. (ERO, 2016, n.p)
N4L Network for Learning	N4L was created by the government to ensure New Zealand schools have a managed network that can “provide an environment to encourage the seamless uptake of digital learning. The N4L managed network provides a safe, predictable and fast internet with uncapped data, online content filtering and network security services” (ERO, 2016, n.p)

SAMR	The Substitution, Augmentation, Modification, Redefinition model is used to “see how well digital technology is being used to improve learning. The least impact is when devices are used just as a substitute for exercise books. The most impact is when the devices are used to redefine or transform learning” (ERO, 2016, n.p).
TPACK	Technological Pedagogical Content Knowledge (Mishra, & Koehler, 2006). TPACK is a framework to help align students' learning intentions, choice of learning activities, and choice of technologies (MOE, 2015a). This framework helps to identify the knowledge teachers need in order to teach effectively with technology.
Connected Learning Advisory	This advisory “provides free, consistent, unbiased advice on integrating digital technologies with learning for all state and state-integrated schools and kura in New Zealand” (MOE, 2015, n.p). The service aims to help schools utilise digital technology and maximise results for students and school communities.
Enabling e-Learning	This is a resource for New Zealand teachers. It is the “Ministry of Education’s online ‘hub’ for ICT-related education resources and programmes in New Zealand, bringing together everything that school leaders and teachers need to improve their e-learning practice” (MOE, 2015a, n.p).
Netsafe	A New Zealand based website created to give New Zealanders advice and guidance about staying safe online. See www.netsafe.org.nz .
Seesaw	A digital portfolio and communication tool for students, families and teacher use. See www.seesaw.me
Hapara	Hapara is a cloud-based instructional management tool for teachers to use in digital classrooms. It allows teachers to manage and organise learning, as well as, monitor what students are doing. See https://hapara.com/
Kahoot	A game-based learning platform where users can create an online quiz. See https://kahoot.it/#/
Linewize	Linewize is a New Zealand programme that aids teachers in the management of internet use in the classroom. It allows teachers to have live online visibility of student use of a school network. See http://www.linewize.com/

TKI	The Te Kete Ipurangi website is an MOE initiative for New Zealand teachers, school managers, and the wider education community. It is a bilingual portal-plus web community which provides educational material. The site began in 1998 when the ICT for schools strategy was developed, see www.tki.org.nz .
Pinterest	Pinterest is an online forum for sharing photos and ideas, a web-based pinboard (http://www.yourdictionary.com/pinterest). See www.pinterest.com .
Blendspace	Blendspace is an online tool where teachers and students can create digital lessons, see https://www.tes.com/lessons .
Book Creator	An application that allows the user to create an ebook.
Class Dojo	An online behaviour management/communication application. See www.classdojo.com
The following terms used in this research are defined by the Oxford University Press.	
Impact	As defined by the Oxford University Press (2016, n.p), “a marked effect or influence”.
Teacher	As defined by the Oxford University Press (2016, n.p), a teacher is “a person who teaches, especially in a school”.

STRUCTURE OF THIS STUDY

This study is organised into six chapters. The introductory chapter provides an overview of the study, its significance and the background to BYOD in New Zealand, in relation to the research questions. The second chapter presents an in-depth review of national and international literature on BYOD and includes SAMR and TPACK literature. The third chapter outlines TPACK and SAMR as the theoretical frameworks behind this research, as well as explaining the methodology used. Chapter Four presents the research findings while Chapter Five analyses and discusses these findings. The final chapter draws conclusions, makes recommendations for schools and also suggestions for further research.

This introduction outlined the background to the study as well as the significance of the research. The structure of the research was explained and the terms were defined. The next chapter will examine literature regarding the use of BYOD in primary school settings both nationally and internationally. It will also examine literature relating to teacher pedagogy and BYOD.

CHAPTER TWO - LITERATURE REVIEW

This chapter will examine literature on BYOD in New Zealand as well as internationally. It will briefly describe the background of BYOD in New Zealand schools. The literature will be presented, examined and discussed in relation to how and why teachers use 1-1 devices in their classrooms and some methods they employ. This chapter also includes literature from the New Zealand Curriculum and the Ministry of Education that outline the use of devices in future focused New Zealand classrooms. Teacher learning and professional development is an important aspect of implementing BYOD and research in this field is also addressed in this chapter.

BYOD IN NEW ZEALAND

BYOD began in New Zealand in the 1990s; however, the research on BYOD in New Zealand is limited and mostly secondary school based. The first school in New Zealand to introduce BYOD/1-1 devices was Saint Kentigern College in Auckland (Adams, 2015). The first trial was in 1996 with 16 students; now BYOD extends to 2,149 students and is still thriving and evolving in the school. The goal for BYOD was to enable students to have anytime and anywhere access to learning. The school worked with whānau to provide technological learning opportunities for the students. As early as 1996, Saint Kentigern had recognised that schools would be financially unable to provide 1-1 devices. Adams (2015) reports on these positive and ongoing opportunities for students at Saint Kentigern; however, associated changes to teacher pedagogy are not described.

BYOD and 1-1 device use is still being developed in New Zealand. Effective methods of integration and the support teachers need have evolved since BYOD was first introduced. The Digital Technologies in New Zealand Schools report (Johnson et al, 2014) did not identify BYOD specifically in its data. However; there was specific information about how many students had access to personal devices to use at school (Johnson et al, 2014). The impact on teacher pedagogy was not explained but there was data on how principals felt about the skills of their teachers to effectively manage personal digital devices for learning (Johnson et al, 2014). This report identified that students' personal devices are used in schools and the majority of teachers are skilled enough to manage them. It did not address the actual methods and strategies teachers need to employ to effectively use these devices in the classroom.

BYOD research based overseas is more extensive than New Zealand based research. Baker's (2010) Australia based research specifically questioned "what learning theories or frameworks are most useful for understanding how students most effectively learn in online environments" (p. 1). This research investigated how teachers teach using digital tools and what method had the most impact for students. Baker (2010) identified the skills and capabilities that teachers needed to "access and use repositories of suitable, exciting, culturally appropriate, discoverable and affordable digital content" (p. 10) as increased collaboration, development of models of learning activity design and detailed pedagogical frameworks. Baker (2010, p. 50) suggested that these frameworks must "integrate the varied uses of ICT from curriculum and assessment, pedagogy, organisation and administration, and professional learning". Baker further stated that teacher capability relies on developing pedagogical expertise in both digital content and technology rich learning environments. In order for teachers to continue to develop their skills, there must be a willingness on the part of the staff involved to continue learning and adapting to 21st century learning, to ensure the use of

digital tools is effective (Stoll, Fink, & Earl, 2003). The MOE (2015c) also reiterated the importance of ongoing teacher support by stating that “a key to successful digital device programmes is to provide teachers with training in using devices and software applications, both in advance of the rollout to students and on an ongoing basis” (n.p).

Baker’s (2010) research is comparable to the ITL rubrics (ITL Research, n.d) that provide a framework for teachers to use to gauge the effectiveness of the use of ICT (Information and Communication Technology) in classrooms. The rubrics were developed to “help educators identify and understand the opportunities that learning activities give students to build 21st century skills” (n.d, p. 2). The Innovative Teaching and Learning Research project tested the rubrics internationally and they can be used in schools to develop teacher capabilities when using ICT. They also provided examples for teachers to follow. In the ITL rubrics, digital media tools come under the umbrella of ICT. These rubrics give specific examples of best practice which can be applied directly to teaching and learning (ITL Research, n.d). Using digital tools to construct knowledge was outlined as the most effective way to utilise technology in the classroom, which was also indicated in Baker (2010). How the students use the technology to complete tasks was the focus of the rubrics rather than the ways the teacher uses the technology to teach; however, it was noted that an educator’s use of technology could enhance their teaching practice significantly. It was considered particularly powerful learning when students had the opportunity to use devices to construct knowledge and/or “real-world problem-solving and innovation” (ITL Research, n.d, p. 23).

PEDAGOGICAL DEVELOPMENT AND DIGITAL TECHNOLOGIES

Both Baker (2010) and Stoll et al, (2003), showed a clear pattern that the use of digital media tools and digital technology connect with building knowledge, supporting innovation and collaboration. When introducing new concepts to classrooms, pedagogical development should play a major part:

Whatever the technology, however, learning is the vital element. E-learning is not simply associated with modes of delivery or the functionality of a particular technology, but forms part of a conscious choice of the best and most appropriate ways of promoting effective learning. (MOE, 2015a, n.p)

More support for pedagogical focus was made by Piehler (2014) who emphasises that the focus should not be on the device or the tool, but on the pathway to teaching and learning with the end goal being accelerated learning. Piehler stated that there should be a very clear plan when implementing 1-1 device classes, that input and consultation should be sought from all parties. This includes parents/whānau, teachers, school leaders and students.

Digital pedagogy is not simply teaching about or with digital technology; rather it is about effective teaching using digital tools where learning is ubiquitous, learners have agency and connections are made (MOE, 2014). In the MOE Statement of Intent 2014-2018 (2014), it is recommended that teachers must have an understanding of pedagogical principles of specific learning related to using digital tools in instructional settings. This report further recommended teachers refer to the NZC to understand how effective pedagogy is linked to the use of digital technologies, as well as, advocates rethinking traditional ways of teaching and how learners are organised and managed. It explicitly mentioned consideration for ubiquity, agency and connectedness (MOE, 2014).

The 21st Century Learning Reference Group (2014) linked digital tools to 21st century learning and outline the need for the development of digital tool use in classrooms and teacher pedagogy. Effective use of devices to develop skills for the future digital world and the subsequent digital competencies are a major part of learning for the 21st century. These skills are part of the components of the NZC key competencies: self-management, collaboration, and social interaction online. Looi et al (2011) and Carver (2012) both highlighted the importance of skill development: communication, problem-solving, creativity and innovation, link contexts to real world problems. Further to this, the MOE (2016) had introduced e-competencies, which is another method of describing and combining digital competencies and NZC key competencies. These were described as e-awareness, technological literacy, media literacy, informational literacy, and digital literacy.

Looi et al's research (2011) found that, prior to 1-1 device acquisition, teachers were task oriented and teacher-centred, but after the implementation of 1-1 devices, students became more independent with questioning and researching, finding information for themselves rather than relying on the teacher. The teachers collaboratively planned, sharing their expertise which helped to develop their subject knowledge. Students used their devices as digital media tools and interacted online with others. Concerns expressed by the researchers were predominantly about assessment as these students still took part in traditional assessment along with the students from other classes. However, the students in the 1-1 class performed better. The research identified that devices not only changed this class but also found it was a combination of the teaching methods used and the way the students and teachers utilised the devices that made the difference for these students. Student outcomes were positive in terms of assessment outcomes, engagement, attitude and teacher agency was increased (Looi et al, 2011). This study showed clearly the links between effective use of digital media tools and increased student achievement and also teacher knowledge and agency. This is in line with Baker (2010), Piehler (2014) and current MOE research and recommendations (MOE, 2013; MOE, 2014).

The report, '*Future-focused Learning in Connected Communities*' (21st Century Learning Reference Group, 2014) made connections between digital tools and Innovative Learning Environments (ILE), and the need for equitable access to devices and also the need for future-focused teaching styles. This reference group provided a digital technologies strategy for New Zealand schools and showed that pedagogy and devices, and digital media tools, link together. In addition, Hedberg (2011) researched how and why teachers change their pedagogy when utilising digital technologies in their classes. The study results showed more effective practices, high student engagement, innovative learning experiences and redefined teaching and learning. This is further research that highlights and emphasises how digital technologies and changes in pedagogy make a positive difference for student outcomes.

SAMR

Research indicated that New Zealand teachers could adapt their pedagogy to use 1-1 digital devices by utilising the following possible strategies: flipped learning (Rotellar & Cain, 2016), blended learning (Arney, 2014) and the SAMR model (See diagram below). The SAMR model (Educational Technology and Mobile Learning, n.d.) is a tool for teachers to use to assess the way technology is being used and ensuring it is effective use. This model has been popularised by Doctor Ruben Puentedura as a method for teachers to select, use and evaluate technology in their classrooms (Hamilton, Rosenberg & Akcaoglu, 2016). The SAMR model provides step-by-step examples to aid

teachers as they design and create learning tasks integrating technology (Puentedura, 2006). The aim is that teachers use technology and move through the stages from enhancement to transformation. It is at the redefinition and modification stages that activities have the potential to transform learning (Puentedura, 2006). For example, the redefinition phase outlines that students will be doing something they wouldn't have been able to do in the past using "technology to create imperceptibly new tasks" (Educational Technology and Mobile Learning, n.d.). Romrell, Kidder and Wood's (2014) research also found that classroom tasks that were based in the transformation levels were more "personalised, situated and connected" (p. 9) than the tasks at the enhancement levels. Arney ,(2014), a specialist in establishing blended learning in schools, stated that the most important part of putting more digital devices into classrooms is ensuring that schools are not just using technology for technology's sake but rather to focus on improving instruction and outcomes for students. This is directly related to the changes teachers must make in their practice to best use technology. The transformation stages add great value and possibilities to learning activities.

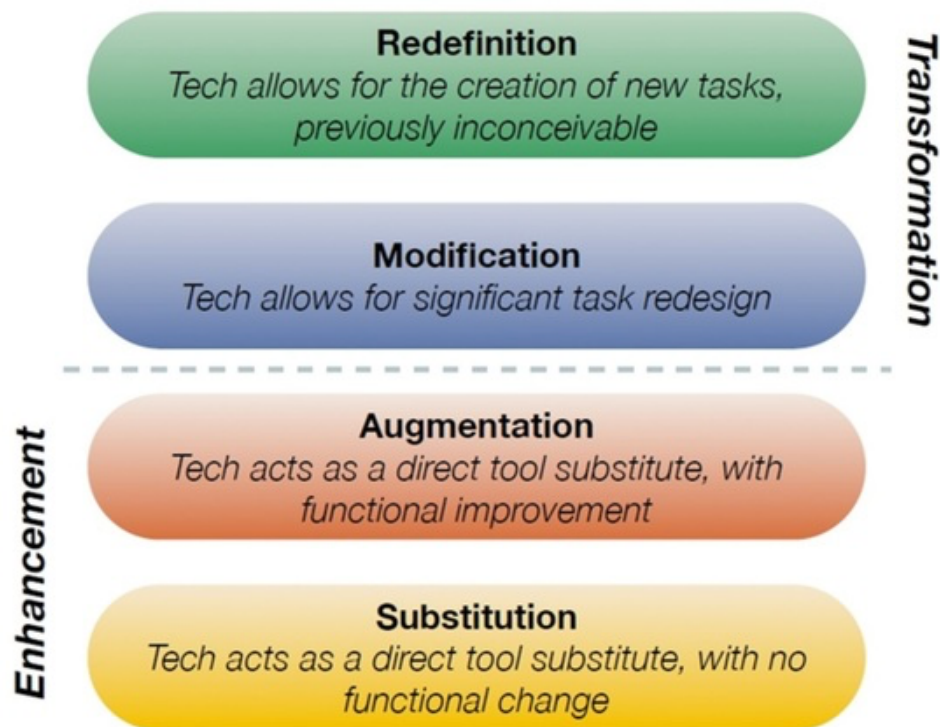


FIGURE 1.

Image the creation of Dr. Ruben Puentedura, Ph.D. <http://www.hippasus.com/rrpweblog/>

TPACK

TPACK is a framework that has been used by researchers to analyse teaching practice. The TPACK model was first developed by Mishra and Koehler (2006). It is a useful tool as "TPACK is the intersection of teachers' knowledge of curriculum content, general pedagogies, and technologies" (Harris & Hofer, 2011, p. 1).

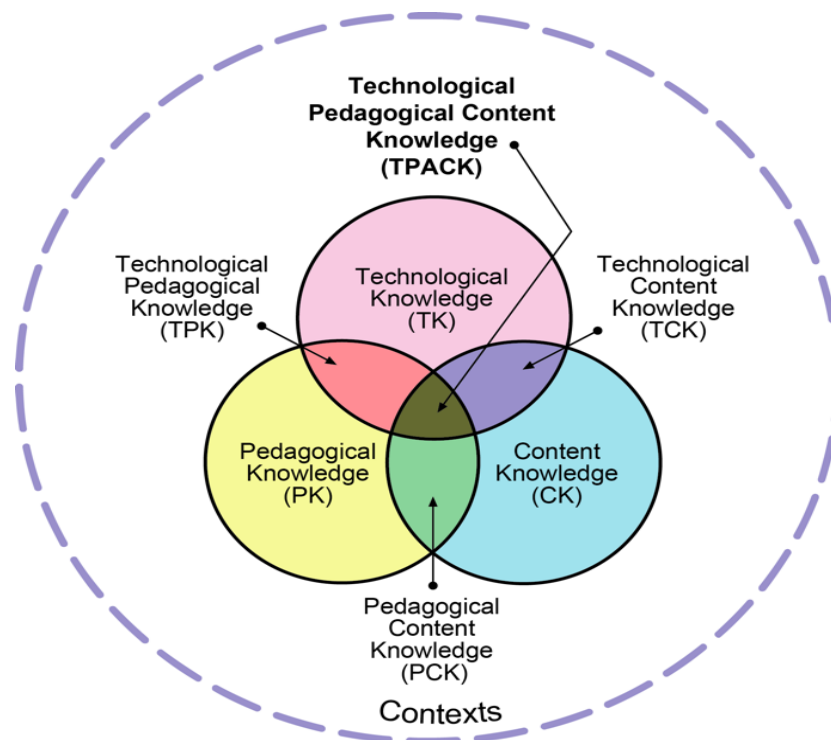


FIGURE 2

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This is an extension of pedagogical content knowledge (PCK) which is the specialized knowledge required to teach differently within different content areas. When technology tools are added to a teacher’s PCK there can be challenges for teachers in terms of planning, activity design and teaching methods. If the digital tool becomes the centre of the planning and design, then the activity becomes more focused on the tool rather than the students and their learning needs (Harris & Hofer, 2011). Hofer and Grandgenett’s (2012) research explored how TPACK could be used as a professional learning tool to help develop teachers’ effective integration of technology. The main focus of the research was on the planning stages. The findings showed that after the professional learning and testing the planning strategy they had been taught, the teachers were able to “plan more judiciously to enhance students’ learning and their own teaching, rather than using technologies because it is required of them to do so” (Hofer & Grandgenett, 2012, p. 225). The instructional planning strategy used in the professional learning complemented existing approaches to teaching and resulted in enhanced planning and teaching methods. Ling Koh, Chai and Tay’s (2014) research examined the contextual influences of teachers’ TPACK construction. It was found that by using TPACK these influences could be used positively, as by using opportunities in the classroom, rather than focusing on logistics, the teachers could focus on pedagogy. One of the recommendations of the research was to use TPACK in the planning and design phase which would support pedagogical improvement. This also supported Hofer and Grandgenett’s (2012) findings about enhancing the planning stage using TPACK.

PROFESSIONAL LEARNING

Professional learning is recommended by the MOE as part of a school’s ICT strategy, including BYOD implementation (MOE, 2014). Eyre’s (2015) investigation into e-learning practices in New Zealand secondary schools showed that teacher pedagogy and professional development for teachers was

considered to be part of the school wide plan when implementing e-learning in schools. The emphasis was on student outcomes and preparing students for the future (Eyre, 2015). The strategies used to implement e-learning were all teacher based, i.e. pedagogy focused, lots of professional development, staff confidence and skills and using a team of teachers to lead developments (Eyre, 2015). However, this research did not include how and why teachers changed or did not change their pedagogy to implement e-learning. Software choices and professional development were identified as important steps, as was teacher attitude and the change management process followed by school leaders. BYOD was identified as a way to solve the problem with the lack of devices in schools (Eyre, 2015). The research above mentioned teacher pedagogy and the need for professional development without going into detail or specifics and it was not the main focus of the research. This particular area of research will be vitally important in informing New Zealand teachers as more and more schools take on BYOD as a way to cope with the increasing expenses of digital devices.

Starkey (2010) completed research on the digital ability of New Zealand secondary school teachers to investigate how they integrated their digital knowledge into their teaching practice in their first year. It was found that teachers who already had extensive knowledge of digital technologies, combined with pedagogical content knowledge, were more able to create rich learning tasks that focused on creativity and knowledge-building rather than skill acquisition (Starkey, 2010). The teachers with high digital capabilities but low pedagogical content knowledge most appreciated support (professional development) with developing content knowledge in order to then integrate technology more effectively (Starkey, 2010).

Barriers to teachers in New Zealand using technology in their classroom were identified in Lai's (2005) research. These barriers were also relevant to this study; this included access to teacher professional development, technical assistance and access to hardware. Access to reliable devices could be solved by employing BYOD in schools, as recommended by the MOE (2014), alongside school acquisition of devices. Sime and Priestley (2005) included teacher personal experience with digital technologies as one of the factors that indicate whether a teacher will integrate technology, as is the support available to the teacher. This particular study focused on the experiences of student teachers as they worked with teachers and developed their own skills and attitudes towards using ICT in the classroom. It was found that teachers who lacked confidence and personal skills in ICT were less likely to effectively integrate it in the classroom. The importance of teacher professional development was identified as important even when teachers had high digital technology abilities. Primary school teachers were found to use ICT to support classroom practice and were more likely to do so when they used technology at home as well (Sime & Priestley, 2005).

Minsheu and Anderson (2015) also stated the importance of professional development which directly catered for teacher individual needs with regard to their content knowledge and also that the use of devices was seen as integral to the classroom programme, not an isolated extra. If technology was seen as an integral part of the specific context the teacher was working in, then they were more likely to integrate the technology. For example, if a mathematics specialist teacher received professional development on integrating devices into a numeracy context, then the teacher saw more relevance and benefits and was therefore more likely to put the skills and knowledge learned into practice (Minsheu & Anderson, 2015). Although this research is American based, the conclusions drawn are reflected in what is recommended for New Zealand school teachers by the

MOE (2015b). The teachers identified the same barriers as Starkey's New Zealand based research and both Starkey (2010) and Minshew and Anderson (2015) made the same points regarding professional development and content knowledge.

Janssen and Lazonder (2015) recognised that teachers are exceptionally busy and can lack the time to attend professional development to upskill themselves in order to implement new strategies and technologies into their classrooms. Janssen and Lazonder's (2015) study investigated what support teachers required when integrating technology into their lesson plans and compared trainee teachers to experienced teachers. It was found that the experienced teachers wanted support to consolidate their existing knowledge base when they were integrating technology into lessons. Support for experienced teachers should take into account the content and pedagogical knowledge they already have and focus on the new technological knowledge required (Janssen & Lazonder, 2015). Olofson, Swallow, and Neumann (2016) also found that the focus on knowledge construction was useful when working with experienced teachers in order to provide learning opportunities for them to integrate technology into classroom practice.

Minshew and Anderson (2015) gave an important insight into teacher efficacy and integrating 1-1 devices into teaching and learning. They emphasised once again the time constraints on teachers and the difficulty with accessing the time needed for teachers to learn about and understand the devices in order for them to be integrated effectively. In addition, they also made a point about the huge benefits to both students and teachers of having and using 1-1 devices in the classroom. Their in-depth study of external and internal barriers to teachers using and integrating 1-1 devices also included examining pedagogical practice. Minshew and Anderson's (2015), research identified that technology knowledge includes "what the teachers knew about technology available for classroom use. Technology ranges from the actual device to the various programs, apps, and websites that are available to support the device" (p.348). However they found that "many teachers do not understand how to use the technology in classroom settings" (Minshew & Anderson, 2015, p. 348). A lack of technology knowledge became a barrier to integrating technology successfully. All aspects of TPACK are essential components to effective technology integration, especially in BYOD/1-1 device classrooms. TPACK will be discussed further in this chapter.

BYOD AND STUDENT OUTCOMES

The most recent New Zealand based research on digital technologies covers BYOD and student outcomes in secondary schools. Baker (2014) specifically investigated how using personal devices at school affected outcomes for students in a secondary setting. The issue of teacher buy-in and effective use was raised in the research and suggested links could be made to appraisal systems. Baker's (2014) research also stated the difficulties with measuring student outcomes and the success of a BYOD initiative and suggests measuring the skills of students would be the best component to measure. Teacher pedagogy was examined, in that some participant schools suggest that teachers need a set of skills themselves before they can begin to use BYOD in the classroom. It was identified that teachers must have professional development to support and integrate successful BYOD implementation.

There was further New Zealand secondary school based research by Wilson (2015) that was focused on innovative learning environments and raised the issue of BYOD within these environments. Wilson reported that BYOD would solve the lack of school-owned devices readily available for

students but also recognised the many demands on teachers and included the implementation of BYOD as one of those demands (Wilson, 2015). Teacher pedagogy in relation to BYOD were not included; however, the need for student and community voice in planning for BYOD were mentioned as being important (Wilson, 2015). Romrell et al (2014) report that there are advantages for students when they use their own personal device for learning. This is due to the personalisation and familiarity of owned devices giving students confidence to use the technology.

INTRODUCING BYOD: MANAGING CHANGE

The Post Primary Teachers Association (PPTA) (2012) provides New Zealand schools with a change management toolkit. This toolkit is readily available for New Zealand primary schools to use. One of the crucial elements of change management in schools is the consideration of teacher professional learning and development needs, particularly in the area of ICT. If schools do not, or are unable to, provide formal professional development, it is considered some teachers will go online in search of ways to upskill themselves (Melhuish, 2013). In New Zealand, teachers use social media and social networking sites as a form of professional learning. This is where teachers learn from other teachers in online forums, such as, the Virtual Learning Network (VLN), Facebook and Pinterest. Melhuish (2013) specifically researched this phenomenon in order to assess the effectiveness of this form of teacher learning. Melhuish stated that for professional learning to be effective it must have an impact on the students. It was recognised that teacher quality and pedagogy were central to improving student outcomes and goal driven professional development could improve teacher quality (Robinson, Hohepa, & Lloyd, 2009). In order for teachers to change and learn, professional development is crucial. There is New Zealand based research that linked effective professional learning to improved acts of teaching and student outcomes; however, it was stated that this was a very complex process and many factors contributed to the success of professional development for teacher learning (Timperley, Wilson, Barrar & Fung, 2007). Niki Davis' (Davis, Eickelmann & Zaka, 2013) arena of change provided a picture of the factors that could impact on the way teachers adopt digital technologies. Professional development was identified as one of the key influences on how and why a teacher adapts their practice to encompass digital technologies into their classroom. Davis identified parents and principals as another two key factors influencing teachers.



FIGURE 3.

Niki Davis' Arena of Change with Digital Technologies in Education

Davis et al's (2013) research identified factors present in schools that had been successful in integrating ICT, with professional learning being one of these factors. It is important to note that the professional learning was successful when designed to cope with new digital trends and linked to pedagogical aims.

The Connected Learning Advisory, supported by the MOE, provides advice and guidance for New Zealand schools through the TKI website under the Enabling e-Learning section. This advisory recently outlined a strategic thinking roadmap to support schools in developing a digital technologies action plan (MOE, 2015). Two essential parts of this plan were a focus on pedagogy and authentic use of digital technologies. Teacher professional development was identified as an important part of the digital technology journey, and building teacher confidence by utilising both external and internal experts was also seen as a way of enhancing teacher practice and experience with devices (MOE, 2015). It was noted that schools must be able to accommodate an increasing range of digital devices, not only in a pedagogical sense but also from infrastructure and technical management positions. This could either be to accommodate BYOD or school/teacher owned devices and/or a combination of school owned and BYOD. One of the main barriers that teachers identified with integrating devices into their classrooms was being able to manage technical difficulties and coping with problems with the school infrastructure (Minshew & Anderson, 2015). Training and support for teachers, both with pedagogy and technical management, is imperative.

BYOD/1-1 device use in classrooms is a major change in education and teachers must understand how and why to integrate devices into their programmes effectively. Teachers who have access to devices and these types of forums are exercising self-efficacy and agency and it puts them in control of their teacher learning. This is reflective of the purposes of BYOD as technology has enabled this type of learning for the teachers and the students. However, Melhuish's research was not able to determine what pedagogical practices changed in the classroom as a result of this informal professional learning. However, a significant aspect of the findings was that teachers were enthusiastic about this form of learning as it did give them a quick, easy way of accessing information that was relevant to them (Melhuish, 2013). This sort of learning definitely has a place in professional development; however, Timperley et al (2007) suggested that it will not bring about sustainable changes in practice.

DEVICE SELECTION FOR BYOD

Device selection in New Zealand is the decision of individual schools. Schools can either specify a particular type of device or allow students to bring any device that may meet a set of specifications. Enabling e-Learning (MOE, 2015a) specified that the school was the best determiner of the most appropriate approach, platform and device for the particular school. There was a list of recommendations for schools to consider when creating recommendations and/or specifying a device type. Core Education (Hall, 2015) also provided support for schools in selecting laptops or tablets through their website, as did MOE (2015a) by providing schools with stories from schools who have been through the BYOD journey. There is little research provided in New Zealand on the type of device recommended for students and if all students having the same device or not is best practice. Baker (2010) researched BYOD in New Zealand secondary schools and discussed device equity and accessibility but did not explore the effects of students having either all the same device or all different devices. Baker did describe the tension between a device-centred focus and the need for real discussions about BYOD, which should instead focus on delivering education digitally in the

most effective manner (Sweeny, 2012). Sweeny also described the current BYOD settings in New Zealand as:

- schools that dictate the device a student should bring and the school then manages that device;
- schools that allow students to bring in any device and connect to the school network;
- some schools that allow students to opt in to a BYOD programme; and
- some schools that make it compulsory for students to BYOD from tablets and laptops to smart phones.

Hall (2015) provided a comprehensive list of the differences between laptops and tablets compared to learning activities and stated that student device choices were influenced in part by the learning and assessment tasks of the school. This list allowed New Zealand schools to examine their choices and make decisions appropriate for their individual communities.

BYOD AND FUTURE FOCUSED EDUCATION

The MOE very clearly states the importance of using digital technologies and innovative practices due to changes in the environment we operate in: “developments in technology that will need to be harnessed to enable a future focused education system ... increasing demand for new and different skills in the New Zealand and global workforce” (2014, p. 12). Future-focused learning in connected communities (21st Century Learning Reference Group, 2014) made links between digital tools and innovative environments, and the need for equitable access to devices and also the need for future-focused teaching styles. This report is another area of research which showed pedagogy and devices, and digital media tools, link together.

The 21st Century Learning Reference Group (2014) states that:

Digital technologies change the way students learn, the way teachers teach, and where and when learning takes place. Increasingly, mobile devices equip students to take charge of their own learning in a context where learning occurs anywhere, anytime, and with access to a wealth of content and interactive tools. Digital technologies can excite and engage educators, students, their whānau and communities in learning. (p. 4)

In agreement with this, Hattie outlined in his Eight Mindframes, “student learning is about what I do or don’t do. I am a change agent” (Hattie, 2013). Once again the research is telling us that the teacher is an integral part in ensuring student use of digital technologies results in improved student outcomes.

This chapter examined national and international literature and research on BYOD, including input from the MOE and the NZC. It introduced literature on SAMR and TPACK and included teaching methods employed when using 1-1 devices and the effect this has on teacher pedagogy. Professional learning for teachers has been included as a crucial aspect of introducing BYOD/1-1 devices to classrooms, as well as methods for managing the changes schools experience when introducing BYOD. The selection of device type forms part of the preparation for BYOD. BYOD was

discussed as an essential factor in future focused education. The next chapter will outline the methodology used in the research and will specifically examine literature and research on SAMR and TPACK as theoretical frameworks for this study.

CHAPTER THREE – METHODOLOGY

This chapter will outline the case study methods followed in the research and identify the key question and sub-questions. The selection of case study, methods and instruments, data management, reliability and validity, ethical issues and management will be described and addressed. TPACK and SAMR, the theoretical frameworks underpinning this study, will be examined in this chapter.

As identified in Chapter One, the key research question is:

How does the introduction of BYOD impact the pedagogy of a teacher in a primary school context in New Zealand?

The sub-questions are:

- What factors impact the teacher's ability to implement (new/existing) pedagogical practices?
- What do teachers do differently when incorporating BYOD into their practice and why?
- What professional learning is required in order to integrate BYOD effectively into the classroom?

METHODOLOGY

The great strength of the case-study method is that it allows the researcher to concentrate on a specific instance or situation and to understand the various interactive processes at work. These processes may remain hidden in a large-scale survey but may be crucial to the success or failure of systems or organisations. (Bell, 2001, pp. 10-11)

Qualitative research methods, and in particular case study methodology, were used within this research. The strength of qualitative research is that it allows a thorough study of a topic or issue within a particular setting in a real-life context. This gives data both authenticity and meaning. Bogdan and Biklen (2007) stated that qualitative research is the study of a particular setting that must be observed in context, capturing perspectives accurately. As qualitative research, case study methodology enables the researcher to study a particular context in-depth using a variety of methods. Bell (2001) described the strengths of using case studies as a way to investigate a particular situation. In an education setting, a case study allows the researcher to study an aspect of a problem in-depth with systematic collection of evidence; relationship between variables is studied and the research is methodically planned (Bell, 2001). Qualitative case study is highly personal research and has personal value which is the case in this instance (Stake, 1995). This research is particularly suited to a case study methodology because it is a how or why question: "the investigator has little control over events and ... the focus is on a contemporary phenomenon within some real-life context" (Yin, 1994, p. 1). The case study would best meet the objectives of this research because it allows the researcher to concentrate on a specific situation and critically examine the processes at work (Bell, 2001).

Knowledge is authentically constructed via the use of many different types of information. Data is important and valid and teachers tend to use a wide variety of information sources, many of which are based on anecdotes other teachers share. Holding professional conversations and making purposeful connections with colleagues are very important ways for teachers to construct pedagogical knowledge (Melhuish, 2013). Vygotsky's socio cultural theory places value in the social interactions and conversations between people in learning and developing new skills (Kearney, Schuck, Burden & Aubusson, 2012). Interaction with peers is a highly valued method of developing new skills and strategies; therefore, conversation and social interactions, including online social interactions, can provide these rich connections for people to collaborate and learn (Kearney et al, 2012). Learning happens in social contexts and it becomes assimilated into what we know. In an educational setting this could take the form of diary writing, peer and mentor collaboration or action research (Shabani, Khatib & Ebadi, 2010). Technology has had an influence on socio-cultural theory and connectivism has emerged as a theory that reflects the technological changes in society (Siemens, 2004). Connectivism is the theory that learning takes place in networks which includes online networking as well as social interactions. New digital tools have changed the way in which people can interact, collaborate and learn from each other (Kropf, 2013).

CONTEXT FOR THE STUDY

Staff at the case study school had been considering BYOD for the previous three years. During this time, the teacher in charge of ICT had investigated other schools' methods of introduction, gathering information and guidance from the Ministry Initiatives on TKI and Netsafe, as well as evaluating infrastructure and what upgrades would be needed. The budget at this school did not extend to being able to purchase enough devices to cater for student needs. It was envisaged that implementing a BYOD programme would enable the school to provide devices but lessen the number needed to buy. During the year prior to this study, a BYOD pilot programme was implemented in one classroom and as a result, the school Wi-Fi network was upgraded in order to manage the increased demand through BYOD. School systems were implemented, such as user agreements, guidelines and a management system for teachers to use to administer student work and devices. A further security upgrade to the school network was completed to manage student devices as well as monitor and regulate what students could access and when. A major restructuring of the wireless system happened as a result of the pilot. This pilot was valuable in identifying the amount of preparation needed before expanding BYOD throughout the school. Device specification became a top priority, as it was discovered that by restricting the device to a certain type, very few students were able to bring devices. After consulting with the community the school found that parents/caregivers were willing to send a device from home but many were not able to or willing to buy a new device. This meant that the pilot was opened up to any device that met the following list of specifications:

- wireless internet connectivity;
- screen larger than 7.9"- larger screen allows for multiple tabs, split screen work and larger text;
- long battery life 4 hours plus as charging will not be allowed at school, so the device needs to last the day;

- portable - think of the weight and physical size of the device in relation to the child's size; and
- built-in camera and microphone are helpful.

However, at the end of the pilot the teacher (who administered the pilot programme) recommended that the best use of BYOD would be for all students to have the same device. The reasons detailed were:

- the ongoing technical issues in dealing with many different types of devices and platforms; and
- some devices were not compatible with apps and/or programmes that were to be used.

This research began at the start of the implementation beyond the pilot class when BYOD was extended to a further eight classrooms. The school attempted to specify a certain type of device (Chromebook or iPad) but again encountered the same problem with only some students able to bring the specified device. The school found that allowing students to bring any device from home that met the set of specifications above meant that more students were able to bring a device. As the year progressed, more students started to bring a Chromebook; this was especially so in the Year 4-6 section of the school.

The case study participants all have considerable teaching experience in New Zealand primary school classrooms and were invited due to their role in the BYOD implementation process at the school involved in the study. The participants will be fully informed of the purpose of the research and its supervision by academic staff at the University of Canterbury. Participants provided voluntary written consent prior to the research being conducted. Permission from the Principal and the Board of Trustees was also obtained. The data gathering will be conducted at convenient times for the teachers, with time beforehand for them to give consent and read the information sheets. Copies of the information and consent forms were provided as Appendices A-D of this document.

Bell (2001) stated that critics of case study approaches firstly draw attention to the difficulty with single researchers selecting and possibly distorting information gathered (due to lack of cross-checking of information) and that, secondly, generalisation is not always possible. Conversely, a case study can allow for reliability when the case study is carried out systematically and critically, and aimed at the improvement of education by extending the boundaries of existing knowledge; then it is a valid form of educational research (Bassey, 1981, as cited in Bell, 2001). A case study allows for an individual researcher to study an aspect of a problem in-depth, with rich data to be gathered within a limited timeframe which therefore should give a descriptive picture of the topic. There are varying opinions on the time effectiveness of a case study (Yin, 1994). Ongoing data analysis, triangulation of data and methods used in conjunction with the researcher's notes all combine together to provide a rich, descriptive case study

DATA GATHERING METHODS

The data gathering methods for this case study included four semi-structured interviews, observations, examination of teaching documentation (i.e. planning) and regular reflections documented by one teacher (see Table 1). The other two teachers participated in four semi-

structured interviews and shared any changes to their planning documentation. Including more than one teacher mitigates the possibility of a teacher withdrawing from the research, and also adds scope and triangulation to the case study. As a full case study, this is in line with literature, as Bell (2001), Neuman (2015) and Scholz and Tietje (2002) believe more than one data gathering instrument needs to be used to ensure triangulation, regardless of the researcher’s time available to complete the case study. The researcher concurs with Mills (2000), in that the strength of research, especially qualitative research, lies in triangulation. This means that researchers should not rely on any one source of data, observation, interview, or instrument; there should be many methods of collecting data, without just relying on one (Mills, 2000).

TABLE 1

Data Gathering Methods

Data Gathering Method	Purpose	Timeline
Semi-structured interviews x 4	Using interviews to gather data allows the researcher to ask open-ended questions, and gather facts as well as opinions and further insight into the case study. “Interviews are an essential source of case study evidence because most case studies are about human affairs” (Yin, 1994, p. 85). Interviews allow for data to be directly related to the case study topic (Yin, 1994). There will be four semi-structured interviews, the first being an introductory interview as well as initial data gathering. The second and third interviews will be part of the follow up to the observations and reflections for one teacher. For the other two teachers, the second and third interviews will address any changes to pedagogy as well as documentation. The last interview will address the previous three interview responses, in particular the first interview, to compare and contrast teacher pedagogy from the beginning to the end of the research.	Interviews with the teachers will be approximately one hour and will be scheduled for the beginning, middle and end of Term Three, and mid Term Four, 2016.
Classroom observations of teacher	To identify how BYOD is being used in the classroom and what teaching practices are involved. Ongoing observations to be timetabled before the second, third and fourth interviews. Observations are one way to corroborate interview data, as another information source	Observe teacher (children will not be included in the observation), during Term Three and up until Mid-term Four, 2016.

	(Yin, 1994). Bell (2001) stated that direct observations may be more reliable than what people say in many instances.	
Written reflections recorded by the teacher (fortnightly)	To identify pedagogical changes (if any) that the research subject engages in in day-to-day classroom teaching and learning that the researcher is not there to observe. This a valid and reliable data source to be used alongside observations and interviews, to cross check findings and will also corroborate the other data sources (Yin, 1994).	The teacher will record reflections using the guide provided at least fortnightly through Term Three and the first half of Term Four, 2016.

Mutch (2005) described some data gathering instruments/methods appropriate to the case study, including formal and casual direct observations, interviews, document analysis and oral history. The interview will be one source of reliable data used in this case, as will observations and surveys. Using qualitative data allows the researcher to investigate the issues in-depth, allowing further understanding of the current situation and therefore generating theories, description or understanding at the end of the case study, which will be meaningful and relevant (Bogdan & Biklen, 2007). Bell (2001) states that it is important that care should be taken not to attempt generalisations based on insufficient data. The interviews with the case study participants, combined with observations, reflections and document analysis, will provide insight into the individual experience within the current situation. The semi-structured interview questions and observation schedule are Appendices E-H. Observations and interviews will be transcribed and given to participants to verify and sign. All forms of data will then be collated and examined in order to identify themes and patterns (Neuman, 2015; Patton, 2001; Yin, 1994).

Bogdan and Biklen (2007) outlined some limitations of qualitative research including the possibility of the researcher amassing too much data, the possibility of the study being too time-consuming, and reliability and procedures not being standardised. There is also the possibility that the researcher will be biased, especially when researching in their own setting; bias then influences the evidence used and conclusions drawn. Therefore, the researcher must have specific skills to conduct a case study effectively. Patton (2001) specifically stated that the credibility of the researcher is necessary to ensure a credible study. This means that the researcher must have “training, experience, track record, status, and presentation of self” (p. 255). Rigorous methods of field work are another aspect of credibility. Regular supervision meetings helped to mitigate these limitations.

DATA ANALYSIS

It is important in case study research to ensure that high quality data is collected and systematically analysed with recognition of patterns in the data (Patton, 2001). Yin (1994) described the importance of analysis in qualitative research, including generating ideas and reading for themes from a variety of data and evidence. Ensuring that the data was analysed in this manner, has reduced the danger of the researcher making generalisations.

The researcher created summary sheets for reflections and they were collected and collated. The interviews will be recorded and transcribed into table format with questions and answers, and the use of different font colours for interviewer and interviewee. The observation schedule will provide data to be analysed. The qualitative researcher uses all the data to explain, to build theories, to examine and identify patterns (Neuman, 2015). Data were sorted into categories and collated using themes and patterns. Neuman stated that qualitative data analysis involves “examining, sorting, categorising, evaluating, comparing, synthesising and contemplating the coded data as well as reviewing the raw and recorded data” (2015, p. 487). Employing coding methods, as a beneficial data analysis method allows the researcher to use and analyse the collated data providing a structured interpretation (Neuman, 2015). Neuman also stated that qualitative research should use more than one method of data analysis. The use of flexible coding allowed the researcher to identify themes during data analysis; some of the emerging themes were teacher confidence, teacher’s personal ICT skills, professional development, teacher technical knowledge and pedagogical knowledge. These themes will be expanded on in Chapter Four.

Postcoding is appropriate to use for the semi-structured interviews during the analysis phase and allows the researcher to closely identify themes and patterns post-interview (Neuman, 2015). Coding was used to identify similarities and differences as they arose (Stake, 1995, Yin, 1994). This ensured that coding was responsive to the data and not based on any preconceived ideas held by the researcher. Initial coding focused on the experiences of the participants and the data (and subsequent patterns) that were presented. Responses will be categorised and broad themes identified first. The researcher was then able to further analyse the responses and compare them to the data in the reflections and observations.

ETHICAL CONSIDERATIONS

Davidson and Tolich (1999) specified a core of five principles that determine ethical conduct during research: do no harm, voluntary participation, informed consent, avoid deceit, confidentiality and anonymity. It is important for the participants in this study to understand that these five principles are being adhered to in the research process, to reduce the influence of power relationships and insider research. This means that the participants were not identified, nor the school and all participants were fully informed and gave consent. It is important to note that while the researcher has endeavoured to ensure anonymity it cannot be guaranteed in a context where individuals may be known. With these steps taken, the participants should be able to be honest and unbiased during the research. For the purposes of this research, it is unnecessary to include specific details about the school or participants and so this further adheres to the ethical principles.

Mutch (2005) also described ethical considerations, including the above five and adding the right to withdraw, permission, coercion, privacy, participant safety, researcher safety, and dissemination. Privacy will be preserved through identification of the participants by pseudonym. The participants will be known only to the researcher and complete confidentiality and anonymity will be respected. The researcher and project supervisor will have access to the data and there will be no access to the data without authorisation. The data will be securely stored. Physical data will be stored in a locked filing cabinet with digital data stored using a password protected laptop and cloud account. The participants will be fully informed and give written consent as voluntary participants in this research. The participants will also be informed of the option to withdraw from the study at any time.

As a permanent member of staff at the school central to this case study, my position within the field could be described as that of an insider, the teacher researcher (Cullen, 2005). However the researcher was on study leave during the school year this research will be undertaken. There were some potential issues related to power imbalance as the researcher had recently been promoted to a leadership position at the school to start the year following the end of the research. This created some ethical dilemmas that needed to be carefully considered when designing and implementing the research. The teachers involved in the research were not in her team and have not and will not be appraised by her. The researcher's position and the confidentiality of the research will be emphasised prior to conducting the research in an effort to keep the answers as transparent and accurate as possible and reduce the possibility of the participant answering in a way to please her.

The established and trusted relationships already existing within the school and with the participants mean that it was imperative that the researcher valued the school and the work that the teachers were doing, and that she acted with integrity and honesty throughout the process. The researcher accessed and used only information that was relevant to the study and she maintained open dialogue with the participants and Principal regarding how information will be used. The data gathered was only used for the purposes of this research. The design and implementation of the research took the above ethical dilemmas into consideration and endeavoured to avoid them.

THEORETICAL POSITIONING

The theoretical frameworks used for this study are TPACK (Technological Pedagogical Content Knowledge) and SAMR. TPACK is a theoretical framework which can help interpret, guide and inform teacher use of devices in the classroom (Mishra & Koehler, 2006). Teachers have been expected to integrate technology into their programmes since computers became part of the classroom but it appears technological pedagogical content knowledge has not kept pace with the changes in technology and its integration. The use of technology by teachers and students is seen as a highly effective tool to use in motivating students and improving student achievement as well as catering for 21st century learning styles and expectations (21st Century Learning Reference Group, 2014; MOE, 2015a). The SAMR model is also a framework that provides support to design "optimal learning experiences using mobile devices in education" (Romrell et al, 2014, p. 1).

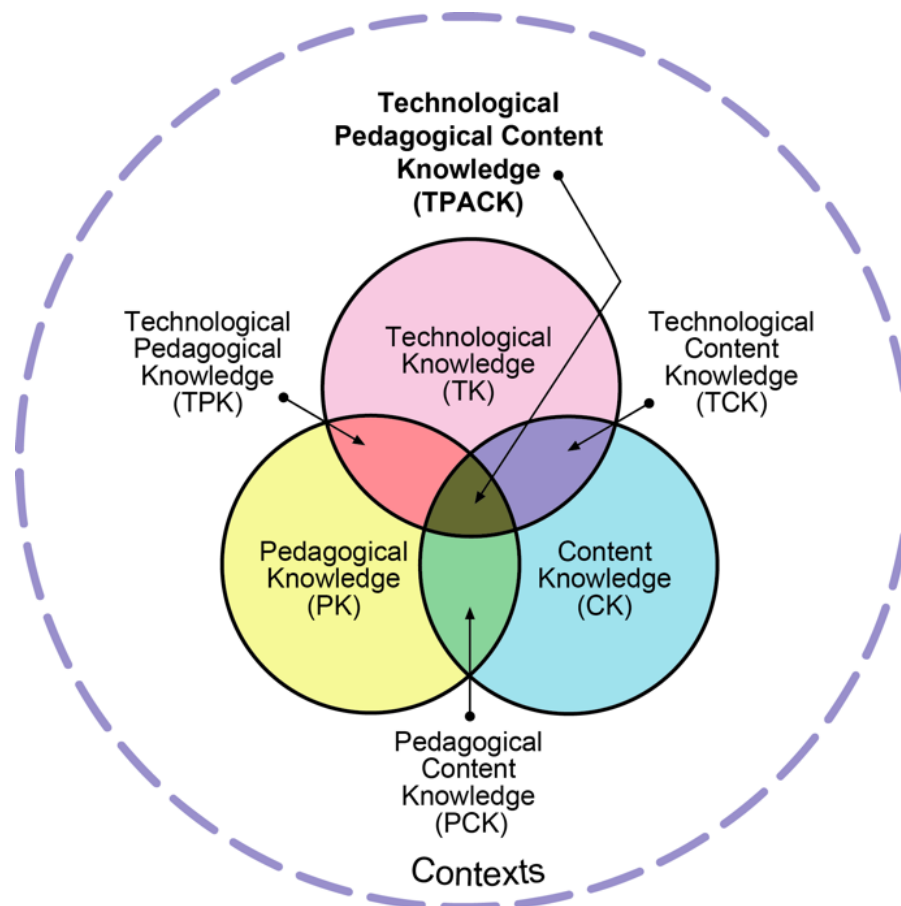


FIGURE 2.

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Gur and Karamete (2015) provided a comprehensive examination of TPACK literature in relation to why and how teachers should follow and use developments in technology in their classrooms. “In teacher education, Pedagogical Content Knowledge has been seen as an important support for teachers’ professional development. In order to acquire and update their skills, teachers must keep pace with increasing educational requirements that necessitates adaptable strategy and a long time commitment” (Gur & Karamete, 2015, p. 778). Adding technology to a teacher’s pedagogical content knowledge should relate to other components of education, not in isolation (Koehler & Mishra, 2009). The use of technological tools to deliver pedagogical content knowledge means that devices can be effectively integrated. When mobile devices are used as tools to modify or redefine how concepts are taught, there is potential for learning to be transformed (Romrell et al, 2014). The technological knowledge part of this framework is in a constant state of change and so requires teachers to be flexible and adaptive with their knowledge. It also makes it a hard component to define (Koehler & Mishra, 2009). Janssen and Lazonder (2015) cited Mishra and Koehler, stating that they “added the concept of technology to PCK to emphasize that technology should not be learned in isolation, but in tandem with pedagogical and content knowledge” (Janssen & Lazonder, 2015, p. 911).

As a researcher with a strong background in ICT and teaching in a primary school setting, I related well to both the TPACK framework and the SAMR model and found them to be invaluable lenses through which to view the research. I understand the importance of teacher professional

development in order for teachers to be confident, capable practitioners. This is particularly true in the area of ICT where technology advances so quickly and there are many changes to keep up with. My experience as a leader of ICT for 16 years included providing and organising professional development for teachers. I have found first-hand that teachers need specific skills, attitudes and knowledge in order to utilise technology effectively in their classes. Those teachers who place a high value on the role of technology in education are more likely to be open to developing new technological knowledge in order to integrate devices into their programmes (Koehler & Mishra, 2009). This then encourages teachers to reach the transformation levels of SAMR. Minshew and Anderson (2015) suggested that “when teachers only see the technology as a tool they must use as opposed to a device that could enhance their instruction, the use of the device is limited” (p.351). Hugh’s (as cited in Minshew & Anderson, 2015) research findings supported the same concept, that when teachers experience “content-specific examples in workshops and professional development, they were more likely to see the value of the instruction and replicate it in their own classroom” (p. 356). When teachers can “develop competencies to facilitate and discourse about design such that contextual concerns can be turned into opportunities to support pedagogical improvement” (Ling Koh et al, 2014, p. 20) then ICT innovations can occur. It is at the modification and redefinition levels of SAMR that these innovations transform learning and the true potential of e-learning is realised (Romrell et al, 2014).

This chapter outlined the case study methods followed in the research and readdressed the key question and sub-questions. The selection of case study, methods and instruments, data management, reliability and validity, ethical issues and management was examined and discussed. The theoretical framework for this research (TPACK) was outlined and explained. The next chapter will presentation the research, address the research questions and the findings.

CHAPTER FOUR- RESEARCH FINDINGS

This chapter presents a synthesis of the research data and findings in relation to the research questions. Key data from interviews, observations, documents, and teacher reflections will be considered and presented. Attention is given to teachers' actions when using and preparing to use BYOD. This chapter will be organised into sections according to recurring themes: technical impact of BYOD; safety and security; time, planning, preparation and professional learning; classroom use of BYOD; and increased whānau engagement. Planning and preparation refers to both the planning and preparation for implementing BYOD in the school as well as teacher planning and preparation for integrating BYOD in the classroom. These findings illustrate what the teachers did differently when they incorporated BYOD into their practice and why, and identified what kinds of professional learning are required in the future in order to integrate BYOD effectively into the classroom. There were a number of factors within each theme that impacted on the teachers' methodology and practice of teaching. The timeline below outlines the school's BYOD journey and where this case study began.

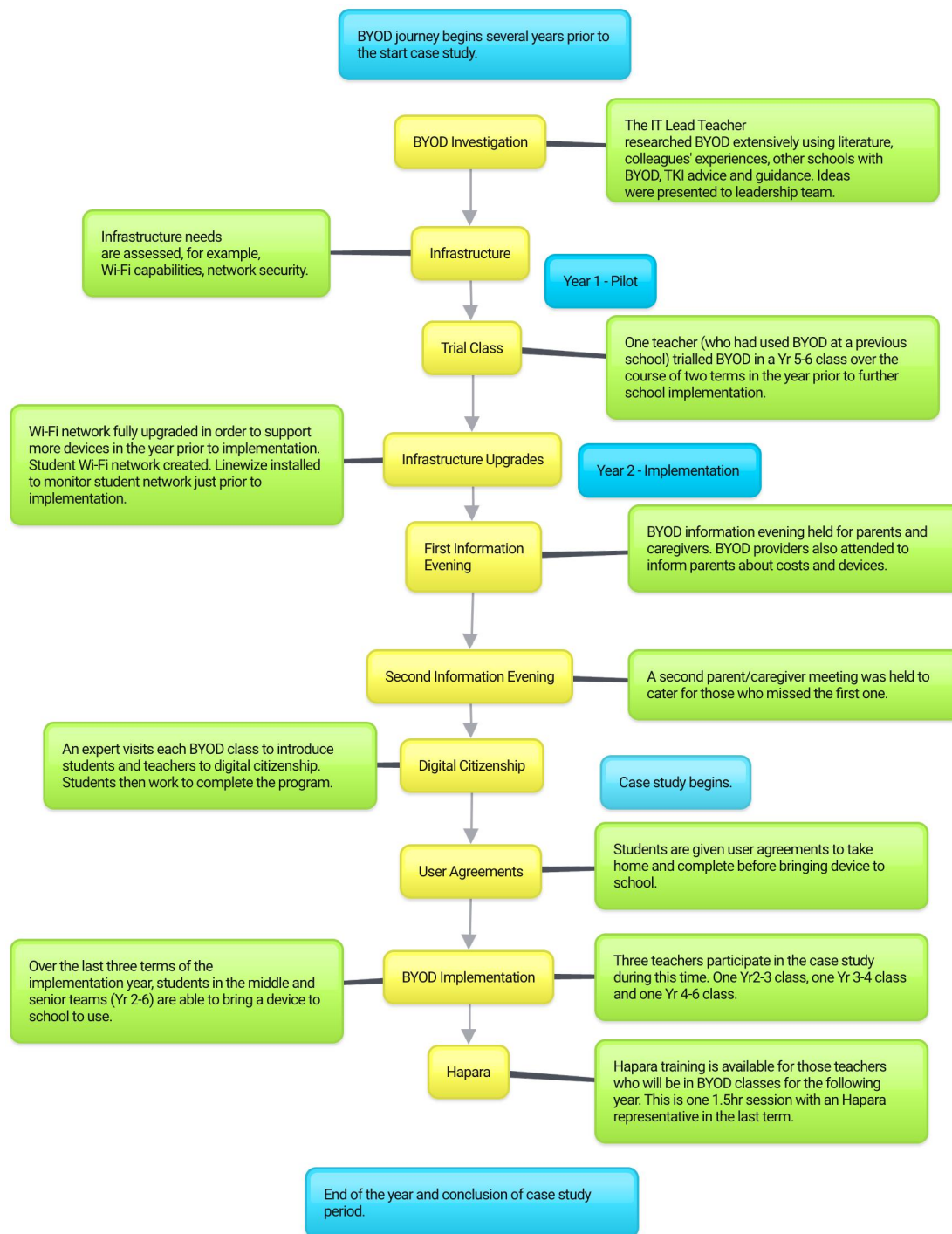


FIGURE 4.

BYOD Timeline, created with Bubbl.us.

All three research participants were experienced, fully certificated, registered teachers with teaching experience in New Zealand primary schools. The study was conducted over the final three terms of one primary school year. Each teacher was interviewed four times over the year to determine what effect, if any, introducing BYOD had on their pedagogy (Appendices E-G). They all demonstrate high levels of pedagogical knowledge and ability to teach across the learning areas of the New Zealand curriculum. Prior to the introduction of BYOD, the teachers had occasionally used school-owned devices in their classroom as part of students' inquiries, and this strategy continued with BYOD. The

amount and quality of ICT professional learning these teachers had received prior to this study differed considerably. For example, one teacher had completed a post-graduate paper, whilst the other two teachers had limited school-based professional learning. The school had taken a number of steps to prepare the students, staff and infrastructure for BYOD. The ICT leader at the school had undertaken preparatory investigations in order to inform the school pilot as to how other NZ primary schools prepared for BYOD. Netsafe and MOE resources on TKI were used to organise user agreements and write guidelines for the school. The wireless network had been significantly upgraded and methods of monitoring of students' devices had been investigated. Linewize (see definition of terms) was set up to manage safety aspects of student use and a separate, BYOD Wi-Fi was made available to the school. This is a network solely for BYOD use, with its own password. This allows Linewize to monitor only the devices logged onto this network. The network is also available only for certain times during the school day. The infrastructure upgrades and research occurred over the two years prior to introducing BYOD. A pilot was held with one class of Year 5 and 6 students during the year prior to further school implementation. During this initial pilot it was discovered that the wireless system needed to be upgraded. BYOD was then introduced to all students in the middle and senior teams (eight classrooms). This involved a parent evening to inform parents about the BYOD programme, safety and security, user agreements and guidelines, benefits of BYOD and why the school was putting BYOD in place. Information gained during the pilot was also presented, for example, the need to upgrade the wireless. Sales people attended to tell parents about the type of devices available and the costs involved. During the initial pilot with one class, families could send any device to school that met the school guidelines on device type resulting in a range of tablets, iPads and laptops. The teacher involved in the pilot class recommended that device type be specified, as there were technical issues with having such a range of devices in the classroom. The IT teacher also recommended one type of device be used after having researched what worked in other primary schools. Chromebooks were found to best meet the needs of children in the senior area of the school with iPads in the middle area. However, after the first parent information evening, it was discovered that few children could bring a certain type of device and that the majority of parents/caregivers were unwilling to buy a new device just for school use, especially if they already had a laptop or tablet at home. A number of parents also expressed the fact that they missed the evening and didn't know anything about BYOD. The school decided to organise a second parent information evening to cater for those who missed the first one, as well as open up the range of devices that students could bring.

Alongside the parent information evenings and user agreements, the staff organised a digital citizenship programme in the classrooms. Staff in the middle and senior teams were given access to a digital passport programme for students to complete online. The IT leader discovered that teachers were reluctant to implement this and/or too busy to start it. It was decided that an outside expert would come in and take a digital citizenship lesson with each class and introduce digital passports to the students. This meant that BYOD could get started sooner, rather than wait for teachers to implement the programme. The case study began as digital citizenship was being introduced (see timeline Figure 4).

Three teachers were invited to participate in this study. The first teacher (Kelly, Year 2-3 class) was initially asked as she was going to lead the next pilot class; however, the school then opened up BYOD for both the middle and senior teams. Therefore a second teacher who was working in a collaborative manner with Kelly in the middle team (Year 2, 3, 4) was invited to join the study. There

were four classes in the middle team with two teachers participating in the research. The senior team was also going to introduce BYOD and so a third teacher was invited, not only to provide more scope to the study but also to mitigate the chances of one of the teachers pulling out of the research. The third teacher provided a research opportunity within the senior team (Year 4, 5, 6 class) using BYOD.

Prior to introducing BYOD, the teachers had no formal professional learning opportunities specific to BYOD or 1-1 device use in classrooms. During BYOD, all three teachers attempted their own form of professional learning by accessing online forums and talking to colleagues. They saw this as a way to try to understand how BYOD could be used in the classroom and the programs and applications that would be beneficial. They expressed a desire to visit successful BYOD classrooms; however, this did not happen during the research period due to time and resource constraints. The one professional learning opportunity on Hapara (one 1.5 hour externally led training session) was highly successful for the two teachers who had access to it. The need for professional learning featured in each teacher's interview and the reflection documents

The first teacher, Kelly, had limited, school-provided professional learning opportunities with integrating and using ICT in the classroom although she had been teaching for 16 years in a variety of primary schools in New Zealand. Prior to BYOD, Kelly had occasionally utilised school-owned devices in the classroom for research purposes and to supplement literacy and numeracy programmes. She found that the only time she used devices was after talking to a colleague who shared an idea to use devices in the classroom. She was then dependent on being able to access the limited school supply of devices to be able to implement the idea. Kelly expressed excitement during the first interview and was looking forward to introducing and using BYOD “for my own professional development and I can definitely see the spark in the children when they pull out a device, so that’s exciting.” As Kelly prepared for BYOD, she expressed the main goal for the year: to “integrate it as much as possible” (Interview One). Kelly completed regular, written reflections on how BYOD was being utilised and was also observed by the researcher on numerous occasions (Appendices H and I). She participated in each of the four interviews.

The second participant, Jo, had completed formal postgraduate ICT professional learning (receiving a Postgraduate Certificate in Applied Practice) and demonstrated a high level of technological knowledge. Jo has had four years teaching experience in New Zealand primary schools. Over the past four years, Jo utilised school-owned devices in the classroom and innovatively used Instagram and Class Dojo to complement student device use. During Interview One, Jo was initially nervous about what was expected of her and expressed a desire for some professional learning prior to BYOD implementation in order to feel prepared. Jo’s response to the question about what she would have liked to have done differently prior to BYOD implementation was: “I would like to maybe do a little bit more PD (professional development) on what I can do as a teacher to make sure it all runs smoothly in the classroom ... just more on me and my practice. I would like to upskill a little bit better and make the most of that with the kids” (Jo, Interview One). Jo participated in all four interviews.

The third participant, Nic, had previously been involved in an MOE ICT PD cluster for three years, yet she described herself as having “fairly limited” technological knowledge. Nic had attended some school-provided professional learning on iPad use in the classroom as well as a one day course about

using ITL rubrics to help guide ICT use in the classroom. Nic has been teaching in New Zealand primary schools for 14 years. She had previously used school-owned devices in the classroom for research linked to inquiry/reading and as part of activities in numeracy rotation. Nic's initial goal for using BYOD was, "to adapt the planning even further and have more meaningful use of the tool" (Nic, Interview One). Nic participated in all four interviews; however, Interviews Two and Three were conducted at the same time due to serious time constraints and teacher and leadership team workload.

The data will be presented by addressing the technical impact of BYOD first. The technical issues faced by the teachers impacted on the way they were able to prepare to introduce BYOD and also how BYOD could function in their classrooms. These technical aspects were often outside of the teachers' control and meant that BYOD could not run as smoothly as they would have liked. While the technical issues are not the most important finding in this research, it will be addressed first as the teachers needed the technology to function properly in order to be able to teach using BYOD.

THE TECHNICAL IMPACT OF BYOD

During the initial stages of introducing BYOD within their classrooms and programmes, all three teachers identified challenges related to technical issues. These issues specifically included connecting to the BYOD wireless network, and passwords not working; however, the most problematic challenge was the variety of devices and teachers having limited technical understanding to help children use them. In particular, children had difficulties connecting to the school's Wi-Fi, finding applications and accessing programs. This was a significant issue for two of the teachers who taught the youngest children. Technical help (via the school's contracted technician) was only available on a fortnightly basis. The lack of technical support meant that some devices took longer to use effectively in the classroom than others. This was the case in Jo's room. She spoke about trying to solve problems as they happened, rather than wait for a technician, "it's time really and if they aren't working like I had planned them to work because the device is now not connected to the internet and I don't know (my) way around the settings, it does hinder the learning that's meant to be taking place and I need to be teaching" (Interview Two). Nic's classroom (the older children) did not experience the same issues with technical problems and this classroom also had the least variety of devices, i.e. most children brought Chromebooks. This class mostly used Google Drive (a cross-platform program). The students, therefore, were not trying to utilise different applications across platforms, unlike Kelly's classes and Jo's classes.

There hasn't been a major problem having children with different devices. I think it's better if it's all the same but so far we haven't had an issue with that one who has got an iPad ... the majority of devices are Chromebooks but we do have one iPad and it hasn't stopped or limited anything and it's actually better to have something rather than nothing. (Nic, Interview Four)

These challenges, however, were superseded by the varying degrees in uptake by children and their whānau. Most children never regularly brought their device into school during this study. Nic specified that "out of a class of 61 we have got maybe 15, so that's challenging" (Interview One). Kelly spoke about the need to have easy access to school-owned devices to supplement the number of BYOD: "It's really helpful having the iPads next door ... because it means we have a better ratio in the room" (Interview Four). Kelly also wrote about her frustration regarding the lack of devices being

brought to school on a regular basis: “I am concerned that only two-four children have devices and what that looks like going forward. Buy-in is essential, I am learning” (Reflection Two).

The slow rate at which students brought devices to school proved challenging. This ranged from days, to weeks and, in some cases, months. The variety of these devices required teachers to have some working knowledge of a range of different platforms, programs and applications. This created extra pressure on the teachers. Jo explained this pressure,

I think that’s where some of my technical problems have come from, because I’m only familiar with Chromebooks and iPads ... tablets unfortunately come in so many different products and different brands and they’ve all got different ways of managing their settings and accessing the internet ... it does cause a few problems and I guess that’s where most of my stress and difficulties have come from. (Interview Two)

Jo also spoke about both the lack of devices and the variety being a challenge:

The different types of devices continues to be a challenge, it has been a whole lot easier with students that have Chromebooks and as I familiarise myself with that it has become easier. But the use of tablets and things like that, it has been frustrating because I want the students to do certain things and the device can sort of restrain what we do, another challenge ... we don’t have 100% buy-in with children with devices so I am putting time and effort into setting up different activities for students with devices and also planning for those without, which is a challenge. (Jo, Interview Three)

The issue with students using a range of device types was finding applications or add-ons that operate the same way on different devices, to enable all children to successfully participate in the learning tasks. Kelly stated, “I would like to know ... more about actual devices because kids are bringing a variety of devices, which is fine, but me having a working knowledge of some of those is interesting?” (Interview One). Kelly found an add-on for Chromebooks to enable them to scan QR codes, alongside the children using tablets and iPads, however this proved to be an ongoing challenge and not particularly successful (Interview Three).

The technical aspect of BYOD also affected teacher time. Time was required to check devices before school to ensure all applications and programs were installed and would run correctly. This was problematic because the BYOD Wi-Fi was only made available from 9 am to 3 pm. This meant that teachers could not help students with their devices before or after school. Jo, in particular, was very frustrated with this because she taught younger children who experienced more difficulties with using their devices. She expressed annoyance that being forced to wait until 9 am to resolve issues was taking up valuable teaching and learning time. She stated,

Students continue to bring devices, some two weeks later, then another three weeks later, having to set them up with logins and passwords and showing them how to do things has been very time consuming and our BYOD Wi-Fi is only accessed 9-3 so it doesn’t allow me time to sit down with them and their device and talk them through things before or after school. I don’t want to have to do that during teaching time and before school is the best time to get them set up in these things. I thought that’s where a lot of my frustrations lie

with BYOD at the moment was exactly that, that I am constantly repeating myself with how to set things up with students. (Jo, Interview Four)

It was very difficult for the teachers to manage technical issues as they arose in class time. Waiting for the fortnightly technician was problematic. Trying to solve technical problems themselves added demands on to their time, as not all problems were pre-empted, and this was therefore having to happen during class. Technical problems were mostly managed by teachers. Jo stated, "I am managing most of that myself, and again it's just sort of knowing the tools really well and once I get my head around some of the common issues or problems then I know how to fix them" (Jo, Interview Two).

Jo reported that technical glitches occurred as more children brought devices. Children brought in different devices at different stages, so the teacher was often having to hold multiple skills lessons for individuals. This resulted in frustration; valuable teaching and learning time was lost. Jo spoke directly about this: "That's where most of my stress and difficulties have come from, is actually managing the different devices and suddenly I don't really know how to use this device so I actually have to sort of problem solve that myself, and when you're pushed for time or want to get a tool up and running it does add another issue to the mix" (Interview Two). She also referred to lost teaching time, "I need to be teaching but I've got to quickly sort out this device so that this person can access this tool and get their work done" (Interview Two). The researcher observed Kelly attempting to solve technical issues during classroom reading time. The teacher was taking guided reading groups and the students interrupted the teacher with devices if they needed help to input passwords or reconnect to the Wi-Fi (Observation One).

SAFETY AND SECURITY

Safety and security were also key considerations when planning for and in the implementation of BYOD. As the school prepared for BYOD, both during the pilot and in the first year, steps were taken to create a secure network solely for students and Linewise (which gave staff the ability to monitor student use) was purchased. After the pilot, and as BYOD was introduced to more classes, a digital citizenship programme was also implemented across the Year 2 - 6 classes in the school. Each child had to complete an application pack that contained several user agreements which were signed by the child, their parent/caregiver and the classroom teacher. Nic spoke about the need for digital citizenship lessons: "There's been a lot that I haven't even thought about that they needed to learn which has been very interesting, just referring back to being safe with their devices because we had a bit of a problem with initially" (Interview Two and Three). The teachers also reported that they had not personally considered security for devices until they were asked to organise lockable storage for them. Locking classrooms during all breaks was also required to ensure devices were not accessed by students or visitors to the school. Kelly referred to safety and security during the preparation for BYOD,

We did some of the digital passport work getting ready for that ... there was lots of stuff around security that I didn't think about and all that kind of side of it, so that's taken quite a while, like even just getting filing cabinets. (Interview One)

Jo was happy with the digital citizenship programme and the way students took ownership and responsibility for completing their passports: "I'm quite happy with how the kids have gone about

their digital citizenship so far and that they're taking the ownership on that" (Interview One). During Interview One, Nic spoke about the need to understand the BYOD safety and security monitoring system prior to implementation (Linewize) and she would have liked better professional learning on how to use Hapara (see definition of terms) before students started bringing devices.

CLASSROOM PLANNING, PREPARATION AND PROFESSIONAL LEARNING

One challenge identified by all three teachers was the additional time that was required to plan and prepare lessons. Jo had to spend an additional 30 to 45 minutes on top of her weekly planning for numeracy to add learning tasks that required device use (Interview Two). The teacher had to take into account those with devices and those without in the same group and work out how to cater for those needs, in addition to the usual planning and preparation. Teacher time was also required to learn about the different devices being brought to school, how to use them and exploring which programs and applications could be used in the classroom. All three teachers reported spending time using social media and Google to upskill themselves, for example, searching Facebook pages in which teachers share their ideas and resources for using technology in the classroom, as well as visiting forums to ask and answer questions. Kelly reported using Facebook, Seesaw (see definition of terms) forums and talking to colleagues (Interview One). Jo used Pinterest, the Blendspace website (see definition of terms for Pinterest and Blendspace definitions), Google and talked to colleagues (Interview One and Two). Jo also accessed information on TKI, including videos, on a number of occasions (Interview Three and Four) but struggled to access the information she needed:

TKI have information about using BYOD in the classroom and your planning so I have kept that in the back of my mind but what I'm finding when I'm searching things is lots of information I already know, about keeping your children safe, management of safety, cybersafety and how to set up BYOD. But all that has already taken place. I want to sort of find out how teachers have implemented devices successfully and how they've done that. I haven't been able to find a lot of information on that. (Interview Three)

Jo said she was searching for information to "find ways I can implement new tools and strategies to use in the classroom to support those with devices and those without" (Interview Three). Nic built on her prior knowledge of Google Drive by experimenting with it herself and talking with colleagues (Interviews One, Two and Three).

The quality of the teachers' technological knowledge appeared to be an area for development, as was transferring this knowledge into technological, pedagogical knowledge. Nic referred to this aspect of professional learning:

We've had PD over the years about how to use apps and things so that's useful, but linking that back in now, like it's making that connection to stuff that we have learned over the years (and) now how can I use it in the classroom. (Interview One)

The teachers all identified a desire to visit experienced teachers using BYOD in the classroom to observe how devices were utilised. They felt that this type of preparation would be extremely useful for their own practice. During Interview Two, Kelly said, "I need to go and look in other classrooms where it's being used more often and see what teachers are doing with that." Nic also spoke about this need during Interviews Two and Three: "Visiting some schools that are well established ... so I can see what they're doing and how they manage ... see it in action and actually ask people on the

spot, how does it work, how do you do this.” During Interview Two, Jo spoke about the desire to upskill herself by talking to other teachers,

(I have looked at) the Blendspace website, I did use Pinterest ... to look for some other ways to see how people are using devices in the classroom but I didn't have a lot of success with that. So I need to go back and find some other ways or talk to some other teachers about what they're using.

Then again in Interview Four, Jo spoke about what support she would have liked to have had available when implementing BYOD:

I think I would have found it really beneficial to do some observations of BYOD in use successfully and talking to other teachers about how they have managed a small number of students on devices ... I can see what I would do if I had a whole class, but that's not the case so that's where I would have benefitted from seeing how other teachers do that.

Nic expressed this need again in Interview Four when discussing the main problems or challenges:

I think that's one thing I haven't done which I still need to do, is go and visit other schools ... looking and thinking about BYOD or one to one devices, seeing some of that in action, seeing children in other places doing it, living it, breathing it, would be a big help.

As teachers began to utilise BYOD, they accessed different applications and programs to incorporate devices into their classrooms. This included web-based programs and iPad applications. During the planning process, allowances were made to cater for both students with and those without devices. Jo mentioned this in Interview Three when discussing challenges, “We don't have 100% buy-in with children with devices so I am putting time and effort into setting up different activities for students with devices and also planning for those without, which is a challenge at times.” Jo selected a program that she had previously used and was very familiar with (Kahoot, see definition of terms) as a form of assessment in numeracy, while Kelly decided what she would teach research skills for Olympic inquiry before selecting a tool for students to use (Google). Jo reported feeling successful about developing an understanding that learning can happen anywhere and any time when students use their own devices (Interview Four). Giving the students time to learn about their devices and navigate their way around them was very important. Jo spent time on this when students first brought their devices to school and talked about it in Interview One when discussing how BYOD was first used in her classroom: “the students are learning their way around how to navigate different devices and how to search for information.” For example, as a substitute for books, Jo added the option of BYOD to the students' Olympic inquiries, for research purposes. This allowed students with devices to use Google to find answers to their research questions. Kelly developed a library task and students could choose to use their device as a substitute for books, library books, or both. This was documented in the planning process. The task involved researching aspects of the Olympics that the students had created questions about. She also added the use of QR codes for students to easily access websites she had found for them. This was successful for these younger students with iPads as they didn't have to type in long website addresses; they could just scan the code. Kelly also used Google Docs for writing tasks and added this option for BYOD students to weekly planning documentation. Nic began using BYOD during inquiry time using Google and Google Docs. This was also part of an Olympics Inquiry. Like Kelly, she also provided students with QR codes so there was

easy access to websites for the students with iPads to use. In summary, all three teachers used blended-learning strategies in selected curriculum areas which enabled the use of different programs and links to websites or YouTube. They all had to consciously make changes to their planned delivery and documentation to incorporate BYOD. Substituting books/pen and paper for devices was a common method of integrating the devices.

Kelly and Jo expressed a need for more school devices to be available for those children who did not bring devices. Kelly mentioned this in Interview Two: "I need more access to more devices from the school but demand is high." Jo talked about this in Interview Four:

I try to use the school devices, iPads, but sometimes I find that they are a nuisance to use because of the way they are set up and what we need and the tools aren't always best used on an iPad and they are not always available and there aren't many of them. (We need) more availability and upgraded (devices), and I think it would be better for teachers if they had access to Chromebooks instead of iPads as it's easier to use the likes of Google classroom.

Jo also reported feeling concerned about the social impact on those children who could not, for a number of reasons, bring a device to school. This then impacted on her planning; she tried to plan so the impact on these children would be minimal, while at the same time, planning for effective device use in the classroom for the children who were bringing devices.

I'm trying to find ways I can implement new tools and strategies to use in the classroom to support those with devices and those without don't miss out. I want to keep the flow and keep things moving on but I don't want those without devices to feel like they're missing out and I want those with devices at school to feel like it's worth their time. (Jo, Interview Three)

Nic also spoke of the need to plan for both device use and those students without devices: "thinking in two headspaces to design the task... I do think if everyone had one it would be so different. It would actually be quite exciting. It's frustrating" (Interview Two and Three).

In one respect, the use of devices changed the way Jo and Nic could utilise their time. Jo said the benefits of children's work being completed online meant she could write their reports at home, easily accessing their work in order to make accurate and up to date assessment comments. Jo could access students' numeracy work online and compare results with other assessment data in order to make her judgement comments (Interview Four). Nic also found accessing student work online was made easier when students had used their own devices. She said the benefits of using Google Docs for writing meant that, unlike previous years when devices were not used, she did not have to take home 30 writing books (Interview Two and Three). Nic considered that this was one way of saving her time and making her workload easier to manage. Jo also considered that this was one way of saving time and reducing workload.

One Hapara professional learning session was held in Term Four by the school for two of the teachers. Both Kelly and Nic strongly felt that this was very worthwhile and wanted more sessions of this kind. This introduction to using the system was very successful and impacted on how they used BYOD after this session. Using Hapara allowed them to organise their work into folders and set tasks for the students easily and quickly. Nic stated,

Since we've had some PD with Hapara and they've come in and shown us what we can actually do with dashboard ... I've learned that you can have some sheets they can just record on and some that are set up as sheets that they can't do anything with, that's just information, and how to share videos and things with them, it's been fantastic. It's really exciting. (Interview Four)

Both teachers were excited about the possibilities of exploring Hapara further and using it next year to enhance the use of BYOD in their classes. "Last week we had the opportunity to have an hour and half Hapara training and that was amazing because it opened my eyes to the possibilities of how you could plan and do something a bit different," (Kelly, Interview Four). Kelly then used what she had learned in the classroom with the students:

And the engagement level was amazing and I could really see how Hapara could help speed up an inquiry, it ... made me think about where you could use it and what we could do next year and how it could look with the kids. (Interview Four)

During Interview Four, Nic talked about the challenge of time and professional learning in the context of practical professional learning: "so time is still a big factor. It was great to have an hour and a half but you can do that in an hour and a half, you must be able to do so much more with some more time."

CLASSROOM BYOD USE

Throughout the four interviews, each teacher spoke about the different ways they were incorporating BYOD into their classrooms. They were able to talk about strategies they used, as well as applications and programs they used. Each teacher used BYOD in different curriculum areas and tended to initially use BYOD in areas they had strong content and pedagogical knowledge. After discussing how the teachers had previously used devices in the classroom, it was clear that they were then using BYOD in a similar manner. Two strategies were discussed during the interviews: flipped classroom and blended learning. Methods of integrating technology into the classroom were also discussed as the teachers substituted tools for technology (Puentedura, 2006).

Kelly and Jo tried a flipped classroom strategy. They sent an email (to the children and their parent/caregiver) that contained links to YouTube clips. The intention was that students could watch the clips and therefore be prepared for the learning the following week. A very small number of students watched the clips so this strategy was not as successful as they had hoped. During Interview Two Kelly spoke about flipped learning and the amount of children who accessed the links as:

Probably about between six and eight children had done it but I guess if you keep doing it, I wonder if more would take part in it ... I have to remember to keep having a go even if the first two or three times you don't get a lot of buy in. (Jo, Interview Two)

Jo also tried flipped learning for those students who could not bring a device to school when she created a Blendspace that was set up to share learning for students and whānau about an upcoming trip to the marae.

Furthermore, teacher strengths influenced where and how devices were first introduced. Jo consistently incorporated device use for mathematics and inquiries. Blendspace and Google, respectively, were used. Jo had some prior knowledge of ways to use Blendspace in the classroom. Blendspace became part of the numeracy group rotation as a way to set and manage tasks for those who had devices. Jo said she used Blendspace as a formative assessment tool and also a substitution method, that “instead of using written tools they are now using their device to answer their maths questions” (Interview Two). Google was used as a way to research questions during inquiry sessions on the Olympics. Device use in inquiry was a direct substitute for books, as those without devices could use the library or a school device. After establishing the use of devices for mathematics and inquiry, Jo began using Google Docs for writing and included this option in her weekly plan. The docs became a substitute for students’ writing books. The Blendspace website and Pinterest were used by Jo to supplement her own knowledge and search for more ideas about device use in the classroom. Nic incorporated BYOD into the writing programme using Google Docs and ensured this was included in writing planning. She also expressed a desire to use devices during reading sessions and identified this as a “next step”. Kelly and Nic reported that they felt most confident about their literacy programmes and that this was the reason why they incorporated device use with these programmes first.

As well, Kelly completed regular reflections detailing changes to practice, challenges and success and any particular strategies used in the classroom with BYOD. Literacy featured as the curriculum area that Kelly first concentrated on. The researcher also observed Kelly’s classroom. The reflections confirmed the interview discussions and revealed the teacher’s excitement when using BYOD successfully. Kelly wrote:

I have to write this in before I lose the excitement of it! Several students did their writing today (recount of weekend) on their devices on docs. I showed them how to set up and what it looked like when I was on the doc too. They were so excited. Even when I was working with groups I could comment and the power of saying to them on the spot, where are you going to put a full stop or what else did you play on? The prompt was immediate and I was still working with a group!!! No turning back on this! I promoted it to the rest of class to show them the possibilities and said if they have a device, please bring! (Kelly, Reflection Five)

However, Kelly did not report that this increased the amount of students bringing devices.

Using Google Docs for writing and the success with this featured in Reflection Five and also Reflection One and Four. Reflection One detailed success in writing for a reluctant writer who was able to record four ideas on the iPad which was more than the student usually wrote. Reflection Four detailed the use of a template for their swimming lesson diaries in Google Drive that the students could access and write into: “(I) have had success with using docs for kids (as I) have been able to share the swimming quick writes doc for (the students), (one student) showed that he was much more engaged being able to write this way.” The challenge of balancing teaching of skills alongside curriculum content was also detailed in the reflections: “I need to also bear in mind the teaching of how to use apps, etc. Does it mean looking at how the day looks and running devices throughout the day and not only having ‘reading’ time to get it done?” For example, using Book Creator (see definition of terms) during writing time meant that the teacher spent more time

teaching the children how to use the application than how to write the content. Kelly's reflections made suggestions for how this might be pre-empted or rectified in the future, with time set aside for skills teaching prior to using new programs. Kelly also expressed surprise that the students had not had the opportunity to use Book Creator before this year. The issue of time features in her reflections: time for the teacher to learn how to use applications before using them in the classroom, as well as time to teach skills during class time.

I need to get more skilled in being able to access all the devices passwords etc. to put on the apps needed and not presume they are on there. Will need to put time aside in planning to make sure this side of it is done and not let this put me off! (Reflection Two)

Kelly reported the high value of the one professional learning session on Hapara in Term Four and how motivating this was to then use Hapara more effectively in the classroom. The reflections are concluded with the statement, "time is the richest resource" (Reflection Six).

The researcher observed Kelly incorporating the use of devices into the reading and writing programmes and allowances were made in the classroom for those with devices and those without. During one observation, the teacher made use of parent help to teach children with devices how to upload their videos to Seesaw. The parent worked with those with devices while the teacher worked with the rest of the class. The observations showed the challenges the teacher was managing as well as the successes detailed during interviews.

Planning for BYOD use in the classroom also proved challenging for all teachers. They all attempted to adapt their planning to make the use of the devices more effective, but they all reported that their lack of technical knowledge impacted significantly. Nic expressed the need for help in planning and developing knowledge:

Probably there's so much you can do with them and not really knowing where to start, what to do first, where to go and how to get my head around it and some things I've seen that I want to try, it was so long ago that I don't know where to go and find them and figure out how to do it. I have an idea in my head but I just don't know where to start. (Interview Two and Three)

Nic also reported that she wanted more knowledge of the digital citizenship programme, prior to its introduction, "We've had someone come in and help us, but actually, if I had been more aware of it and I had looked into it and made sure the kids were ready to go, that would have been better" (Interview One).

Kelly felt the students were well prepared for BYOD and the two parent information evenings were helpful; however, she felt that the teachers needed more information on how to integrate devices:

I attended the BYOD parent information evening so that was good for them to hear that side of it ... I'm not sure that we feel like there's been a lot of day-to-day practical, how to make this happen stuff, so that's probably something that we need to work on. (Interview One)

She wanted to build on her own knowledge and skills with BOYD and attempted to do this herself using the NZ Primary Teachers' Facebook page:

I have found it quite helpful and talking to experts ... asking colleagues who are a lot more BYOD savvy than what I am ... I have had a wee look online ... but definitely people I think has been the strongest bit. (Kelly, Interview One)

Jo also talked about needing guidance on ways to smoothly introduce student devices into the classroom programmes: "I would like to maybe do a little bit more PD on what I can do as a teacher to make sure it all runs smoothly in the classroom" (Interview One). Kelly wanted a better understanding of the "big picture", i.e. where the school is ultimately heading with BYOD; what "the vision" is around this; professional learning on 'day to day' use; and practical ideas for everyday device use in the classroom. Nic also expressed the same need, to find "out some everyday practical things I can do, easily and quickly ... so we are really using them, because you don't want to have their devices there and them not using them as much as they possibly could" (Interview Two and Three).

Time was a recurring theme and another significant challenge that the teachers reported: time added to planning, time needed to learn new skills, time to find programs and applications, time to work out how to use programs and applications, time in the classroom to teach children skills they need to complete tasks (e.g. using Google Docs, Book Creator, effective search terms, etc.) and time to teach those students with devices what they need to know to complete tasks. The teachers identified the need to timetable skills teaching into weekly planning, as well as time for the actual tasks. In Reflection Three, Kelly wrote, "I tried to find a way to export the books from the iPads but with no success so that's some more learning that I need to do. Again I need more time to learn things!"

Although the teachers all experienced a range of similar difficulties, they also experienced a number of successes. The following successes were reported from all three teachers. Teachers observed that children without devices were asking for more opportunities to use school-owned technology in the classroom. In general, they observed that children were excited and motivated to use their devices. Nic said, "They're doing them (stories) on Google Docs and sharing them with us, rather than doing it in their books and they're highly motivated. They're excited to do it that way." Children who may not have completed tasks in the past were motivated to finish their work when using their devices. Nic also noticed an increase in student engagement and reported this as a success: "Children's engagement, the ones using devices are so excited and there's desire from the other children to start using devices." One success that Jo reported was that student engagement was increased when working on numeracy tasks: "Student engagement and interest with their maths and their follow up, completion of tasks, being able to check in with the students and see what they're doing." Kelly also reported feeling motivated after introducing Google Docs to writing as she saw the students' interest and engagement increase and recorded this in her reflections (Reflections One, Two, Four and Five).

Moreover, Nic emphasised that the teacher's ability to give children feedback on their writing through Google Docs was very straightforward and rapid. Children were able to respond to feedback instantly by accessing the teacher's comment on the Google document itself. She reported that the "engagement of the children and the feedback; being able to respond so quickly and so easily. Those are my two favourite things." Kelly expressed how worried she had been about the writing process being lost when using devices but she actually discovered that it was quicker and easier for students

to work through the process and publish their work. All teachers reported success using Google Docs for their writing programmes. “I was concerned about losing the writing process when using devices, but now I see how I can give feedback and it’s so quick and children can make changes then and there without having to go back to it later” (Kelly, Interview Three). Teachers observed that children who otherwise struggled with writing found it more enjoyable. Kelly wrote about one student who, trialled using a device some days for writing as he was a reluctant writer.

This really spring boarded more regular writing ... (he) showed that he was much more engaged being able to write this way. The interesting part for me was listening to the discussion between him and someone sitting next to him about spelling words and how to end the sentence. (Reflection One)

INCREASED WHĀNAU ENGAGEMENT

Nic reported that parents responded positively to the use of Google Docs for the writing programmes. Parents were excited to be able to see and comment on their child’s writing. Some parents expressed to her that they were initially hesitant to buy a device but could really see the benefit for their child’s writing. Parents could see their child working at home to finish writing and share it with their teacher because they were so motivated to finish: “a couple have commented that they bought the device sort of hesitantly and now they can really see the benefit in it and they’re seeing how much they’re writing at home” (Interview Two and Three). Jo also reported positive whānau responses: “parents talking to me at school and giving me feedback about how they see it and the benefits for them, that’s been positive” (Interview Three). Some students in Jo’s class wanted to finish their work during break times and at home: “students that want to continue learning and do activities outside of school and asking if they can do work in break times” (Interview Three). She saw this as a positive; children could access learning when and where they wanted.

CONCLUSION

In conclusion, the teachers were enthusiastic and passionate about using devices in the classroom, and they wanted the best outcomes for their students. The following changes were made to their practice to incorporate BYOD: they added time to, and made changes to, planning and preparation, solved technical problems, incorporated multiple skills lessons, planned for both BYOD and non-BYOD students within the same sessions, and upskilled themselves. All three teachers expressed a strong desire to learn from colleagues who are successfully using BYOD. With limited formal professional learning for BYOD available at this school during this year, the three teachers involved used the internet to develop their own knowledge and skills. As a result, they all reported the need for more guidance and BYOD-specific professional learning.

From these interviews, reflections and observations, it was apparent that the teachers need more professional learning in order to integrate BYOD effectively in the classroom. This learning needs to include the integration (set up) of BYOD in the classroom, curriculum-specific and program-specific learning, and learning how to use devices in a way that is innovative and appropriate while still effectively teaching students who do not bring a device.

This chapter presented a synthesis of the research data and addressed the challenges and successes experienced by the research participants. The data was presented thematically, according to the

commonalities that emerged. The next chapter will analyse the research and address the research questions and findings.

CHAPTER FIVE- DISCUSSION OF RESEARCH FINDINGS

This chapter will address the research questions and discuss the findings. Specifically, the changes the teachers made to their pedagogy will be scrutinized and factors that impact on the ability to make these changes will be explored. Professional learning opportunities will be examined and addressed. The challenges and successes the teachers experienced in terms of professional learning and BYOD implementation will be analysed.

BYOD AND SAMR

The findings appeared to reveal patterns within the participants' practices. These patterns are reflective of the SAMR model (Educational Technology and Mobile Learning, n.d.). Initial use of BYOD in the classroom utilised the device as a direct substitute for pen and paper. For example, Kelly and Nic used devices during writing time, whilst those without devices continued to use pen and paper; Jo used devices during numeracy group teaching as a substitute for pen and paper. There was some movement towards augmentation as teachers realised the potential for using Google Docs as a tool to provide feedback and modification of the writing learning tasks. This led to some functional improvement of the teaching and learning taking place. This was also the case for Jo who began to utilise web-based programs as part of the numeracy group teaching. This allowed for those with devices to complete tasks that the other children could not do with pen and paper, for example, the use of Blendspace. This demonstrates that, to move towards modification, the teacher needs to significantly redesign the task.

During the interviews, all three teachers spoke about the desire to be more creative and innovative in their use of devices. Nic spoke about this being her next step: "(I'd like to learn about) ways you can engage children ... my next thing would be finding out what exciting, fancy things you can use because I'm just using Hapara well" (Interview Four). She suggested that the school should provide professional learning early on in the BYOD journey to ensure teachers have the tools to be more creative and innovative. According to the SAMR model, this would mean that the learning tasks would fit within the redefinition phase; tasks would be new and previously inconceivable without the use of technology (Educational Technology and Mobile Learning, n.d.) In order for teachers to be confident in redefining tasks, it is imperative that they receive ongoing support in the form of professional learning. This is an essential component to the success of digital device programmes (Baker, 2010).

The teachers became more positive about the use of BYOD as augmentation enhanced the use of the devices. This became evident during the third and fourth interviews. Nic spoke about being excited about the possibilities of Google Docs and Google Drive to enhance the writing programme. She spoke of the ease of using these tools and her accompanying excitement:

Everything (writing/instructions/templates) is sitting there so they are personal to them and again it's so easy to give them feedback. It's so much easier to write feedback in really quickly with the device, even the small stuff happening now, it's much easier than doing it in the book. That's one of the really exciting parts. (Interview Four)

Nic found that assessment and publishing were more streamlined and as she learned more about Google Docs, device use during writing became more frequent and effective. She said that she had

to learn how to use Google Drive on her own by “playing with it” (Interview Four) and suggested that targeted professional learning would have been really beneficial. This is in agreement with Baker’s (2010) research. Her advice for teachers new to BYOD: “Get PD quick. If you're plodding along by yourself (and) you don't know what you're looking for it's not flash. The quicker you can get an expert to tell you how you can use this basic thing well, the better” (Interview Four).

Jo substituted pen and paper for Google Docs during writing time and found that the students could progress through the writing process (i.e. drafting, editing, proofreading and publishing) with the added benefit of detailed, rapid feedback and feedforward. Kelly, however, moved beyond substitution and into augmentation in the way she was using technology in the classroom. She introduced an application (Book Creator) to use for publishing the writing, which was a functional improvement to the learning task, as prior to this students may have published using pen and paper or the teacher would have published work for the students. Kelly also utilised the devices as a substitute for books during library/reading research tasks; there was some functional improvement (augmentation phase) in the learning task as she used QR codes for the students to access specific websites. This meant that the students could access safe and useful websites quickly and easily. These are examples of device integration which resulted in some functional improvement beyond substitution. This indicates some movement through the SAMR stages towards more transformational teaching and learning.

In addition, Kelly’s reflections also demonstrated a shift through the SAMR phases during the year. As Kelly first started integrating BYOD in the classroom, devices were used as a substitute for books (research/inquiry) and pen and paper (writing). She began to augment learning tasks as she learned more about what was available on the devices, for example, Book Creator. The use of Seesaw for assessment and communication with whānau grew throughout the year. After one Hapara professional learning session, Kelly decided to use the system to enhance the inquiry programme and this encouraged more task modification (Interview Four). Kelly expressed excitement about the possibilities that a system like Hapara can bring to the classroom programme, as well as planning and preparation, especially for inquiry. She found she was able to use Hapara to set up the inquiry and include a Google Form at the end to show what the students had discovered (Interview Four). Kelly was able to immediately implement what she had learned and experience the effectiveness of targeted professional learning in action in the classroom. Kelly could understand the way this type of professional learning could make a significant difference to her pedagogy and aid in the creation of rich learning tasks. She expressed a desire for more opportunities like this.

Kelly and the students experienced the benefits of modifying learning tasks using technology. This, in turn, motivated Kelly to further modify and redefine student tasks and investigate further possibilities. Nic also spoke of the benefits of learning more about Hapara and her responses indicated more augmentation and modification of learning tasks using Hapara. This teacher used Hapara to set up and distribute tasks for students to access using their devices. This demonstrates modification because the students without devices could not access these tasks or complete them in the manner those with devices could. This meant the teacher was designing significantly different tasks for those with access to devices and those without. Nic expressed the desire for students without devices to have access to similar tasks but stressed the need for more devices to be able to run these programmes effectively in the classroom:

We still have to struggle with the fact that we don't have 1-1 devices, (we) still have that struggle with having to balance pen and paper and plan for devices, because when you start planning for the device you can see how much more effective it is. (Interview Four)

Lai (2005) identified access to hardware as a barrier to teachers integrating technology. This was definitely a barrier in this case study with all teachers expressing a desire for more access to devices for students.

In summary, all three teachers started off substituting pen and paper for devices and their device use slowly evolved over the year, augmenting the learning tasks. They all discussed the need to be more creative, to learn about new and different technologies. This essentially shows the teachers' intuitive awareness that they needed to progress through the four stages of SAMR. As they learned about new programs and methods of using Google Drive, more augmentation became evident in their classroom programmes. Minshew & Anderson (2015) researched internal barriers that influence teacher technology use and integration. It was found that the issue of teacher confidence and technical knowledge were barriers to integration, this was also evident in this research. Therefore, technological content knowledge was essential for them to be able to progress further through the SAMR phases. None of the research participants reached the redefinition phase. This demonstrates that, for devices to be implemented and used effectively (i.e. in the way that they were designed, not as a tool substitute), teachers must develop an understanding of the possibilities of the technology and how to use them in the classroom (Minshew & Anderson, 2015). These possibilities should be understood before the planning process, instead of planning the programme and then attempting to find technology that might fit the tasks (Arney, 2014). Teachers need more technological knowledge of what is available and the pedagogical content knowledge to be able to implement it in the classroom (Starkey, 2010). This links directly to the TPACK framework.

BYOD AND TPACK

TPACK is a theoretical framework which identifies the knowledge teachers need to teach with technology successfully. Three primary forms of knowledge are identified: content knowledge, pedagogical knowledge and technological knowledge. TPACK is at the intersection of these three forms of knowledge. Combinations of knowledge are varied according to the teacher, situation and a number of factors unique to the individual (Ling Koh et al, 2014). During this research, these forms of knowledge presented themselves in a variety of combinations. The need for development of TPACK for successful integration of BYOD became obvious throughout the year. The three teachers involved in this research had proven pedagogical knowledge and content knowledge as all three are experienced classroom practitioners. During the interviews, they talked about their areas of strength and therefore began to introduce devices into curriculum areas where they had strong content knowledge. Kelly and Nic began with literacy and Jo with numeracy. There were varying degrees of technological knowledge and they all identified with having limited technological pedagogical content knowledge. This illustrates that content knowledge had a direct, powerful influence on the way they used devices in the classroom. Teacher confidence in content knowledge is an important component in ensuring teachers integrate technology into the classroom programme. Minshew & Anderson (2015) and Starkey (2010) also identify that this lack of knowledge can be a barrier to integrating ICT.

The lack of professional learning opportunities was a recurring theme in this study and became a barrier to the successful implementation of BYOD. All three teachers emphasised the need for technological, pedagogical content knowledge-based development, with Nic emphasising the need for teachers new to BYOD to “get PD quick” (Interview Four). This directly demonstrates Janssen and Lazonder’s (2015) findings on the type of support experienced teachers need in order to integrate technology effectively. The teachers in this study felt most successful after participating in a professional learning session that directly related to their classroom practice and built on the content knowledge they already had. Content specific examples were considered the most valuable as they allowed the teachers to understand how to use the technology in the classroom every day. The Hapara professional learning session catered directly to this need. This was supported in research by Ling Koh et al (2014) as well as Minshew and Anderson (2015) and specifically results in ICT innovation in the classroom. Two out of the three teachers (Kelly and Nic) were able to participate in this professional learning opportunity and expressed excitement about the possibility of using the innovation in a classroom setting. They both began trialling Hapara in their classrooms after one session with an expert. This emphasises Minshew and Anderson’s (2015) findings about the barriers to successful integration and that this type of professional learning is essential.

Another barrier to successful integration was the significant time constraints on teachers, which was identified very early in this research. All teachers identified the need for time to learn about the devices as well as programs and applications. In addition to learning about the technology, the research participants expressed a strong desire to understand how to apply this new knowledge in classroom setting. This aligns with Minshew and Anderson’s (2015) research, which signifies the importance of giving teachers the opportunity to develop specific technological pedagogical content knowledge through professional learning opportunities. Koehler and Mishra (2009) also emphasised the importance of the technological aspect of the TPACK framework as being an essential component of professional learning.

All three teachers identified the difficulty inherent with the rapidly changing nature of technology. They recognised the difficulties in adapting their practice to learn about, and consequently include, new technology within classroom practice effectively. This confirms Gur and Karamete’s (2015) examination of TPACK and the need for teachers to continually acquire and update their technological skills and knowledge. These three teachers were all willing to participate in this type of professional learning and attempted to update their knowledge and skills independently. In comparison to the formal professional learning session provided by the school, the methods the teachers employed to upskill themselves were not as valuable or as successful. This validates Baker’s (2010) conclusions, that teacher capability relies on developing pedagogical expertise in both digital content and technology-rich learning environments and the willingness to continue learning. Stoll et al, (2003) also asserted that staff must be willing to continue learning and adapting in order to use technology effectively in the classroom. The professional learning occurred at the end of the year in this study and could have been more effective if it was scheduled at the start of, or prior to, BYOD. The Teaching and Learning Development information provided on TKI (MOE, 2015c) also confirmed that teachers must have targeted professional learning before implementing device use and they must have ongoing opportunities to upskill. The teachers believed that the most valuable professional learning for them was to observe other teachers, talk to colleagues and learn from other teachers who are using BYOD successfully. It must be noted that there are many factors that contribute to the success of professional learning and in this case there was strong desire to learn

from colleagues. This concept is also supported by Davis et al, 2013 and Timperley et al, 2007. Integrating ICT effectively is dependent on quality professional learning that meets pedagogical aims and digital trends. This is clearly shown through Nic's experience, who participated in the MOE ICT PD cluster six years ago but with so many changes in the digital world over the years since she participated, this professional learning was not as relevant as it once was. Nic spoke of the need to keep up with digital trends and to know and understand what is new and available to use on the devices in her room (Interview Four). This understanding is a factor in the way Nic is able to adopt new digital technologies and the lack of professional learning is hindering her development of using technology in the classroom. Davis et al, (2013) identifies that specific professional learning is a key influence on how and why a teacher adapts their practice to include digital technologies. Lai (2005) also identifies this lack of access to teacher professional learning as a barrier to integrating ICT.

BYOD AND TEACHER TIME

The teachers made a number of changes to their practice and a significant difference in this study was the way they used time. The participants made changes to their planning to make provisions for those children who brought a device to school. As the teachers developed their knowledge and skills, they were able to move beyond substitution and made some progress through the SAMR stages (Educational Technology and Mobile Learning, n.d; Puentedura, 2006). This was evident as their knowledge of Google Drive developed; they were able to begin to functionally improve tasks through using templates and forms. Kelly and Nic also began to use Hapara which provided opportunities to move beyond pen/paper and book substitution. A significant amount of time was added to Jo's weekly planning in just one curriculum area (numeracy). Not all students brought a device to school; consequently, teachers had to plan for device use and non-device use. The use of TPACK in the planning stage was missing and the contextual factors that impeded device use (technical issues, lack of time and professional learning) hindered pedagogical improvement. These findings are also confirmed by Ling Koh et al (2014) and Harris and Grandgenett (2012). All three teachers made changes to day-to-day planning, weekly planning and inquiry planning. It is acknowledged that when technological tools are added to teacher PCK, challenges in planning can occur. If the tool becomes the centre of the planning and design, the focus on the students and their learning needs can be lost. This is also suggested by Harris and Hofer (2011). Kelly, Nic and Jo focused on their curriculum area of strength first and tried to find tools that would work. While the tool wasn't the centre of their planning, it was certainly a major consideration when planning. Problems arose when they could not find a tool that worked and they did not know what they did not know. The tool formed a significant portion of their planning time and consideration, but as there were students in the room without devices as well, planning for student needs was just as important as integrating the tool.

Moreover, researching for ideas and applications was time-consuming for the teachers. They used time, in addition to usual planning and preparation time, to research how to use BYOD in the classroom and then had to investigate how to transform this knowledge into pedagogical knowledge. They researched strategies, such as flipped classrooms (Rotellar & Cain, 2016) and blended learning (Powell et al, 2015), for potential use in their classrooms as methods of integrating BYOD. They were looking for guidance on how to use ICT to promote effective learning (MOE, 2015a, n.p). When teachers develop knowledge of digital technologies alongside pedagogical content knowledge they are able to create rich learning tasks rather than just focusing on skill acquisition (Starkey, 2010).

There was a strong willingness on behalf of the teachers to continue to learn and develop their pedagogical expertise. This willingness is recognised as a key component in ensuring the use of digital tools in the classroom is effective (Baker, 2010). They made use of social media and online forums, which is an example of non-formal professional learning which can provide teachers with easy access to information they require quickly, although it is not known how effective this form of learning is in positively affecting teaching practice (Melhuish, 2013). However, the MOE recommended that professional learning when integrating digital devices should include specific teacher training before introducing devices and on an ongoing basis (2015c). When teachers make changes to their pedagogy whilst integrating digital technologies, there is increased student engagement, more effective practices as well as redefined teaching and learning (Hedburg, 2011; Starkey, 2010). There is a strong connection between effective teaching methods and device use resulting in positive outcomes for both teachers and students (Looi et al, 2011; Baker 2010; Piehler, 2014). The teachers in this study had not yet redefined their teaching and learning practices, however they were attempting to access information to be able to do this in the future. A key aspect that was missing in their attempts to do this was BYOD or 1-1 device specific professional learning prior to, and during, BYOD (MOE, 2015c). Teachers who have high personal experiences with ICT still need professional learning to transfer this knowledge to classroom practices (Sime & Priestley, 2005). This is true in Jo's experience as she identifies as having high technological knowledge yet needed support to integrate BYOD.

BYOD had a significant impact on how time was spent in the classroom as well. Teachers began using time in the classroom to teach children skills they needed to complete tasks e.g. how to use Google Docs, Book Creator, how to phrase effective search terms. Not all children had a device; therefore, the teachers had to take time to teach those with devices what they needed to know to complete the tasks. They then began to timetable skills teaching into weekly planning, as well as time for the actual task. For example, Kelly discovered she had to teach students how to use Book Creator before integrating it into the writing programme. Before powerful learning could occur and students had the opportunity to construct knowledge, skills had to be established (ITL Research, n.d). The issue of children bringing a range of device types also meant that it was essential that teachers found applications and programmes that would run across platforms. This impacted on class time if the teacher had not pre-empted this issue. This indicates a need for professional learning for teachers in using devices and software applications (MOE, 2015c).

The teachers also had to use their time to check devices before school to ensure all applications and programmes would run or are installed on devices. This became problematic due to the student BYOD Wi-Fi not turning on until 9 am and so Jo found she had to use classroom time to solve problems and complete preparation. This aspect of BYOD affected preparation time as well as teaching and learning time. Technical issues also arose during class time which took time for teachers to solve. This posed a considerable problem with the amount of technical support available, especially during the initial phase of BYOD. This demonstrates one of the main barriers to teachers in New Zealand using technology in their classroom as identified by Lai (2005). Lack of technical assistance negatively affects the amount of technology teachers use. This was evident in this case study as technical issues were discussed often and the teachers had to solve technical problems on their own.

CONCLUSION

In summary, the changes that the teachers made to their pedagogy all relate to SAMR and TPACK and the need to develop the different types of knowledge that support the use of BYOD in the classroom. Technological knowledge was required to use and understand the different types of devices that were being brought to the classroom. Technological content knowledge was being developed in order to know how to use the devices. Pedagogical knowledge was expanded to include ICT specific strategies, such as the flipped classroom. A combination of these types of knowledge, alongside quality professional learning, can result in enhanced ICT integration (Minshew & Anderson, 2015) and effective use of BYOD and this is the next step for this particular school.

There were a number of changes teachers had to make to their practice in order to implement BYOD in the classroom. The most notable change that impacted on methods and practice of teaching was the impact on their time; time to prepare, plan and cater for BYOD in the classroom; time to develop knowledge and skills both independently and in formal school professional learning; time to solve technical problems; time to teach skills as well as the curriculum content. These three particular teachers made significant changes to their everyday practice and included these changes in their planning. All three expressed a desire to continue to make changes and learn more about redefining their practice to effectively make use of BYOD.

It is apparent that the professional learning required in order to integrate BYOD effectively into the classroom must reflect the principles of the TPACK framework. It must also cater for teachers' current needs and relate directly to classroom practice. The most valuable form of professional learning combines technological pedagogical content knowledge and needs to be consistent and ongoing. The willingness of the staff involved in professional learning is a crucial component for changes to then occur in the classroom.

This chapter analysed the data and addressed the research questions. The changes teachers had to make to their pedagogy and what they did differently day-to-day were presented and analysed. The professional learning aspect of BYOD was analysed in conjunction with the opportunities these teachers had for professional learning. TPACK and SAMR provided a framework for analysing the data. The sixth and final chapter will draw conclusions from the findings, make recommendations and suggestions for what is next. Both the relevance and the implications of this research will be identified and suggestions for future research will be made.

CHAPTER SIX - CONCLUSION

This final chapter will draw conclusions, summarise the overarching themes that have emerged in this study and link them to recommendations. There will be a description of the limitations of this study and suggestions made for future research. Following that, the recommendations will be outlined. These recommendations could be taken into account by primary school teachers, leaders of IT, policy makers for BYOD and primary school leaders. The research questions will be addressed and the study will be concluded.

SUMMARY OF THE STUDY

This study followed three New Zealand primary school teachers as they implemented BYOD into their classrooms. The researcher sought to understand how the introduction of BYOD might change their pedagogy and what professional learning was required to support the BYOD programme. BYOD was seen as one way to equip the students with more devices than the school could provide, therefore giving students more technological opportunities, helping them to be confident, connected lifelong learners (21st Century Learning Reference Group, 2014). In this technology-rich, information age, education needs to be more future focused. E-learning is an important factor in preparing students for their future working lives, and the 21st Century Learning Reference Group (2014) stresses that education must change in order to cater for 21st century students' needs. Adopting BYOD as part of a school's e-learning strategy provides challenges as well as opportunities. This study focused on three teachers introducing BYOD for the first time and explored how, what and why they made pedagogical changes during this introductory year. The aim was to provide the reader with a comprehensive understanding of pedagogical changes, and factors that impact on the ability to make these changes, when introducing BYOD within a New Zealand primary school classroom. This study used TPACK as a theoretical lens through which to examine the links between teacher knowledge and pedagogy, and confidence when introducing BYOD. SAMR was also used as a tool to examine and analyse data. The teachers in this study made a number of changes to their pedagogy whilst managing barriers to implementation. These changes included the methods teachers used to plan and prepare for teaching and learning and the pedagogical strategies used in the classroom. These strategies included the substitution and augmentation stages of the SAMR model. The barriers to successful implementation were technical issues and problems with devices, as well as, the lack of professional learning opportunities (specifically TPACK related) to keep abreast of rapidly changing technology; the additional time needed to properly implement BYOD was another barrier. It was found that professional learning about devices as well as software, alongside technological content knowledge, is essential to successful implementation. This finding links directly to the TPACK model and the proven success of utilising TPACK to inform and guide professional learning opportunities.

RECOMMENDATIONS

The researcher has reached a number of conclusions from this research in order to make recommendations. To aid the successful implementation of BYOD in a primary school the following recommendations can be made for educators considering BYOD.

1. School leaders are encouraged to survey the teachers to understand what sort of support is needed for individual teachers before implementing BYOD, as well as assess what the

current skill levels are and what are the minimum expectations. Then, leaders could develop a plan about how the school would build on this.

2. School leaders should ensure that there is a team that prepares for the changes needed to accommodate BYOD, for example, policy writing, user agreement preparation, community information meetings, brochures, website updates, and make links with appropriate vendors. . This team should represent the school and be reflective of the whole staff vision and direction.
3. This team could also specify a device type to suit the school community and current infrastructure. Alongside this, initial applications and programmes that will be used in the classroom could be specified so students and teachers are prepared.
4. Schools should ensure BYOD is included in strategic planning goals and that the planning is reflective of the school vision.
5. Schools must ensure the community is informed and given many opportunities to participate in and understand the changes.
6. It is essential that teachers participate in specific professional learning on effective device use in the classroom.
7. Schools must have a management system/safety system (monitored BYOD Wi-Fi) that all teachers understand and can use (for example, Hapara or Google Classroom).
8. School leaders need an understanding of the extra time required to plan and prepare for using BYOD in the classroom and prepare accordingly. They need to ensure that time is provided for teachers to prepare as well as have professional learning time. Ongoing changes in practice need to be planned for so that teacher progress is maintained.
9. A successful school-wide digital citizenship/digital literacy programme is essential and should be managed by the classroom teacher.
10. User agreements, guidelines and policy documents are essential for students, staff and whānau and should reflect the school vision.

RELEVANCE, IMPLICATIONS AND LIMITATIONS OF THIS STUDY

The findings of this research will be of use to a range of educators from principals and ICT leaders to classroom teachers. This research is based on the experiences of three New Zealand primary school teachers; however, the themes, patterns and results can be applied to many educational contexts. BYOD is being developed in many schools, nationally and internationally, and an understanding of how other schools have undertaken this journey is important in informing others about factors that can create effective implementation and integration. As New Zealand primary school teachers commit to using the New Zealand Curriculum, all are required to utilise technology to support all learners (MOE, 2007); therefore, the implications of BYOD or 1-1 device use can be applied to current New Zealand primary school teachers. The intention is that students in New Zealand primary schools will become connected and confident ICT users (MOE, 2007). National and international educational organisations could relate to the findings regarding professional learning, as BYOD is an

international strategy. Professional learning, or lack thereof, was a major challenge identified by the teachers in this research. In particular, technological pedagogical content knowledge based professional learning was identified as being an essential component when implementing BYOD.

School leaders could benefit from the findings of this study, as the teachers identified that one of the main challenges with implementing BYOD was the variation in device type and the lack of technical support. This was particularly evident in the initial setup phase. This process could be made much smoother for schools by specifying device type, application and programmes to be initially used. Ensuring that there is extra technical support put in place at the beginning would also be very helpful. Jo made a valid suggestion which could benefit schools during initial BYOD implementation: that student's start bringing devices at certain times throughout the year and that way schools can plan for extra technical support at those particular times. Staggering the use of devices would also mean teachers could plan for specific skills teaching around the use of the device at the same time, for example, logging on, creating passwords, using Google Drive. This would mean that the teachers aren't repeating the same lessons every time an individual brings a device to the classroom.

An important factor of this research is that this particular school allowed students to bring a range of device types, so schools that specify a device for students to bring may not experience the same challenges identified in this study. The perspective of the teachers in this study may differ to those in schools with a particular device type. Therefore, as schools make decisions about device type, this research would be of use. The comparisons between schools that specify devices and those that don't would be an area for further for research. School leaders would then be able to make informed decisions about which method of device specification would suit their educational context. The other challenges, however, of a lack of teacher time and professional learning are relevant to many New Zealand primary schools.

The researcher experienced challenges in this case with teachers being exceptionally busy and therefore it was often difficult to find a time to meet with the participants. One teacher in particular (who was also in a leadership role) found it very hard to organise a time to meet for the interviews. This meant that the interviews occurred later in the research period than planned and also later than the other two teachers' interviews. Therefore this teacher's experiences as discussed in Interview Two and Three were slightly further along in the BYOD journey than the other two teachers' and reflected a positive evolution and slightly less technical issues. More extensive research and further comparisons could be made by including more teachers in the research process, as well as completing the observations in more than one classroom.

There are limitations when using case study methodology. This was a small-scale case study over a short time span with a small number of teachers. However, the use of three teachers provided a rich and accurate portrayal of how BYOD was implemented at this school. The tools used in this case study offer both limitations and advantages. Ensuring the research included a variety of data gathering methods (observations, reflections, examination of teacher documents and semi-structured interviews) allowed for triangulation of data and increased reliability (Scholz and Tietje, 2002; Yin, 1994). Using semi-structured interviews meant that the researcher could gather opinions and facts related directly to the topic with the use of open-ended questions (Yin, 1994). Interviews and reflections could then be compared with the observations to corroborate findings (Yin, 1994). Although the specifics of this research may not be relevant for all readers, there are many aspects

that can be applied to a range of different contexts and educational settings. The recommendations outline how educators in different settings can apply findings that are relevant to them.

SUGGESTIONS FOR FUTURE RESEARCH

This case study revealed further opportunities for future research in BYOD. As this study focused on teachers, there is the possibility to investigate the implications for students, for example, student achievement in a primary school setting; how, what and why students use devices; and how this can affect engagement or achievement. The economic benefits for schools of implementing BYOD versus schools purchasing 1-1 devices could be an area for examination. Conversely the economic implications for families could also be considered when studying the economy of BYOD. As this study revealed, not all whānau purchased devices, so it would be useful to research the reasons for whānau uptake (or lack of uptake), as well as whānau involvement and the impact that has on student use of devices.

The lack of professional learning was a challenge identified in this study and revealed a large area of potential further research. Specific technological pedagogical content knowledge-focused professional learning could be investigated for the effect on teacher pedagogy, as could specific SAMR-based professional learning. Comparisons could be made between teachers sourcing their own learning through internet-based methods versus face-to-face targeted sessions. The two teachers that participated in the Hapara professional learning session expressed the value of the professional learning being led by a classroom teacher who could relate all the training back to practical, everyday classroom use.

One of the challenges that teachers faced at this school was coping with a variety of device types in the classroom and it could be worth comparing data from this school with a school that specified device type to be able to make recommendations for schools new to BYOD. As these teachers did not experience a wide range of professional learning opportunities, this meant that this particular area of research could not be explored in depth within this study and would be an important area of research to inform schools. Comparisons could also be made with schools that provide a high level of specific professional learning on BYOD/1-1 device use prior to or during implementation. Researching teacher pedagogy in classrooms where there is more professional learning available would be worth exploring the types of professional learning that most benefit teachers as they introduce and use BYOD. If the research could continue after these teachers participated in professional learning, further valuable data about the type and value of professional learning could be collected and analysed. Furthermore, TPACK specific professional learning and the impact of this on teacher practice would be beneficial to inform schools on types of professional learning that they could provide.

There is scope for wider research involving more schools to allow for comparisons of similarities and differences and the challenges and successes in order to inform schools on recommendations for successful BYOD programmes. This would also provide more comprehensive information for teachers to aid in integrating BYOD.

CONCLUSION

This research has provided an insight into the way one school implemented a BYOD programme. It highlighted the challenges as well as the successes as BYOD was introduced. The importance of

specific professional learning and technical support was one of the main issues that emerged and this is an important recommendation for other schools.

The researcher hopes that other New Zealand schools will benefit from the findings, as well as the recommendations, as a result of this case study. School leaders will be able to use the recommendations as they plan for BYOD and teachers will be able to use the research findings to help them to implement BYOD in their classrooms. The three teachers who shared their experiences and journey over this introductory year are excited to build on their first year with BYOD and were pleased to be involved in this study.

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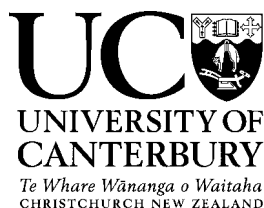
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APPENDICES

APPENDIX A



Department Telephone:

Email:

Date:

BYOD (Bring Your Own Device) and its impact on teacher pedagogy: A New Zealand case study

INFORMATION SHEET FOR TEACHER

I am a MEd thesis student at the College of Education, Health and Human Development, University of Canterbury. I am also an experienced teacher of 16 years, a school leader and a specialist in using digital technologies in the classroom. I would like to invite you to participate in my research of ***BYOD (Bring Your Own Device) and its impact on teacher pedagogy: A New Zealand case study***

This will include the following things:

- Completing regular reflection/evaluations of your classroom practice introducing and using BYOD
- Participating in at least four semi-structured interviews during Term Two, Three and Four 2016
- Allow the researcher to observe in your classroom on at least four occasions during Term Two and Three 2016. The researcher will specifically be observing the teaching practices when using BYOD in the classroom.

Data will be recorded using a voice recorder for interviews as well as notes and anecdotal notes for the observation. Each observation will take up to one half day in the classroom and the interviews will take up to one hour.

Participation is voluntary and you have the right to withdraw from the project at any time without penalty. If you choose to withdraw, I will use my best endeavours to remove any of the information relating to you from the project, including any final publication, provided that this remains practically achievable.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: your identity will not be made public without your prior consent. To ensure anonymity and confidentiality, no names of people or places will be included in the research. All data collected for this study will be kept in locked and secure facilities at the University of Canterbury and will be destroyed after five years. A thesis is a public document and will be available through the UC Library.

You can receive a report on the findings of this study by providing your email address below.

If you require further information you can contact the researcher, Genevieve Rae. If you have any complaints, you can contact Nicki Dabner or the Chair of the University of Canterbury Education Research Human Ethics Committee.

Please indicate to the researcher on the consent form if you would like a copy of the summary of results of the project.

The project is being carried out as a requirement for EDEM690 Med Thesis by Genevieve Rae under the supervision of Nicki Dabner, who can be contacted at nickidabner@canterbury.ac.nz. They will be pleased to discuss any concerns you may have about participation in the project.

This project has been reviewed and approved by the University of Canterbury Educational Research Human Ethics Committee, and participants should address any complaints to The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human- ethics@canterbury.ac.nz).

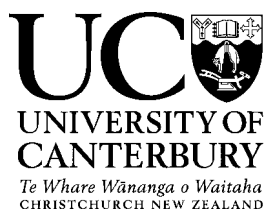
If you agree to participate in the study, you are asked to complete the consent form and return to Genevieve Rae in the envelope provided.

Name: _____ Date: _____

Signed: _____ Email address _____

University of Canterbury Private Bag 4800, Christchurch 8140, New Zealand. www.canterbury.ac.nz

APPENDIX B



Department Telephone:

Email:

Date

BYOD (*Bring Your Own Device*) and its impact on teacher pedagogy: A New Zealand case study

INFORMATION SHEET FOR SCHOOL – PRINCIPAL AND BOARD OF TRUSTEES

I am a MEd thesis student at the College of Education, Health and Human Development, University of Canterbury. I am also an experienced teacher of 16 years, a school leader and a specialist in using digital technologies in the classroom. I would like to invite the school to participate in my research of **BYOD (*Bring Your Own Device*) and its impact on teacher pedagogy: A New Zealand case study**

This will include the following things involving two-three classroom teachers:

- Completing regular reflection/evaluations of classroom practice introducing and using BYOD
- Participating in semi-structured interviews during Term Two, Three and Four 2016
- Observations of teaching practices in classrooms on at least 4 occasions during Term Two and Three 2016

Data will be recorded using a voice recorder for interviews as well as notes and anecdotal notes for the observation.

Participation is voluntary and the school has the right to withdraw from the project at any time without penalty. If the school chooses to withdraw, I will use my best endeavours to remove any of the information relating to the school from the project, including any final publication, provided that this remains practically achievable.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the school will not be identified without consent. To ensure anonymity and confidentiality, no names of people or places will be included in the research. All data collected for this study will be kept in locked and secure facilities at the University of Canterbury and will be destroyed after five years. A thesis is a public document and will be available through the UC Library.

The school can receive a report on the findings of this study by contacting the researcher directly.

If you require further information you can contact the researcher, Genevieve Rae. If you have any complaints, you can contact Nicki Dabner or the Chair of the University of Canterbury Education Research Human Ethics Committee.

Please indicate to the researcher on the consent form if the school would like a copy of the summary of results of the project.

The project is being carried out as a requirement for EDEM690 Med Thesis by Genevieve Rae under the supervision of Nicki Dabner, who can be contacted at nickidabner@canterbury.ac.nz. They will be pleased to discuss any concerns you may have about participation in the project.

This project has been reviewed and approved by the University of Canterbury Educational Research Human Ethics Committee, and participants should address any complaints to The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human- ethics@canterbury.ac.nz).

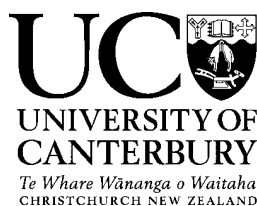
If the school agrees to participate in the study, please complete the consent form and return to Genevieve Rae in the envelope provided.

Name: _____ Date: _____

Signed: _____ Email address _____

University of Canterbury Private Bag 4800, Christchurch 8140, New Zealand. www.canterbury.ac.nz

APPENDIX C



Department Telephone:

Email:

Date:

BYOD (Bring Your Own Device) and its impact on teacher pedagogy: A New Zealand case study

CONSENT FORM FOR TEACHER

- I have been given a full explanation of this project and have had the opportunity to ask questions.
- I understand what is required of me if I agree to take part in the research.
- I understand that participation is voluntary and I may withdraw at any time without penalty. Withdrawal of participation will also include the withdrawal of any information I have provided should this remain practically achievable.
- I understand that any information or opinions I provide will be kept confidential to the researcher and UC supervisor and that any published or reported results will not identify the participants or their institution. I understand that a thesis is a public document and will be available through the UC Library.
- I understand that all data collected for the study will be kept in locked and secure facilities and/or in password protected electronic form and will be destroyed after five years.
- I understand the risks associated with taking part and how they will be managed.
- I understand that I am able to receive a report on the findings of the study by contacting the researcher at the conclusion of the project.
- I understand that I can contact the researcher, genevieve.rae@pg.canterbury.ac.nz, or supervisor Nicki Dabner, nickidabner@canterbury.ac.nz, for further information. If I have any complaints, I can contact the Chair of the University of Canterbury Educational Research Human Ethics Committee, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz)
- I would like a summary of the results of the project.

By signing below, I agree to participate in this research project.

Name: _____ Date: _____

Signed: _____ Email address _____

Please return this completed consent form to Genevieve Rae on 1st June in the envelope provided.

Genevieve Rae

11 May 2016

-
1. This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee
 2. Complaints may be addressed to: The Chair, Educational Research Human Ethics Committee
University of Canterbury, Private Bag 4800, CHRISTCHURCH Email: human-ethics@canterbury.ac.nz

APPENDIX D



Department Telephone:

Email:

Date:

BYOD (*Bring Your Own Device*) and its impact on teacher pedagogy: A New Zealand \case study

CONSENT FORM FOR SCHOOL - PRINCIPAL AND BOARD OF TRUSTEES

- I have been given a full explanation of this project and have had the opportunity to ask questions.
- I understand what is required of the school if I agree to take part in the research.
- I understand that participation is voluntary and the school may withdraw at any time without penalty. Withdrawal of participation will also include the withdrawal of any information provided should this remain practically achievable.
- I understand that any information or opinions provided will be kept confidential to the researcher and UC supervisor and that any published or reported results will not identify the participants or their institution. I understand that a thesis is a public document and will be available through the UC Library.
- I understand that all data collected for the study will be kept in locked and secure facilities and/or in password protected electronic form and will be destroyed after five years.
- I understand the risks associated with taking part and how they will be managed.
- I understand that I am able to receive a report on the findings of the study by contacting the researcher at the conclusion of the project.
- I understand that I can contact the researcher, genevieve.rae@pg.canterbury.ac.nz, or supervisor Nicki Dabner, nickidabner@canterbury.ac.nz, for further information. If I have any complaints, I can contact the Chair of the University of Canterbury Educational Research Human Ethics Committee, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz)
- I would like a summary of the results of the project.

By signing below, I agree to participate in this research project.

Name: _____ Date: _____

Signed: _____ Email address _____

Please return this completed consent form to Genevieve Rae on 1st June in the envelope provided.

Genevieve Rae

11 May 2016

-
1. This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee
 2. Complaints may be addressed to: The Chair, Educational Research Human Ethics Committee
University of Canterbury, Private Bag 4800, CHRISTCHURCH Email: human-ethics@canterbury.ac.nz

APPENDIX E

SEMI-STRUCTURED INTERVIEW ONE - TEACHER

Scheduled Time:	60 minutes, beginning of Term Two
Participants:	Participant for the interview - one teacher from primary school A
Aim:	The aim of the interview is to triangulate data and to follow up the observations. The interview will be used to gather more information to specifically answer the research question.
Purpose of the interview:	An interview will be used to enable the researcher to gain a deeper understanding of one teacher's attitudes to the use of key competencies in their classroom programme. It will also provide an opportunity to explore the teacher's thoughts about the new competencies and how they work with the new curriculum. The teacher will be given an opportunity to ask questions or discuss other issues at the end of the interview.
Introductions	The participant is known to the researcher. They will be thanked for being available.
Interview Guide	
What preparation have you done before introducing BYOD to your classroom?	
What would you do differently to prepare next time?	
What changes have you made to your own pedagogy since introducing BYOD? i.e. planning, everyday practice, assessment, day to day planning	
How have you integrated the device into the classroom programme? i.e. do you have specific curriculum areas you are using devices in/specific programmes you are using?	
Tell me about the professional development and guidance (if any) you have had on introducing BYOD and/or implementing it in the classroom. How has this changed the way you plan/prepare for lessons? Why?	
Notes:	
Introduce the reflections process and guidelines, discuss timeline for reflections and follow up interviews (teacher one), make time to meet again for the second interview and make dates for the last two interviews.	

APPENDIX F

SEMI-STRUCTURED INTERVIEWS TWO AND THREE - TEACHER

Scheduled Time:	60 minutes, end of Term Two 60 minutes, end of Term Three
Participants:	Participant for the interview - one teacher from primary school A
Aim:	The aim of the interview is to triangulate data and to follow up the observations. The interview will be used to gather more information to specifically answer the research question.
Purpose of the interview:	An interview will be used to enable the researcher to gain a deeper understanding of one teacher's attitudes to the use of key competencies in their classroom programme. It will also provide an opportunity to explore the teacher's thoughts about the new competencies and how they work with the new curriculum. The teacher will be given an opportunity to ask questions or discuss other issues at the end of the interview.
Introductions	The participant is known to the researcher. They will be thanked for being available.
Interview Guide	
Refer to reflection notes since last interview and discuss.	
What changes have you made to your own pedagogy since the last interview with regard to BYOD? i.e. planning, everyday practice, assessment, day to day planning	
What have you changed in terms of integrating the device into the classroom programme? i.e. do you have specific curriculum areas you are using devices in/specific programmes you are using? Have you used any specific strategies or methods that you can tell me about?	
Have you had any PD? How have you upskilled yourself? Have you done anything to increase your skills and knowledge in using 1-1 devices?	
What have your successes been?	
What challenges have you encountered? How have you overcome these or managed them?	
How has this changed the way you plan/prepare for lessons? Why?	
Notes:	
Check on the reflections process and guidelines, discuss timeline for reflections and follow up interviews, confirm next interview.	

APPENDIX G

SEMI-STRUCTURED INTERVIEW FOUR - TEACHER

Scheduled Time:	60 minutes, mid Term Four,
Participants:	Participant for the interview - one teacher from primary school A
Aim:	The aim of the interview is to triangulate data and to follow up the observations. The interview will be used to gather more information to specifically answer the research question.
Purpose of the interview:	An interview will be used to enable the researcher to gain a deeper understanding of one teacher's attitudes to the use of key competencies in their classroom programme. It will also provide an opportunity to explore the teacher's thoughts about the new competencies and how they work with the new curriculum. The teacher will be given an opportunity to ask questions or discuss other issues at the end of the interview.
Introductions	The participant is known to the researcher. They will be thanked for being available.
Interview Guide	
Refer to reflection notes since last interview, discuss.	
What changes have you made to your own pedagogy since the last interview BYOD? ie planning, everyday practice, assessment, day to day planning	
What have you changed in terms of integrating the device into the classroom programme? ie do you have specific curriculum areas you are using devices in/specific programmes you are using? Have you used any specific strategies or methods that you can tell me about?	
Have you had any PD? How have you upskilled yourself? What have you done to increase your skills and knowledge in using 1-1 devices?	
What have been the main problems or challenges you have encountered?	
What advice would you have for teachers new to BYOD?	
Notes:	
Thank the participant as this is the last interview.	

APPENDIX H

OBSERVATION SCHEDULE

Scheduled Time:	Ongoing observations over Terms two, Three and Four at times that suit the teacher
Participants:	Participant for the interview - one teacher from primary school A
Aim:	The aim of the observation is to corroborate information sources, gather more data, have more understanding of the case and allows the researcher have direct experience with the topic in real time and in real context (Yin, 1994, p. 80 and Stake, 1995, p. 62)
Purpose of the observation:	To identify how BYOD is being used in the classroom and what teaching practices are involved.
Introductions	The participant is known to the researcher. They will be thanked for being available. The class will be aware that I am going to be there to minimise disruption.
Observation	
Use of BYOD by teacher	
Storage of BYOD	
Specific teacher actions using devices	
Techniques employed e.g. blended learning/flipped classroom	
Notes:	
Thank participant. Make a time for next observation, remind and confirm interview time to follow up observation	

APPENDIX I

SUGGESTED REFLECTION/EVALUATION GUIDELINES FOR TEACHER

Date	Please make notes on any or all of the following: What particular changes have you made this week? Name a challenge and a success. (What is and is not working?) Name any particular strategies you have utilised and why?