A Critical Evaluation of The Implementation of Microsoft OneNote Class Notebook at One New Zealand Secondary School

by

Prasad Patchigalla

A thesis submitted to Auckland University of Technology in partial fulfilment of the requirements for the degree of Master of Educational Leadership

School of Education

Faculty of Culture and Society

2019

Abstract

Against the background of the national and international changes in education and educational technology advancements, this study critically evaluates the influences of digital technologies on teaching and learning in one New Zealand school case study school, by focussing on its school-wide introduction of Microsoft OneNote Class Notebook.

The literature on the use of OneNote Class Notebook and the nature of change that the implementation of this new educational software is limited, as the software is relatively new. Therefore, a critical evaluation of the introduction of OneNote Class Notebook can provide insights into the use of digital technology and applications such as OneNote Class Notebook in secondary schools. This study was conducted from the perspective of a transformative worldview with an interest in establishing the influence of change brought about by OneNote Class Notebook. Accordingly, this study explores whether the introduction of this software led to change that was transformational or simply transitional.

Data were collected using an anonymous online student survey, conducting focus groups with students, and undertaking classroom observations specifically focusing on the emergent influence and uptake of OneNote Class Notebook by teachers and students. The evidence points to the substantial use of digital technologies by all participants with findings presented under three major themes. Students and teachers were found to be using OneNote Class Notebook for content delivery and interaction. Teachers, however, used only the basic features of the software, with limited evidence of the participant teachers exploring the innovative teaching and learning potentialities of the software. The data analysis, interpretation and conclusions lead to recommendations to Microsoft in Education, and to the case study school's leaders and teachers, potentially contributing to the school's future digital strategies.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Ratna Prasad Patchigalla

Chapter One: Introduction

The Innovative Teaching and Learning (ITL) Research (2011) initiative is a multinational research collaboration sponsored by Microsoft's Partners in Learning. The focus of ITL is innovative teaching practices, including the use of ICT (Shear, Gallagher, & Patel, 2011). Drawing on the findings of ITL Research (2011), Fullan (2011) has concluded that: "powerful pedagogies and supportive ecosystems work together to produce the 21st century learning outcomes" (p. 6). In several countries, laptops and data projectors have replaced blackboards and chalk, yet the majority of students are still seen as consumers with little regard to problem-solving and critical thinking (Fullan, 2011). Student-centred pedagogies that extend beyond the classroom are essential, to broaden and deepen learning opportunities (Shear et al., 2011). While there is a debate about the use of digital technology in education, Apple, Google, and Microsoft, are already offering tools for primary and secondary schools to meet the increasing demands of digital technology. These include 'classroom' packages for schools delivering and accessing content and assignments using collaborative platforms, where teachers and peers can digitally offer and receive feedback. With these rapid technological advancements and the growth of knowledge-based economies around the world, educational systems have been criticised as being notoriously slow to respond to change and innovate. Others see the intrusion of the multinational companies as simply looking to extend their market into education.

In 2017, the New Zealand Minister of Education, Nikki Kaye, announced that education was shifting into a "digitally oriented system" (Ministry of Education [MoE], 2017), in response to growing concerns as to the shortage skilled labour in the technology sector. The McKinsey Global Institute (Mourshed, Patel, & Suder, 2013) has predicted that by 2020, there will be a shortage of 85 million high to middle-skilled workers. Although the role of education and schooling is arguably beyond preparing students just for employment, digital technologies have been made a priority in the New Zealand Curriculum (MoE, 2007). This prioritisation has been adopted so as to equip young New Zealanders with the knowledge, skills, and competencies they require to transit from education to employment. This is in line with; changes in the United Kingdom (Department of Education, 2013); initiatives in computer science education in the United States (The STEM Act of 2015, Department of Education); the updated European Computer Drivers Licence (ECDL), also referred to as International Computer Drivers Licence

(ICDL) outside of Europe (ECDL Foundation, 2018); and Digital Technologies in the Australian Curriculum (Australian Curriculum, Assessment and Reporting Authority, 2015) .

The New Zealand government is spending $40 million on raising teachers' skills levels from 2018, with a transition period of two years (MoE, 2017). By 2020, it is anticipated that all schools will provide a 'digital technology education' curriculum, that will involve all students from years 1-10. These changes will place digital technology in education under two categories: digital fluency and digital technologies. Digital fluency combines core skills of critical thinking, information literacy and digital competencies in the digital environment (Miller & Bartlett, 2012). This implies that all students and teachers will be expected to know how to safeguard themselves, and others while navigating the virtual world. A digitally fluent user utilises tools for educational, recreational and administrative purposes while keeping themselves and others safe. Digital technologies were reintroduced as computational thinking for digital technologies and design for developing digital outcomes. These two technological areas and unique Māori content (MoE, 2017), concern the tools and techniques for creating new technologies. In other words, these two new areas teach students how to "think for computers" that will lead to designing and developing digital outcomes, like apps, databases, websites, networks, robotics and interaction with computers.

Against the background of these national and international changes in education and technological advancement, this study critically evaluated the use of digital technology and Microsoft OneNote Class Notebook (ONCNB), in the context of digital fluency at a New Zealand state secondary school. It also considered whether the influence of the school-wide implementation of ONCNB was transitional or transformational to the case study school. The school will be cited as 'New Era College' (NEC) in this thesis. Even though the changes to the technology learning area may widen the scope of education, this study is limited to evaluating the use of digital technology, in line with extent research on Technology integration, ICT integration, learning with digital technology and e-Learning.

Rationale

In 2014, Microsoft developed a new teaching and learning tool known as OneNote Class Notebook Creator. This was a digital platform that allowed teachers to create a digital classroom. As reported by Salman (2014), the software has become one of the most powerful

tools for helping teachers and students to move away from a traditional approach to teaching and learning, owing to accessibility on any device anywhere and anytime.

The school-wide implementation of OneNote Class Notebook at New Era College (NEC) in 2015, has had implications for teachers and students. Before the implementation of OneNote Class Notebook at NEC, teachers and students used the O365 SharePoint Sites as their primary platform for e-learning. This application worked as a content library with limited interaction between teachers and students.

An essential aspect of this study was to determine whether the change of digital platform from O365 SharePoint to OneNote Class Notebook, was going to be transformational or transitional. The change could only be considered to be transitional if teachers and students perceived the move from SharePoint Sites to OneNote Class Notebook as no more than a natural progression within the status-quo, as both Sites and OneNote portals are part of the Microsoft Office 365 suite of applications. If, however, the change was perceived as moving away from the status quo, through innovation into a disruptive space, then the change could be seen as transformational.

The literature on the use of OneNote Class Notebook and the nature of change that the implementation of this new software brings is limited, as the software is relatively new. Therefore, the evaluation of the implementation of OneNote Class Notebook and exploration of whether the change was transformational or transitional, provides not only useful data for a case study but contributes new knowledge to the field of educational use of similar learning technologies in New Zealand.

Case study

'New Era College' (NEC) is a state co-educational high school that opened its doors in the early 2000s. The school's roll was 1950 in 2018 including 200 fee-paying international students. The students were predominantly Asian (43%) and New Zealand European/Pākehā (41%) with a small percentage of Māori (6%) and Pacific (6%) learners (citation withheld to protect the school's identity). The unique characteristics of the school included: a rich information and communication technologies (ICT) environment, with a fully implemented Bring Your Own Device (BYOD) policy; flexible learning spaces; clear expectations of learning and behaviour for all students and staff; and, high expectations for academic

achievement balanced with the development of character around the core values of respect, excellence, integrity and empathy.

In 2009, case study school partnered with Microsoft in Education received recognition as Microsoft Global Showcase schools. According to Anthony Salcito, Vice President of Worldwide Education at Microsoft Corporation, Showcase Schools were characterised by thoughtful leaders, who empowered educators and students to re-imagine and re-design leading, teaching and learning (Salcito, 2018). This recognition gave exclusive access to regional and global professional development opportunities for school leaders and teachers, who were in turn recognised as Microsoft Innovative Educator Experts (MIEEs). While reaching out to local and regional communities, the school leader-learners worked together to acquire knowledge about global trends in education and test new Microsoft solutions. These included the O365 suite of products, such as OneNote Class Notebooks, and adjusting these tools to meet the specific needs of their communities while providing valuable insights for product developers at Microsoft. In effect, the school leaders in the case study school implemented the Class Notebook part of OneNote in 2015, as part of the Global Showcase schools partnership agreement.

Research positioning

As a staff member at NEC, I participated in professional development and discussion surrounding the use of digital technology and associated pedagogies with senior leadership, middle management and teachers from 2015-2017. During that time, I became interested in evaluating the use of digital technology regarding OneNote Class Notebook to understand how this implementation might influence teaching and learning. During the research, I positioned myself as an outsider, focusing on change brought about by the implementation of OneNote Class Notebook and by studying the context and setting of participants, validating the accuracy of findings, interpreting the data, and creating an agenda for review by NEC. The outsider perspective on the study helped me to be aware of any bias.

In my research, I sought to provide a voice for the participants, raising their awareness and the influence of change brought about by OneNote Class Notebook. As the researcher, I proceeded collaboratively with the participants with a view not to further marginalise individuals or groups who were traditionally disenfranchised and invested in their oppression to resist change (Freire, 1998).

Research questions

The study was framed by the following questions and sub-questions:

What can be learnt about the influence of digital technology and its effect on teaching and learning in a secondary school, through the introduction of a specific software application?

• What was the nature of educational change associated with the use of digital technologies for teaching and learning?

• What was OneNote Class Notebook, how did it differ from other similar tools, e.g. Google Classroom, and what was its significance as a digital learning tool?

• What was the emergent value of the OneNote application to teaching and learning to the case study school?

• In what ways could traditional methods of teaching and learning have achieved the same outcomes as using OneNote Class Notebook?

Design and participants

The research was designed to incorporate a range of methodological tools. I developed an anonymous survey containing both open-ended and closed questions. Responses were collected from 108 students, representing about 5% of the total school population. Further data were collected from a student focus group of 5 students from Year 12 and 13 (16-18 years); and finally, from classroom observations of six different classes from Year 12 and 13 taught by six different teachers. These six observations of 30 minutes and post-observation discussions occurred throughout one school term in 2018.

Thesis organisation

The current chapter presents the background and rationale for the research. A brief overview of the case study and researcher positioning is considered, as well as a summary of the data collection methods. Chapter Two provides a critical summary and analysis of the relevant literature related to the research questions. This chapter identifies and critiques the main thesis: change management and leadership; the role of digital technologies in education; the relationship between people and digital technology; and, an evaluation of the implementation of specific digital learning tools. Chapter Three describes and justifies the research methodology and research methods used in the study. The process of data analysis is discussed and critiqued. Finally, triangulation and the ethical considerations relevant to the research are considered. Chapter Four explains the findings from the participant students and teachers. The emergent themes from an online questionnaire, focus group, classroom observation and post-

observation discussions with teachers are subsequently discussed. Chapter Five considers the major findings of the study. The findings are presented in themes, which gives meaning to the research questions and the literature reviewed. Chapter Six brings together the findings from Chapter Four and the discussion from Chapter Five, to present five major conclusions in relation to the main research question and sub-questions.

Chapter Two: Literature review

An important aspect of this research study is to establish whether a change of digital platform from O365 SharePoint Sites, to OneNote Class Notebook, was going to be transformational or transitional. The change would have been transitional if teachers and students perceived the move from SharePoint Sites to OneNote Class Notebook as no more than a natural progression within the status-quo, as both Sites and OneNote portals are part of the Microsoft Office 365 suite. If, however, the change was perceived as moving away from the status quo, through innovation into a disruptive space, then the change would be transformational. In that scenario, the traditional role of the teacher changes to 'facilitator of learning' or 'learning coach' and school leaders become agents of change leadership (Benade, 2017).

Digital technologies have influenced and affected education in New Zealand secondary schools by offering new and innovative ways of learning. This literature review provides a critical summary and analysis of the literature that offers insights into the research question - what can be learnt about how digital technology has influenced and affected teaching and learning, in secondary schools, through the study of the introduction of a specific software application in one case study school? In this chapter, I provide a narrative of the educational use of digital technology in the literature. The key themes, which repeatedly emerged throughout the literature were: change management; the role of digital technologies in education, the relationship between people and digital technologies; and the evaluation of the implementation of specific digital tools.

Theme 1 Change management and leadership

New Zealand secondary schools are today encouraged to transform teaching to create enhanced learning for students (MoE, 2017). There are a few schools in New Zealand who claim to have gone through the transformation process and are showcasing innovative practice. These 'modern schools', and pockets of teachers in 'traditional schools', are known for their innovative approaches, advocating for 'future-focused' teaching and learning practice. There may be, however, confusion between transition and transformation. While transition, might be seen as a natural evolution and adaptation to educational and technological trends, transformation is disruptive and includes: "re-conceptualising the physical, organisational arrangement of students, the approaches to curriculum and assessment, and the structuring of the school day" (Benade, 2017, p. 56). However, how do leaders manage transformational

change in addition to managing the change process? Change is uncomfortable for many individuals, and poorly managed change can lead to conflict (Benade, 2017). Gill (2002) contends that the lack of effective leadership, coupled with poor management causes conflict and or resistance to change.

Leaders managing the change process

As pointed out by Levin and Schrum (2012), leaders may manage the change process through collaborative reflection, and open discussion, aligning the school's mission with teacher expectations if they are to be successful. Leaders managing change need prior preparation, by clearly defining the change initiative, evaluating the climate for change, developing a change plan, and selecting defined roles, goals, and expectations (Botkin, 1999; Jensen, 2000; Mento, Jones & Dirndofer, 2002). The staff involved need to be committed, competent and share the same goals before implementing the change process. In addition to the above preparations, the leaders must create a culture fit for a sustained change. Having specific milestones, the leaders' team can create small wins for motivation and provide feedback during the journey. As the change continues, the leaders may continuously and strategically communicate the progress made to the staff (Botkin, 1999; Jensen, 2000). To ensure that the morale of the staff remains positive, plans need to be flexible, so that finally, a review may be conducted to evaluate the knowledge gained and disseminated (Mento et al., 2002)**.**

A precursor to transformational change demands time spent establishing relationships and building a supportive culture. A supportive culture is characterised by a sense of trust, and it falls to the leader to build that culture as pointed out by McKenzie (2014). A school culture, built on principles of trust, support, openness to change, and a commitment to lifelong learning by all stakeholders, takes time to develop. Building relational trust is a core skill that leaders are required to develop, which includes a positive attitude to innovation and utilising digital technologies. Leaders spending a significant amount of time with staff and students, developing a shared understanding can lead to staff and students, to seek the same goals in the adaptation of digital technology. The fractal nature of broccoli (Mackey, 2015), is a representation of this model, where each part of the broccoli looks like the whole. Digital technologies in a high trust model can enable all users to visualise a similar purpose for both teaching and learning, that may lead to transformational change.

A clear vision or re-visioning process, that embraces emerging technologies and associated pedagogies, can help guide a school community. Kotter (2012), defines vision as a statement that is meaningful, inspiring, imaginable, quotable and feasible. A vision can foster change, though this begins with the identification, and subsequent rejection of the status quo (Kotter, 2012). A vision can harness commitment, motivation, and connection between people intellectually, and emotionally. This process of re-visioning or creating a new vision can lead to successful outcomes (Baum, Locke & Kirkpatrick, 1998).

Having a clear vision, and a distributed approach to leadership encourages staff to lead technology-enabled pedagogical innovation. A high trust relational model may encourage teachers to take risks and develop greater flexibility in their pedagogy. As pointed out by Romrell, Kidder and Wood (2014) transformational learning supported by digital technology, can offer truly personalised and connected learning. The risks are not a reckless effort to try new methods; rather, they provide the freedom to try new things with the goal of improving students' learning.

Connecting the vision to learning experiences by observing, advising, and supporting classroom teachers, requires a balance, as suggested by Mackey (2015), between expectations and teacher autonomy. This balance can be maintained through dialogue and decision meetings. In dialogue meetings, teachers anticipate their new methods may be questioned and evaluated. These dialogue meetings provide opportunities for teachers to reflect on their practice, express their thoughts, and listen to other staff perspectives, without the pressure of making decisions as new methods. Decision meetings may happen when everyone understands the implications of new pedagogical innovation. By this means, there may be greater ownership of transformative change, employing digital technologies (Mackey, 2015). Gaining a common understanding and consensus on emerging technologies and associated pedagogies is a challenge that schools are now facing, especially as educational and technological changes can challenge teachers and students to change their practice. This can add to staff workload pressure and can result in high levels of additional stress for teachers (Benade, 2017).

The influence of school strategic change on teachers' practice

Teachers are currently in a state of confusion, uncertain as to whether to trust traditional approaches and those that place more responsibility on their students. In effect, they are forced to rely far more on digital technology to provide learning experiences. Benade (2017) has

challenged the marginalisation of the 'invisible teacher', as a consequence of these shifts brought about through digital pedagogies. Transformational leadership, (Dubrin, 2001, as cited in Gill, 2002) is about helping teachers understand the reasons for change, both emotionally and intellectually, so as to empower teachers for action. In other words enabling educators, to take risks, and implement new ideas and innovative teaching practices (Kotter, 2012).

It is well documented (Groundwater-Smith, Ewing, & Le Cornue, 2001), that the role of a teacher has become increasingly complex, with the increased demands of the curriculum, such as pastoral programmes, and social education. In addition, there is an expectation that staff will be using digital technologies. As a result, the focus of learning has changed from arriving at a pre-determined destination to valuing the process involved, which may or may not be the destination that the teachers are familiar with. Schools are required to: "prepare young people for what lies ahead" (Macdonald & Hursh, 2006, p. 129). Yet the very real fear of not meeting required goals, such as those set by the Ministry, or school management, or assessment procedures, overshadows thoughts of innovation.

Theme 2 The role of digital technologies in education

Change is indicative of the teaching profession, and teachers are always expected to change (Hargreaves, 1994). Digital technologies are changing and are playing an integral part in 21st century schooling (Moyle, 2010). Dumont and Istance (2010) have suggested that the ubiquitous access to technology will provide 'bedrock foundations' to accommodate the change in education, so that technology is seen as part of every teaching and learning event. The role of technology in, and how digital technology shapes, the identities of the participants are explored in the following sub-themes.

Quality and quantity of digital technologies in secondary schools

Digital technologies are ubiquitous; they are present in secondary schools as they are in other workplaces. Digital technologies in secondary schools may include computers loaded with productive, creative, educational software and web 2.0 technologies, touch screens, interactive whiteboards, data projectors, virtual reality, augmented reality headsets and mobile devices like tablets, and smartphones. All these technologies are what Lei and Zhao (2007) term as, 'quantity of technology use'. They refer to these devices as digital tools, Information and Communication Technology (ICT), new technologies or novel technology in the literature. But the New Zealand Curriculum (Ministry of Education, 2007), makes it clear 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" (p. 36). This signals a shift in focus from quantity to the quality of technology use. This shift has been reinforced in the revised Technology Curriculum (2017), strengthening the position of digital technologies in the New Zealand Curriculum (MoE, 2017).

The 2012 Programme for International Student Assessment (PISA) round reported that 88% of students used computers for leisure activities (Organisation for Economic Cooperation and Development [OECD], 2015). This report suggested that current students who are at ease with digital technologies and multitasking may not, therefore, be using digital technologies for learning. Arguably, the use of digital technologies in schools has not been seen as a 'silver bullet', that will guarantee personalised learning, and give students control of their learning (Green, Facer, Rudd, Dillon & Humphreys, 2005). As Benade (2017) has pointed out, schools and teachers still have a valid role to contribute to students' learning, with regard to the use of these new tools contributing to the quality of technology use. Otherwise implementing new digital tools adds to the quantity of digital tools with no apparent benefit to students. Ready access to the World Wide Web has opened up new learning and has enhanced the research skills of student users. Additionally, accessibility and portability of devices requiring only a live Internet connection to permit access to learning resources means that an 'anywhere, anytime' mindset, has taken hold among students. Digital technologies can enable teachers to support their students to engage in learning, and those who ignore digital devices and applications may be doing themselves and their students a disservice (Benade, 2017).

The educational use of technology is sometimes overrated owing to the presumption that technology is driving the learning. Selwyn (2015), believes that this talk is on a 'slippery slope', as it often implies a core relationship between education and technology. Evocative words like 'impact', or 'transformation' assume that technology leads to significant improvements in educational outcome when these terms require more critical scrutiny (Selwyn, 2015). As Frankfurt (2005) observes, the language used to support the impact of educational technology is often excessive: "without any regard for how things really are" (p. 30). Frankfurt (2005) points out that in the past 100 years, education has remained largely unchanged by technological innovation. Empirical research has been equivocal about 'learning', that can be said to result from the use of digital technologies. Selwyn (2015) has questioned why these complex realities have been ignored, challenging the use of buzz-words and suggesting that more objective and less emotive descriptions be adopted. For example, collaboration be

changed to co-operation, digital classroom to digital resource dumps. Honest declaration of the likely consequences of digital technology use, and encouraging a greater diversity of people to speak up about education and technology, are some of his suggestions to improving the integrity and overall impact of this field (Selwyn, 2015).

Learning identities shaped by digital technologies

In addition to the abundant use of digital technology and discussions on its influence and affects on teaching and learning, Loveless and Williamson (2013) point to learning identities shaped by socio-technical systems in the 'digital age'. The literal meaning of socio-technical systems is a "combination of organisational, technical, educational and cultural structures and interactions" (Herrmann, 2003, p. 60). These new socio-technical systems and new identities, shaped by these systems, must be carefully understood in the context of the role of digital technologies in education. These systems are open and interact with their environment while also remaining closed by creating their own behaviour, depending exclusively on their own inner structure (Varela, 1981), whereas technical systems are created and controlled externally. In this context, the social and technical systems appear to be fundamentally different. However, Loveless and Williamson (2013), advocate a view that: "technology is inextricably a part of society" (p. 6); since, "all technological devices and systems are both socially shaped and socially shaping" (p. 6); and, "technology and society are in a reciprocal relationship" (p. 6). The new identities shaped by socio-technical systems may consider a new approach, that gives equal weight to social and technical issues when new systems are designed (Mumford, 2000). In this new approach, schools may consider building social capital by developing a community-oriented social-identity (Herrmann, 2003), providing mobile and ubiquitous learning opportunities, independent of limits of time and space enabled by technology. Digital technologies in education may not just be stimulating a debate on the quality and quantity of technology use, but envelop socio-technical systems that are shaping learning identities.

Theme 3 The relationship between people and digital technologies

A recent analysis conducted by Boyd (2014) concluded that the use of digital technologies is 'complicated'. It is complicated because our perceptions of the relationship between people and digital technologies do not match. A closer look at the relationship between students and digital technologies, and the relationship between teachers and digital technologies may clarify the use and 'usefulness' of digital technologies in schools.

'Digital natives' and 'digital immigrants'

Current school students were born at a time when Wi-Fi had become more widely available. They are capable of multitasking with multi-sensory, multi-modal digital devices for learning and consumption of digital content for entertainment, whereas many teachers have predominately learnt through print media, completing one task at a time. This has now become a recognisable gap between teachers, as 'digital immigrants', and students as 'digital natives' in terms of digital competence (Prensky, 2001). These descriptors have gained traction, owing to a common-sense understanding that native speakers are more fluent than immigrants. Although Prensky (2011) later corrected himself, this problematic distinction has persisted. Several studies (as cited in Kennedy, Judd, Dalgarno, & Waycott, 2010), have explored this 'clash of cultures', between teachers and students. These studies: "resulted in a general acknowledgement that Prensky's ideas were at best an oversimplification of the nature of the staff and students' use of technology" (Kennedy et al., 2010, p. 339). The literature suggests moving on from an age-based divide, to look towards technological competencies that may lead to improvements in the quality of teaching and learning. In other words, the usefulness of technology is more important than the use of digital technology (Bennett & Maton, 2010).

Students' and Teachers' use of digital technologies

The evidence from PISA (OECD, 2015) and Hattie (2012), have concluded that increasing access to, and use of computers for, and by students, is unlikely to significantly improve educational outcomes. The positive effects of computer use are seen as limited to certain outcomes and uses of computers (OECD 2015). It is time to look at the 'usefulness' and 'helpfulness' of digital technologies in the teaching and learning environment (Henderson, Selwyn, Aston & Finger, 2015) rather than getting stuck within terminology such as 'digital natives' and 'immigrants' in schools. 'Usefulness' refers to the use of digital technologies for learning, and 'helpfulness' denotes the administrative use of digital technologies to manage processes logistically. Kennedy et al. (2010), concluded that the current generation of students encompasses 'power users' to 'basic users', when it comes to digital competencies, interests and dispositions. The assumptions that are under question are that students, in general, know how to use digital technologies and that they are better users of digital technology. While they may be more comfortable with emerging technologies, the conclusions of Kennedy et al. (2010) suggest that student ability to use digital technologies in innovative and novel ways to improve their learning outcomes needs to be explored further. The intentions of the revised Technology curriculum (2017), moving students from being consumers and users of digital

technologies to creators of new technologies (MoE, 2017) are ambitious. More so considering the view that current students are not necessarily 'digital natives', and the 'usefulness' of digital technology may be limited to convenience factors of learning.

Teachers are a special group of people with strong beliefs and convictions (Abbott, 2015). Upskilling digital competencies adds additional stress to teachers and their work. Each teacher identity is made up of personal identity and professional identity (Alsup, 2006), there being a constant tension between personal and professional, as they comply with requirements from external sources. Understanding teacher identity appears to be central to making sense of teacher response to the use of digital technologies in education (Abbott, 2015). As pointed out by Ertmer & Ottenbreit-Leftwich (2010), keeping up with digital technologies is like 'hitting a moving target'. Teachers' personal beliefs and convictions on the educational use of technologies, are based on their experiences (Ertmer & Ottenbreit-Leftwich, 2010; Tschannen-Moran & Woolfolk Hoy, 2007). Good experiences with digital technologies, backed up by evidence of improved outcomes, are necessary if teachers are to make effective use of digital technologies. Teachers believing in themselves and having confidence in what they do also has a strong link with student achievement (Goddard, Hoy & Hoy, 2004).

Beveridge and Lorraine (2017) have concluded that teacher engagement and ownership shows itself when they plan and implement professional learning. This will ultimately build school capacity when it is collaborative, data-driven, locally-based and incorporated into teachers' everyday work, and part of a wider school change and systems agenda. Translating the everyday use of digital technologies into the academic context is, however, not easy, as a result of a lack of consensus on the use of digital technologies (Bennett & Maton, 2010). Therefore, age-based generalisations may not help to clarify this complicated topic of digital technologies in education.

Theme 4 The evaluation of the implementation of specific digital technologies tools

Reiser & Kegelmann (1994) have concluded that evaluation methods must include "students as participants in the evaluation process … and the process is incomplete if they do not include an examination of how a software program affects student learning" (p. 68). Within this theme, the emergent value of OneNote Class Notebook to teaching, and analytical tools like the SAMR

model, and 21st Century Learning Design and Taxonomy can be employed and explored to help evaluate the implementation of OneNote Class Notebook.

Emergent value of the OneNote Class Notebook to teaching and learning

To date, the innovative applications of educational software are sporadic at best (Conole & Alevizou, 2010). Implementing new educational software tends to replicate teacher-centric, 'chalk and talk' methodology, instead of allowing innovative ways of teaching and learning that the software is intended for. Conole and Alevizou (2010), have suggested that a much-anticipated change may not appear very soon, when there is a minimal indication of a transformational tipping point, from traditional teaching methods to innovative teaching and learning. Analytics, derived from user interactions with software, and corresponding improvements in student outcomes, have been used to inform educational practice (Greller & Drachsler, 2012; Pardo & Kloos, 2011).

While older learning management systems (LMS), like Moodle and Blackboard, remain popular, maintaining centralised control for teachers, the new generation of LMS like Google Classroom, and OneNote Class Notebook, are gaining in popularity. They are popular because of their ease of use, and after several iterations, offer powerful online tools, that empower teachers and students to connect, create, collaborate, and facilitate learning (Guhlin, 2016). Google Classroom and OneNote Class Notebook are similar, with OneNote Class Notebook going one step further, by offering a digital inking feature for drawing and annotating content. OneNote also serves as an e-Portfolio, that can integrate with a variety of learning management systems, including Google Classroom.

Use of analytical tools to support the evaluation of an implementation process

Any analytical tool on its own may not be enough to evaluate an implementation process, because of the inherent complexities, when teaching with technology. Some of the tools discussed in the literature can be used together, to support the evaluation of an implementation process, though they are there to evaluate the use of technology and not the learning.

SAMR Model

The Substitution, Augmentation, Modification and Redefinition (SAMR) model, is a four-level taxonomy-based model, for selecting, using and evaluating the use of technology in schools (Puentedura, 2006). At the substitution stage, technology is used as an alternative tool with no

real change in the learning process. This could be a pdf document emailed or uploaded to an online learning management system, instead of printed handouts or a digitised version of the same learning material. At the augmentation stage, technology is used as substitution with improvements in terms of the function of the task. For example, providing worksheets to identify a species of fish can be augmented with video, audio and static pictures on the screen. According to this model, the learning activities that use digital tools as substitution and augmentation of existing activities may enhance the use of technology for learning. At the modification stage, the technology redesigns the task. Instead of handing out a paper resource on a food chain, the learning can be redesigned by asking the student to create a digital poster that shows an understanding of a food chain using pictures, audio and video. Finally, in the redefinition stage, where technology has the greatest impact (Puentedura, 2006), an augmented reality mobile app might be employed for writing essays. The app on the phone uses GPS to pinpoint the student location, descriptions of the things around that student would be displayed over the image seen through the phone's camera. Students can then record their voice, describing their experience; using those descriptions, they can then use their recorded data to write an essay on their trip to the local mall, or popular tourist destination. This would not have been possible without technologies like augmented reality, GPS, phone cameras, and voice recorder. These learning activities that use digital technologies as substitution and augmentation of existing activities may enhance learning experience, whereas the learning that uses digital technologies, to modify and redefine existing learning activities, could transform the learning process (Romrell et al., 2014).

Even though Puentendura (2006) developed the SAMR model as a way for teachers to reflect on their use of technology in their practice, it was not about enhancing and/or transforming learning as focussing on technology, for transforming learning would be a 'wrong driver' as advocated by Fullan (2011). Despite the potential and popularity of the SAMR model, the model has been criticised because of the "absence of context, *(and)* emphasis on product over process, and rigid structure" (Hamilton, Rosenberg, & Akcaoglu, 2016, p. 439). Therefore, the SAMR model is applied for its intended purpose – to evaluate the use of technology.
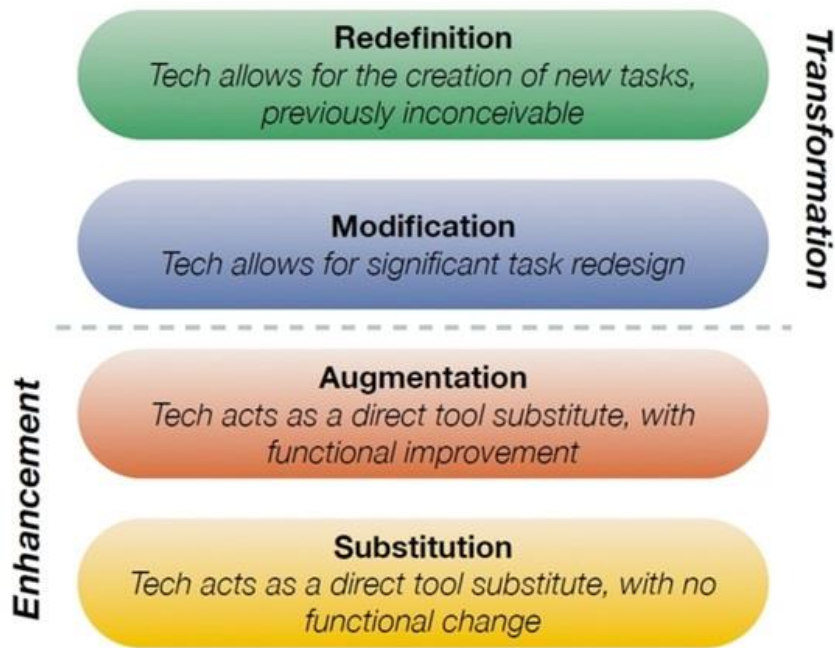
Figure 1: SAMR Model.

21st Century Learning Design (21CLD) Learning Activity Rubrics

The project, Innovative Teaching and Learning (ITL) Research (2011), developed the 21st Century Learning Design (21CLD) Learning Activity Rubrics. The 21CLD rubrics provide a framework to evaluate six typical 21st century skills: collaboration, knowledge construction, self-regulation, real-world problem solving and innovation, use of ICT for learning, and skilled communication. The rubrics for 'use of ICT for learning' in figure 2 can be used as an analytical tool to support the evaluation of the implementation of digital technologies such as OneNote Class Notebook in an organisation. At level 5, the highest possible score of this rubric, students are required to use ICT for knowledge construction and create an ICT product for authentic users.

Taxonomy of the use of educational technology for learning

Bruce and Levin (1997) developed a taxonomy for education technology learning, based on John Dewey's four natural impulses of a child: inquiry, construction, communication, and expression. In this taxonomy, technologies can be used as a media for learning through inquiry, construction, communication, and self-expression. Technologies can be used as media:

- for learning through inquiry, when they are used explicitly to facilitate the inquiry process, including a search through multiple databases and the analysis of retrieved

data;

- for learning through construction when they are used to support the constructivist approaches including Project-Based and Problem-Based approaches, that focus on knowledge construction and construction of artefacts as important for learning;

- for communication when they are used to communicate with teachers, other learners and experts outside of the education system. In this media of learning, a web portal with presentations, lecture notes, homework drop-boxes and collaborative spaces are mainly used for learning through communication; and,

- for learning for expression, when they are used for the "development of one's own voice" (Graves, 1983, as cited in Bruce & Levin, 1997) with a focus on self-expression that is found in theories of writing and other creative arts (Bruce & Levin, 1997).

The taxonomy of the use of educational technology becomes an analytical tool when all educational technologies are categorised into the four media for learning. In doing so, each

Use of ICT for Learning: Decision Steps
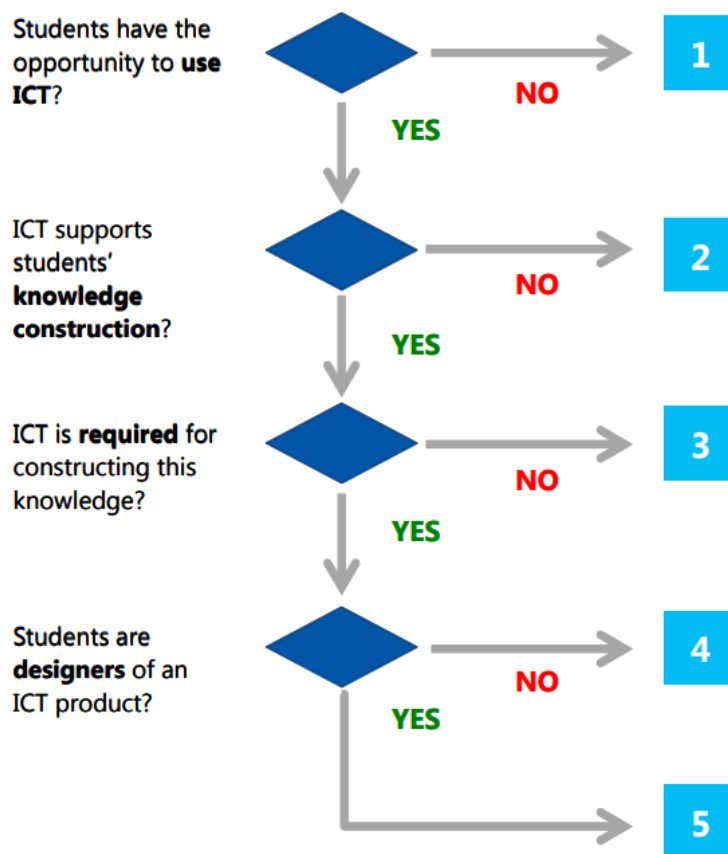
Figure 2: Use of ICT for learning rubrics. Picture was taken from ITL Research (2011).

technology can be analysed and evaluated according to this taxonomy. The combination of analytical tools like the SAMR Model, 21CLD Learning Activity Rubrics, and Bruce and Levin's taxonomy, may help evaluate the implementation of digital technology such as OneNote Class Notebook.

Conclusion

Digital technology has become an integral part of teaching and learning in schools, and a major vehicle shaping the economic, social and political context of a rapidly changing society (BuaBeng-Andho, 2012; UNESCO, 2002). This thesis builds on the influences and effects of digital technology in schools, considering the issues raised in this literature review.

The literature acknowledges that change is a feature of technology, and suggests that change management in conjunction with change leadership is required. Othwerwise, the lack of effective leadership and poor management may cause conflict and or resistance to change by teachers and students. At the same time, technological change, coupled with the educational change, add workload pressures onto teachers. The literature points to the tensions experienced by teachers as they are caught between personal convictions of tried and tested pedagogies and the potential benefits of digital pedagogies that lack strong evidence. As digital technologies are taking centre stage, students are assumed to be fluent and comfortable with all technologies ignoring the range of 'power users to novice users' of technology within the current generation of students. The literature highlights this distinction between 'use' and 'usefulness' of technology and the quality use of technology. While the current evaluation methods of technology are incomplete, the SAMR, 21CLD and Taxonomy of use of technology, may be used together, taking into consideration their intended purpose and limitations. Technology powered teaching innovation is a 'wrong driver' as Fullan (2011) termed it, but innovative teaching pedagogy fuelled by technology will have the intended impact (Fullan, 2011).

Chapter Three: Methodology

Introduction

This research is motivated by the curiosity to evaluate the influence of digital technologies such as OneNote Class Notebook on teaching and learning in a mainstream secondary school context. This curiosity has evolved into questioning the assumptions behind the use of digital technologies for improved educational outcomes. The intentions of questioning assumptions are to reform practice. In this chapter, I describe and discuss the methodology and methods used in the research study. The first section reflects on theoretical ideas, including the rationale behind the research design, and the ontological and epistemological assumptions. The second part explains why a case study methodology was employed, followed by a discussion of the methods and data analysis. Finally, there is a discussion of the ethical and cultural issues and limitations related to the research.

Theoretical ideas

In this project, I bring a transformative worldview. This is a worldview that holds: "an action agenda for reform that may change the lives of the participants, the institutions in which individuals work or live, and the researcher's life" (Creswell, 2014, p. 9). The significance of this perspective is that technology and education are creating a 'socio-technical' system that is shaping learner identity in particular ways, that can be marginalising: "this system is leading to the inchoate, messy and sometimes incoherent vision of the future" (Loveless & Williamson, 2013, p. 8). As an inquirer, I proceeded collaboratively with the participants, not with a view to marginalise them. Students are also often voiceless in research, however my interest is in how and whether the implementation of digital technology can bring about fundamental change; and ensure that the student voice is heard. At the same time, I hope to raise critical awareness of digital technologies and the influence of OneNote Class Notebook in their learning.

Ontology and Epistemology

As a researcher, the positioning I wish to use is the transformative worldview, where: "differing beliefs in the nature of reality (ontology) and the way in which we acquire knowledge of it (epistemology)" (Wellington & Davies, 2015, p. 6). The term 'worldview' is referred to as epistemologies and ontologies by Crotty (1998), while according to Creswell (2014), a worldview is: "a general philosophical orientation about the world and the nature of research

that the researcher brings to study" (p. 6). The ontological and the epistemological assumptions are often intertwined in daily experience, as pointed out by O'Toole and Beckett (2013). The lens I bring to this study is a transformative worldview with an agenda to bring change by raising awareness and the influence of change brought about by OneNote Class Notebook.

Design methodology

While the transformative worldview provides guidance for this research, the research methodology provides a framework to put together the research tools and apply "appropriate research rules" (Newby, 2010, p. 51). These research tools, employed in collecting data included an online survey, observations, post-observation discussions and focus groups. Added methods for data collection included note taking, audio recording and transcribing post-observation discussions, and conversations as described by Miles, Huberman and Saldana (2014). The methodology can be seen as how these tools were brought together in the toolkit, to address the specific research problem (Newby, 2010). The case study was the principal methodology used in my research study, which provided a bounded context for the research phenomena (Miles et al., 2014).

Approach – Case Study

The case study design incorporated a range of methodological tools. This study was a single case study, which treated the individual school as representative of a particular phenomenon (Newby, 2010), which in this case was the implementation of digital technology and its influence on teaching and learning. A case study design allows for a comprehensive analysis of the phenomenon rather than coverage (Newby, 2010). This required conducting an empirical investigation of the phenomenon within the natural context by using multiple sources of evidence (Yin, 2014). Similar views on the case study approach are expressed by Berg (2007) – who sees that this methodology allows researchers to gain a deeper understanding of how people operate when a particular phenomenon occurs in their context by capturing patterns and hidden elements. Case study methodology provides the opportunity for researchers is to gain insights into the real dynamics of people and situations (Cohen, Manion & Morrison, 2007). The benefits of the case study design are that it can draw on a wide range of data collection tools, providing rich data for analysis. The recommendations, while not generalisable, may offer lessons to other schools, in similar circumstances (Newby, 2010).

The 'case' in this study was 'New Era College'(NEC), a New Zealand state secondary school. This study focused on this individual school in its natural context, bounded by space and time. According to Hancock & Algozzine, (2017) case study research, is grounded in deep, and varied sources of information, that employs quotes from key participants, anecdotes, and narratives, composed from the post-observation discussions. This brings to life the complexity of the many variables present in the phenomenon being studied. Undertaking a case study meant selecting a design that matched the investigation. This type of design, selected for this study, was historical, focusing on the events and programmes that changed over time. As suggested by Hancock & Algozzine (2017), I attempted to gain the trust of the participants and used the data collection methods as unobtrusively as possible. The focus was on identifying factors to shed light on possible answers to research questions. During the study, I recognised and addressed inherent biases and predispositions that could have prejudiced an interpretation of the study's findings, to ensure the impartiality of the conclusions.

Methods – Online Survey, Classroom Observations, Post-observation discussions, Focus group

Research methods are tools used to collect data; whereas methodology is the logical approach to solving a research problem (Kothari, 2004). According to Wellington & Davies (2015), a methodology is: "the activity or business of choosing, reflecting upon, evaluating and justifying the methods you use." (p. 33). Therefore, the methodology is the entire process, whereas the methods are the tools used for the research data gathering process.

Online Survey

The first data collection method was an online questionnaire. An anonymous online survey in the form of a questionnaire was judged a suitable method to gather opinions and perceptions about particular issues in this study (Briggs, Morrison & Coleman, 2012). The online survey is a widely used method of collecting information without requiring the physical presence of the researcher. As Cohen et al., (2007) pointed out, it is a method to collect data quickly, from many people at once. The anonymity that the questionnaire offers encourages participants to express themselves freely, which might not be possible in a face to face interview. As illustrated by Wellington and Davies (2015), the potential for gathering free, honest expression through a well-designed questionnaire cannot be underestimated. The online survey was created using Microsoft Forms. The initial questions focused on students' use of digital technologies for

schoolwork and leisure, then moved onto students' the use of OneNote Class Notebook, and their perception of its usefulness.

The anonymous online survey was made up of both open-ended and closed questions. Open questions allow participants to justify their responses while avoiding the limitations of pre-set responses (Cohen et al., 2007), whereas closed questions such as multiple-choice questions, enable comparisons to be made across the responses of the participants. They are easy to code, and analyse, and do not discriminate against participants according to their ability to articulate their responses (Cohen et al., 2007). The responses were expected from 80-100 students, representing about 5% of the total roll of the school. By the time the online survey was closed, there were 108 responses.

The anonymous online survey was used because it is a popular method for quick collection of opinions and perceptions of participants in this study. The students could easily access the survey using their personal or school-provided devices to participate. The anonymity of the survey encouraged participants to express themselves freely. The in-built analytics in the Microsoft Forms made it easy to analyse the responses. Student participants were selected by a random sampling technique. After gaining permission from the Principal, I displayed a poster with a hyperlink to survey and an information sheet with research project details on Whānau noticeboard inviting the student participants of the school. The student online survey is outlined in Appendix A, and the student information sheet is outlined in Appendix B.

Classroom Observations and Post-observation discussions

The second data collection method was classroom observations and post-observation discussions with teachers. Classroom observation is a very useful research data collection tool, as it can give "insights into complex social interactions and physical settings" (Moyles, 2002, p. 174). The data was collected by writing notes during classroom observations. Six different classes from Year 9-13 taught by six different teachers were observed for 30 minutes each with a post-observation discussion of 10 minutes. This process took place throughout one school term (in 2018). In this approach, I positioned myself as a researcher, to collect participant meanings, focus on change brought by the implementation of OneNote Class Notebook, study the context and setting of participants, validate the accuracy of findings, interpret the data, and create an agenda for a review by the case study school (Creswell, 2014).

Focus group

Finally, data was collected from a student focus group of 6 students, from Year 12 and 13 (16-18 years). The focus group data collection was a valuable tool for gathering rich, detailed data from the perspective of the individuals who might ultimately benefit from research efforts (Asbury, 1995). The advantage of a focus group over other methods is that a small group of people provide qualitative data in a focused discussion that aids a researcher's understanding of the topic of interest. The combination of these characteristics in focus group interviews is not available in other types of interviews (Krueger & Casey, 2014).

The data collected using the above methods was qualitative data. The qualitative method of data collection is "usually an exploratory activity" (Wellington & Davies, 2015, p. 259). The qualitative data was in the form of words - responses to open-ended questions in an online survey, note-taking during classroom observations and post-observation discussions, which generated a lot of data. It was important that I collected enough data to use appropriate frameworks to analyse the data so that the qualitative data was not under-analysed as cautioned by Wellington & Davies (2015).

Tools – Analysis

As suggested by Creswell (2014), the data analysis must be consistent with the research approach and purpose. This is to avoid the possibility of a researcher's perceptions, biases, and the background leading to the findings telling more about the researcher, than the data collected (Cohen et al., 2007). It was thus important that I ensured the data described and attached meaning to the phenomena in the study. Therefore, I ensured that my coding scheme was coherent with the purpose of my study. According to Creswell (2014), coding is a process of zooming into the data for themes, ideas or categories and highlighting similar text with a code for further analysis. I used NVivo 11 software for storing, organising and coding the data collected. I used NVivo 11 'Nodes' to sort out data from various sources with the same ideas into various themes. The themes were: use of digital technology, learning approaches, significance, unrealised potential, and limitations of OneNote Class Notebook.

In addition to the above coding scheme, I followed six stages during this process, as suggested by Wellington & Davies (2015). These were: Immersion, Reflection, Taking Apart, Synthesizing, Relating and Locating data, and Presenting. During the Immersion stage, I immersed myself in note-taking while observing classes, actively reading the responses to

open-ended questions, and annotating transcripts of the notes. In the second stage, I reflected on the data and allowed the data to sink in while I stood back and pondered. In the third stage, I managed to break down the data into components by turning them into manageable units. I selected units that could be used, created categories and placed the selected units into categories. In the fourth stage, the categories were further refined to synthesise data. A continuous refinement occurred until the early categories were changed, taken out, or new categories created. In the fifth stage, I went through the process of comparing and contrasting these categories with the literature, by locating and relating my data. In the final stage, I presented the findings of data as clearly, coherently and attractively as possible (Wellington & Davies, 2015).

Analysing the quantitative data collected from the online survey was relatively simple and straightforward. The Microsoft Forms provided the analytics; I interpreted the analytics and concluded by returning to the research questions. Returning to the research questions is a "valuable tactic when faced with a large volume of data" (Wellington & Davies, 2015, p. 271) because the original research questions were used to guide and plan the research. Besides this straightforward analysis, I converted "quantitative data into qualitative data" (Briggs et al., 2012, p. 143). This means that I created profiles for particular result patterns, into more meaningful categories. These profiles developed, by converting quantitative data to qualitative, were helpful during data interpretation (Briggs et al., 2012).

Ethical considerations and possible limitations

As a researcher, researching my workplace, I acknowledge that I am in a position of power when collecting, analysing and interpreting data collected from students and teachers for my research (Mutch, 2013). Because the purpose of the exercise was for research, I had to maintain a researcher's mindset and be highly self-reflective and follow ethical principles to guide my actions. According to Wellington and Davies (2015), the term, 'ethics' refers to the moral principles that guide the conduct of a group or a profession. Some of the general ethical considerations are outlined by Mutch (2013) include:

- to adequately inform the participants of the purpose of research;
- ask for voluntary participation with a right to withdraw at any stage of the study;
- inform the length of time data will be kept and possible venues where the research finding might be published;

- assure participants of privacy;
- provide a safe environment for participants and the researcher, where they are not subjected to physical, psychological, emotional, or cultural harm; and,
- The participants should know who to approach if they have concerns about the conduct of research.

The ethics were considered not only at the beginning but throughout the research (Mutch, 2013). Wellington & Davies, (2015) have pointed out that a higher level of ethics has to be observed in educational research, because in educational research "people are studying people" (p. 112). If great care is not taken, "educational research might be unethical in its design, its methods, its data analysis, its presentation or its conclusions" (Wellington & Davies, 2015, p. 113).

This research was guided according to the principles and guidelines of the Auckland University of Technology Ethics Committee (AUTEC). Throughout, it was important for me to consider these guidelines, to protect myself, and those participating in my research. The key principles were: informed and voluntary consent; respect for social and cultural sensitivity; minimisation of risk; truthfulness including limitation of deception; social and cultural sensitivity including a commitment to the principles of the Treaty of Waitangi; and, research adequacy and avoidance of conflict of interest (AUTEC, 2016).

As a researcher conducting this study at my workplace, I was an 'insider', with a new set of issues to consider besides the general guidelines mentioned above (Mutch, 2013). There were, however, obvious advantages to choosing my workplace: I had access to resources and materials; and, knowledge of the history and progress to date on the use of digital technologies for teaching and learning. I was also able to fit my research around other duties while maintaining credibility with the participants. To avoid any potential conflict of interest, I did not research within the department that I led. Despite other disadvantages, such as a possible lack of objectivity, I avoided or minimised disadvantages by implementing my code of ethics listed in Appendix J. As Smith (2012) has suggested, I had to be as ethical and respectful, as reflexive and critical, as an outsider researcher.

Before the study

After obtaining ethics approval from AUTEC, I wrote a letter to the Board of Trustees of NEC with details of the research and requested permission to conduct the research. Upon receiving

permission from the Principal, I displayed a poster with a hyperlink to the online survey and an information sheet with details of the study on each Whānau noticeboard, for informed and voluntary participation (O'Toole & Beckett, 2013) for the online questionnaire. The information sheet, and the introduction to the online survey, clearly stated that participation was voluntary and that they were giving consent for this their responses to be included in the research by completing the survey. When I prepared the questionnaire using Microsoft Forms, I chose the option 'anonymous'. By choosing this option, I was not able to identify the participants responding to the questions. To obtain informed and voluntary participation in the focus group, I displayed a poster, information sheet and consent form on each Whānau noticeboard. To obtain informed and voluntary participation by the teachers, for the classroom observation, I displayed a poster, information sheet and consent form on the staff noticeboard. All participants were assured of privacy and confidentiality.

During data collection

I regularly checked the online survey for responses and closed the survey once the desired number of students had responded. During the classroom observations, I asked teachers who consented for me to observe their classes, to briefly introduce me to the class by outlining the purpose of my visit to carry on with normal teaching routines. I sat in a corner and avoided any interaction with students and teachers. When I conducted the post-observation discussions face to face, I informed them that their responses would be stored in a secure place. I conducted the focus group during lunch breaks, so students' academic progress was not interrupted (New Zealand Association for Research in Education [NZARE], 2010), and to ensure that the study did not intrude into participants' time and space (Litchman, 2013). I provided biscuits and juice for students as a token of appreciation (Koha) in a classroom. The reason for conducting a focus group in a classroom was to provide a safe and respectful environment, for students to express themselves, as a requirement for sound ethical research (NZARE, 2010). The reason for providing food was to establish a relaxed and comfortable environment (Asbury, 1995).

Limitations

It is quite possible to collect a large amount of qualitative data out of fear of not having enough to analyse, then have little time for analysing and interpreting the data (Wellington & Davies, 2015). As advised by Youngs and Piggot-Irvine (2014), I made sure the research design was manageable for collecting and analysing data. Therefore, it was important for me to ensure that

the design was not too complex. Even though this methodology had limitations, I was able to use this methodology to deeply investigate the phenomena occurring in the case study school.

The second limitation was my lack of experience in conducting formal research. My research was guided, however, by an experienced supervisor, who has researched innovation in education using digital technologies.

The third limitation was researching my workplace, which could have led to a potential conflict of interest and possible bias. To avoid conflict of interest and bias, I developed and observed an ethical code of conduct (Wellington & Davies, 2015). Appendix J outlines this code of conduct, in addition to the general code of conduct discussed in this report, and guidance set by AUTEC.

Conclusion

A clear and concise methodological approach guided me in collecting, reflecting, interpreting and analysing the data in a meaningful and ethical way when conducting the research. While the methodology justified why particular methods were chosen, my discussion of methods explained the specific instruments used to gather and analyse the data. The lens used to analyse data was a transformative worldview, with an agenda to reform practice.

Chapter Four: Findings

Introduction

This research is a critical evaluation of the influence of digital technology on teaching and learning in one case study school, with specific reference to the school-wide implementation of OneNote Class Notebook. This chapter presents the participants' experiences and perceptions of the influence of digital technology and the implementation of OneNote Class Notebook. Three different methods were used for collecting data. The findings drew on data gathered from: an anonymous online survey; classroom observations, followed by post-observation discussion with teachers of those classes; and, a student focus group. One hundred and eight students from year 9 to year 13 participated in the anonymous online survey; six teachers, one each, participated in the classroom observations and post-observation discussion, and five students from year 12 and 13 (aged 16 and over), participated in a focus group discussion.

The data sets complemented on one another and were merged into themes, that answered the research question. The data analysis process, discussed in Chapter Three, established the emergent themes employing NVivo. The themes were:

- Use of digital technology;
- Learning approach; and,
- Significance of OneNote Class Notebook.

In this chapter, multiple perspectives from participants with specific evidence, and explanation under each heading were supported using graphics generated by Forms, a Microsoft application. Indented paragraphs were used for students' and teachers' transcribed statements identified by a code. For students, a two-letter code, e.g. RA, was applied, and for teachers, a three-letter code, e.g. SSA. As a result of using these statements, the presented findings became more realistic, providing richer insights into the participants' perspectives (Creswell, 2014) on the influence of digital technology. These findings contributed to answering the research question: **What can be learnt about how digital technology influences and affects teaching and learning at one New Zealand secondary school, with specific reference to the school-wide implementation of OneNote Notebook?**

Theme 1 Use of digital technology

As a Bring Your Own Device (BYOD) school, both students and teachers at New Era College (NEC) used several digital devices and software applications. All observed students had laptops in class. All participant teachers used their laptops and projected OneNote Class Notebook onto the whiteboard throughout the entire period of observation. Both teachers and students were observed to use digital devices and applications for a significant part of class time. During classroom observations, most of the students used only a laptop, with very few students using their mobile phones. It was beyond the scope of this study to look at whether the use of mobile phones was part of their learning, or for non-educational purposes. Notably, one of the six teachers mentioned that students should not use their mobile phones, and even warned them that mobile phones would be confiscated if they used them.

The results of the online student survey indicated that 70% of the students regarded a digital device to be either extremely, or very important for learning, but a small group, about 5% of students, thought digital devices were less important or not at all important. About 25% of students thought the computer was of some importance. The laptop was the most preferred digital device for learning. The graphs in Figure 3 indicate the importance and preferred digital devices from the students' perspective.

1. In your opinion, how important it is for you to have a computer device for learning?

More Details

Extremely important	28
Very important	47
Somewhat important	26
Not so important	6
Not at all important	1

2. What is your preferred digital device?

More Details

Laptop	90
Desktop	7
Mobile phone	10
Other	1

Figure 3: Importance of digital device.

During the focus group interviews, the student participants reported that they used laptops in class, and sometimes used mobile phones as well. This trend was identified during classroom observations and teacher post-observation discussions.

> RA: I mostly use digital technologies in class for learning and for just doing other things on it. I find that using the laptop really helps me go onto OneNote, and to really interact more with my work as well. I use my laptop in class, but the great thing about a laptop is that I can use it outside class like at home and stuff, … because I can use it wherever and whenever.

Advantages

The advantages of teaching with digital technologies were numerous from the participant teachers' perspective. The following extracts from teacher post-observation discussions reflect some of them.

> AHK: I have been teaching over 25 years and adapted to a lot of changes, and I really appreciate the changes brought about by digital technologies. One of the things that I find is student engagement. When I project work on the board the students can employ more than one sense, they see things, they can listen to things, and then they can process whatever they see at the same time - and I have more time for questions. Digital technology allows me to use several subject-specific and general apps, like Smart Class, Quizlet, Kahoot, OneNote and multimedia tools including casting. Even though some of the apps like OneNote are hard to get used to, I like them as they allow me to track my students' progress.

> ASA: Imagine drawing organic molecules, labelling and checking for accuracy on the board. Whereas if it is digital, all I have to do is display, dissect the structure, and break it down for students. Because the structures are correctly formatted, I have time to explain and students can understand better.

From my research journal during and after classroom observations, I noted that students and teachers appeared heavily reliant on OneNote Class Notebook mainly for content delivery and interaction during classroom observations. I concluded that this showed that teachers also used digital technologies for convenience, rather than tapping into the unrealised potential of digital technologies in general, and OneNote Class Notebook specifically.

For teachers, digital technology helped them keep all their content in one place, and allowed them to feel they were more organised. Students who were slow writers, and especially those who struggled with spelling and grammar, preferred digital technologies over writing on paper. They felt that their work was better presented than using paper. The following extract from the focus group interview summarised the advantages of digital technologies from the students' perspective and echoed the online survey as well.

> RA: I use digital technologies in class for learning and for doing other things. I find that using the laptop really helps me get onto OneNote, and to really interact more with my work as well… I can use it wherever and whenever. I prefer digital technologies as I get a lot more information from the Internet than from a teacher or a student in my class.

The participant teachers and students appeared to be happy and fluent with various digital technologies for teaching and learning process. Teachers expressed that digital technology was helping them explore possibilities that were not available to them in the past. They felt that student engagement with the learning activity and teacher interaction with students have improved because of the use of digital technology.

Disadvantages

The qualitative data from the online survey revealed some student concerns. Some students felt that they were forced to use digital technologies for learning by teachers since most of the activities were online. Many students also felt that digital devices were a distraction because they believed social media and games were more attractive than school work. Some students also believed that their eyesight was affected, as they had to use a computer for a longer time than required. Some were concerned at the lack of hand-written notes, that might negatively affect their ability to understand concepts, and when it came to writing their end of year exams.

The following extracts from the focus group interviews highlighted the concerns expressed by students.

> LG: I can get more notes into my computer by typing, but you do not necessarily connect with them; when you write them physically, it's easier to remember them. When everything is digital, it's hard staring at a computer screen for six hours. At the end of the day, your eyes hurt.

> SL: I think, the interaction between teacher and student is the most important part of learning, and digital technologies are replacing that interaction. Digital technologies flood me with a lot of information, and it just goes to nothingness. I feel digital technologies are a very good supplement, but the teacher guiding me through face to face interaction helps me sort out what is important and helps me learn better.

The teachers were positive and did not discuss any disadvantages with digital technologies, but students felt that the heavy reliance on digital technology was negatively affecting their learning and wellbeing. The main disadvantages from the students' point of view were the lack of face to face interaction with teachers, less opportunities to write on paper that might negatively affect their end of year examinations results, and too much screen time affecting eyesight that was leaving them to feel tired.

Theme 2 Learning approach

Three preferred learning approaches emerged from the online survey and focus group. The findings of those three learning approaches and sub-themes within each learning approach form Theme 2. The online survey results revealed that the majority of the students preferred a blended learning approach, where both digital and paper-based learning activities were used. Only 10% of

5. Is your preference to learn using: (Select one)

More Details

- Digital devices only — 10
- A blend, but more digital — 51
- A blend, but more paper-based — 47

Figure 4: Preferred learning approach.

students preferred a fully digital learning approach. The students were divided into two halves when it came to their preference for a blended learning approach. Figure 4 reflects this trend.

While the focus group revealed that the participant students preferred a blended approach, with a balance between digital and paper, there were concerns expressed in the online survey, that some students were relying too heavily on digital technologies. This qualitative data revealed that several students preferred a blended learning approach, as they believed research suggested it, but they did not mention any particular research.

Blended with more digital

The analysis of the qualitative data, collected from the online survey, focus group interview, classroom observation, and teacher post-observation discussions, revealed several reasons for preferring blended learning with more digital content. Nearly 50% of students preferred a blended learning approach with more digital content as it was more convenient or expected. Some students in this group expressed their preferred approach owing to the opportunities for new and different ways of learning. At the same time, there were contradictions within this group of student expressions. These students contradicted their personal preference for using digital content by citing the disadvantages of using digital content over paper-based learning activities. For example, data lost due to computer crash or accidentally deleting work.

The students who preferred a more digital approach did so because of digital practices:

- kept all the content in one place;
- content was less likely to be lost;
- it was easier to store and retrieve documents and notes;
- slow writers and those with bad handwriting benefited by typing their notes; and,
- it was easier to complete and edit any mistakes.

According to this group, the use of digital technology made it easier for research, collaboration and interaction. Compared to paper-based activities, this was vital for research-based work, as it offered more resources, and some tasks could only be undertaken on a computer. It appeared that the belief that digital was preferable to paper-based methods represented a personal preference. Some students in this group preferred typing to writing, as the presentation of their work was better structured and organised, whereas others preferred digital usage to save paper.

Although it was easier to write notes on a computer, some students in this group found they could remember more clearly when they handwrote their notes.

The view was expressed in this group of students that digital tools were preferable because digital technology was taking over occupations and schools, although knowing how to use a pen and paper was also seen as important, so both were needed. In line with this view, some preferred predominantly digital methods to help them to get used to what it would be like in the real world. In other words, they believed that digital skills were 21st-century skills. Many students preferred digital resources, as they allowed for more interaction, for example: 3D, simulations, graphing, animations and digital tools provided better presentation and explanation for a concept. Digital methods added significance (no reason was given), to learning, when the students had access to the Internet because they would have access to better resources anytime.

Within the same group, some students indicated that paper-based learning suited subjects like Mathematics and Chemistry, where several symbols and equations were used. They believed a paper-based approach supported their brain function by encouraging the brain's artistic element. In their opinion, paper-based learning helps students to retain information, and reinforce concepts, especially in Mathematics. They felt it was easier to write notes, draw diagrams and graphs on paper as the current technology did not allow for drawing diagrams and graphs. Some in this group felt paper was more reliable; they would write important things on paper, as something could go wrong with a digital device, and content stored on it could be lost. This expression contradicts the argument for the advantages of digital use. Some students preferred paper to reduce time spent on a laptop and while others preferred to rewrite on paper at home looking at their notes on a laptop.

The views expressed by the students who preferred blended learning approach with more digital content are related to ready access to information, the organisation of work, overcoming problems with spelling and handwriting with some hints of new and different ways of learning possibilities available through digital content.

A very small group (less than 10%) preferred digital only learning approach. The reasons given for their preference seemed more for convenience or pragmatic reasons. Student participants who preferred digital devices only for learning, did so as they said their work was easy to retrieve and read anywhere, and that they found it faster to work on a digital device. They

believed writing was time-consuming, and written information difficult to retrieve sometimes, as it was "all over the place". It was easier to organise files using a digital device. Digital devices meant there was less cargo to carry in bags and therefore more convenient. These students preferred digital learning because they believed everything they required was on the Internet.

Blended with more paper

The group of students who preferred a blended learning approach with more emphasis on paper-based activities justified their preferences as:

- paper was more convenient;
- students are used to it;
- the end of year exam is paper-based;
- paper allows innovation; and,
- digital is a distraction.

Some students in the group believed that writing on paper was better for remembering and understanding, whereas typing did not allow for the cognitive process involved since it did not require that much effort. Some of them believed printed books were better, and easier ways of explaining concepts than what might be found online. Within the same group, some students expressed that digital use was distracting more students and using paper would save time by getting straight to the learning activity. There were some tensions and concerns expressed by students within the group that they felt that they were forced to use technology such as social media, OneNote, YouTube when they preferred paper-based activities. They expressed that they felt 'left out' when they wanted to stay away from social media. Some students in this group justified their concerns by citing the disadvantages of using digital technology, for example, waiting for the computer to load programs or websites, and spending time learning to use the software that explains the concepts. Some students were worried that their eyesight might be affected, internet crashes might erase valuable data and negative effects on handwriting due to the overuse of computers. The critical comments of some students in this group were directed at teachers, as evidenced in the following statements.

> I like to use my device as a way to access the resources required for
> each subject, but I prefer to do my work in my book, which hasn't been

> happening lately since my subject **teachers always tell me to do my activities online.**
>
> It is also very easy to become distracted on a laptop. However, it is convenient some of the time, but **I believe many teachers rely too heavily on devices.**

At the same time, some students contradicted their preferred approach of blended with more paper activities because they acknowledged that paper resources cause more damage to trees and the environment. Some preferred to use digital devices over paper because drawing diagrams is better on computers and videos provide a better explanation of the concepts. Overall, the students who preferred a blended learning approach with more paper were voicing against the heavy reliance of technology for learning and expressed their desire to have a choice of using paper-based activities over digital content.

Theme 3 Significance of OneNote Class Notebook

The findings on the significance of OneNote Class Notebook were derived from data collected from the online survey, focus group, classroom observations and teacher post-observation discussions.

It was hard to conclude how widely OneNote Class Notebook was used based on the following graph in Figure 5, as the respondents (Y9-13 students) had 5-7 subjects each, depending on their year level. However, it is safe to conclude that about 70% of the teachers were using OneNote Class Notebook at the school.

Within the group of students who were using OneNote Class Notebook, 50% of them rated OneNote Class Notebook as very or extremely important, 35% of them rated it as somewhat

Figure 5: Popularity of OneNote Class Notebook.

9. How do you rate the importance or value of OneNote Class Notebook for your learning?

More Details

- Extremely important   17
- Very important   35
- Somewhat important   40
- Not so important   9
- Not at all important   7

Figure 6: Importance of OneNote Class Notebook.

important, and 15% per of them rated it as not, or not at all important for their learning. Over 80% of these respondents explained their choice. Figure 6 above supports this finding.

The qualitative data collected for Question 9 has been sorted into three groups, based on their preferred learning approach. These responses were analysed and summarised under two subgroups: Convenience and Compared to other products.

Blended, but more digital group

The students who preferred a blended learning approach, with more digital content, perceived OneNote Class Notebook to be important as all the materials were well organised in one place, with easy access. Paper-based assessments, schedules, and other important information could easily be misplaced, but as OneNote was backed up, there was no risk of losing completed work. OneNote was seen as becoming a more effective tool, as teachers were improving their capability – and as it had been in use for a few years by the time of this study. Participant

8. In how many subjects are teachers actively using OneNote Class Notebooks with you? Please select one

More Details

- 1   8
- 2   8
- 3   23
- 4   31
- 5   23
- 6   10
- 7   5
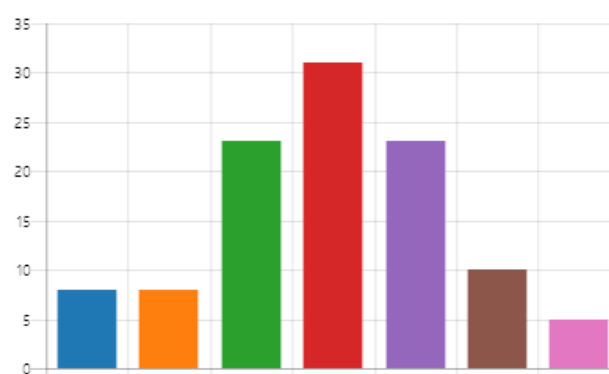
teachers found OneNote Class Notebook more convenient than having to collect information from multiple emails or other places like O365 and SharePoint.

Some students in this group considered OneNote to be very important, enabling collaboration and allowing for flexible user experience. The students believed their learning was enhanced by the product, as it was easier to see work on OneNote than on the board, and for students to access their classwork, even if absent, as teachers could ensure all their classwork was available on OneNote. Some students preferred Google docs, however, as some found OneNote took a long time to load.

Blended, but more paper group

The students in this group perceived OneNote to be important as that was where they could find all information. It was easy for teachers to distribute work, and for students, OneNote helped when a teacher kept the information well-organised. The students preferred OneNote to other digital portals like SharePoint Sites and Wikis, as it was available any time anywhere, and could be useful for revision or catching up missed work as it stored all course outlines, assessment information and research resources. On the other hand, students in this group believed that OneNote was good for some subjects but not necessarily for all subjects. Some of them perceived paper and face to face interaction with teachers and peers, was better than using digital media like OneNote, even though it enabled collaboration.

Digital only

This was a very small group of students. They perceived the importance of OneNote for the same reasons as the other two groups, and these participants stated they always opened OneNote Class Notebook when they got to class. This group commented especially on their ability to catch up missed work, due to the availability of classwork on OneNote.

Unrealised potential of OneNote Class Notebook

Although OneNote Class Notebook had innovative features, most of the teachers observed were using it as a storage system rather than tapping into the real potential of the software. A common use found during classroom observation was that all resources, either in the form of Word or Adobe documents were attached to the Content Library, and students were expected to open and use those resources for their learning. The data collected from the online survey, focus group and classroom observation, revealed that OneNote had been used as a static

website to collect resources. One of the features of OneNote is word processing; however, many word processing activities were being attached as files to various Content Library pages. My observation notes and research journal recorded several entries noting that students were using Microsoft Word for word processing, and attaching those files to the Student Notebook for teachers to mark. Some of the teachers were observed using the print option, where the attached file printed out a static picture. Students could not manipulate this static picture, other than just structuring their work. The only way they could manipulate such resources was to download the file then add their work to it. Instead, all the resources had to be reformatted on OneNote and distributed to students, for them to continue working on the same resource. Collaboration is one of the 21st Century skills, and OneNote Class Notebook offers Collaboration Space, but none of the teachers during classroom observations used the Collaboration Space. Nor did the use of Collaboration Space come through the focus group or online survey.

The presentation of findings reveals that OneNote Class Notebook is underutilised in the case study school even though the software is widely used by all participants irrespective of their preferred learning approach. The features of the software that could potentially transform the teaching and learning process are not explored, and the use of OneNote Class Notebook in the case study school is predominately substitutional to traditional methods of teaching and learning.

The transformational changes are not very evident because digital technology adoption and implementation is a complex social and developmental process, not an event (Straub, 2009). The use of OneNote Class Notebook appears transitional, a natural progression within the status-quo from static SharePoint Sites to OneNote Class Notebook within O365 suite of applications. Conole and Alevizou (2010), suggested that a much-anticipated transformational change may appear when traditional teaching methods change to innovative teaching and learning methods coupled with innovative educational software. The theorists referenced in chapter 2 point to transformational changes that are often disruptive and suggest how leaders might manage transformational change in addition to managing the change process. But the evidence suggests that the primary use of OneNote Class Notebook in the case study school was limited to the Content Library for accessing resources much as was the case when using the prveious SharePoint Sites.

Conclusion

Student voice from the online survey and focus group offered a student perspective and learning experience of digital technologies generally, and OneNote Class Notebook specifically. Teacher voice from classroom observations followed by a post-observation discussion focused on their perspective and experience of digital technologies and OneNote Class Notebook for teaching. The findings were presented under three major themes to answer the research question.

The evidence points to the heavy use of digital technologies by all participants with some interesting findings. Students were mostly in favour of digital technologies, highlighting the advantages and disadvantages. They acknowledged that digital technologies provided access to information any time anywhere, offering different ways of learning that would not be possible with traditional and paper-based methods of learning. They realised their work was more organised and accessible; however, they expressed concerns about the school's reliance on digital technologies. The concerns included: digital distraction, reduced face to face teacher interaction, reduced amount of writing on paper - that would be necessary for the end of year exams and the limitations of digital technologies for some subject and specific activities. Teachers in the study were frequent users of digital technologies, and were fluent with various hardware and software available to them. They recounted that digital technologies were improving their teaching practice, although very few teachers took advantage of the transformational nature of digital technologies.

Most teachers, agreeing with the students, preferred a blended learning approach, using both paper and digital. They were pragmatic about the need to use pen and paper for the end of year exams, and many suggested that the students' learning benefited from traditional approaches than a fully digital approach. Within the blended approach, students were equally split into those favouring the digital practice, and those who preferred a more paper-based approach. There were also contradictions within the students' personal preferences. For example, the students who preferred a more paper-based approach wanted teachers to give more digital content, as they believed digital use would develop their 21st century skills. The students who preferred a more digital approach, wanted teachers to give paper-based resources so that they could learn better using paper. Teachers favoured the blended teaching approach, with more digital content being used.

OneNote Class Notebook has become an integral part of teaching and learning at NEC. The participant students and teachers were heavily reliant on OneNote Class Notebook for content delivery and interaction. Participant teachers, however, used only the basic features of the software. There were only minor hints from the data that some participant teachers were exploring the innovative teaching and learning potentialities, that were not otherwise possible through traditional methods. In Chapter 5, meaning will be extracted from the interpretation and discussion of the key findings in light of the literature.

Chapter Five: Discussion of findings

Introduction

The purpose of this study has been to critically evaluate the influence of digital technology on teaching and learning at New Era College (NEC) focusing on educational change associated with OneNote Class Notebook. The following discussion evaluates the key research findings of the research. This will reflect on the findings that differ from, reinforce and extend educational change associated with digital technology such as OneNote Class Notebook. The experience and evaluation by teachers and students at NEC will be analysed, according to the significance of OneNote Class Notebook. The discussion of findings, which reflect with the themes in chapter four, extends current knowledge regarding the impact of digital technology on teaching and learning. By analysing the implementation of OneNote Class Notebook, in light of the issues raised in the literature will inform the conclusion and recommendations to this chapter.

The use of digital technology

The change management literature, as examined in chapter three, suggests that effective change leadership is required alongside change management (Gill, 2002). Re-visioning, or creating a new vision (Baum et al., 1998) in a supportive and collaborative environment requires leaders who continuously, and strategically, communicate progress to staff (Botkin, 1999; Jensen, 2000). Transformational change in education demands upskilling teachers' knowledge, and critical reflection to encourage innovative teaching practice (Kotter, 2012). This study considers these issues in change management literature related to the use of digital technology. As a 'forward-thinking school, focussed on innovative and personalised learning' (NEC Vision/Mission), the school heavily invested in digital infrastructure. This took the form of an in-house ICT Centre, with two full-time technicians, who were available to maintain the network, and support teachers and students with their day to day technical difficulties. A Learning with Digital Technologies (LwDT) team, made up of two teachers from each learning area, supported teachers' use of learning technologies, mainly the O365 suite of products, with an emphasis on One Note Class Notebook. The data collected from the online survey, focus group and classroom observations, confirmed that digital technologies were an integral part of the day to day teaching and learning practice at NEC. Although while it appeared from the study that there were a few obvious administrative advantages for students in delivering and accessing information, underneath this positive mood, there existed tensions and some

concerns. These negative effects are discussed as a sub-theme under disadvantages that makes digital technology less desirable.

Two of the six teacher participants identified themselves as members of the LwDT team, leading change with digital technology. They expressed during the post-observation discussions that school leaders encourage teacher-led professional learning opportunities. These included the use of 21st Century Learning Design (21CLD) Rubrics, developed by Innovative Teaching and Learning (ITL) Research (2011), in a collaborative environment to encourage innovative teaching. The ITL Research (2011) findings describe effective teaching and the promotion of student-centred pedagogy as personalised/individualised, collaborative, student self-regulated, knowledge building, and skilled in communication. Fullan (2011), referring to the ITL findings, highlights the key role that ICT can play in deepening and extending learning beyond the classroom into problem-solving and innovation. The teacher participants acknowledged the changing role of teachers demands upskilling their knowledge and critical reflection, which may increase workload pressure. Another teacher participant was positive about the changes; however, he talked about other teachers who complained about the number of changes driven by technology. Even though all teacher participants were positive about digital technologies, such as OneNote Class Notebook, it appeared that some were not happy. The *New Zealand Curriculum* vision is of "students who are confident, connected, actively involved lifelong learners" (Ministry of Education, 2007, p. 8). The analysis of the data collected through the methods discussed in the previous chapter, reflect the intentions and expectations of the curriculum and the Ministry of Education, however, digitally 'connected' young people who are 'actively involved', should be trained to harness technology educationally (Wright, 2010).

Advantages of digital technology for students and teachers

The student participants acknowledged that there were advantages of digital technologies making statements such as: "my work is always backed-up, especially it offers access to my work from any computer"; "it is easier to type than writing"; "internet offers a lot of information, it is easy to search"; and, "I am more organised". These advantages expressed by students were, however, related to the organisation and presentation of their work. The students acknowledged that digital technology helped them keep all their content in one place and that they felt more organised. Students who were slow writers and those who struggled with

spelling and grammar preferred digital technologies over the paper. They expressed that their work was better presented than using paper.

These are, however, as I noted earlier, no more than administrative benefits. The effective use of digital technology, as outlined in the PISA report (OECD, 2015), promotes dynamic interaction between students and teachers, increases collaboration in problem-solving activities, stimulates creativity in both students and teachers, and helps students to control and monitor their learning. These strategies can have an immediate impact on a school's learning environment. There was, however, minimal evidence of this kind of dynamic interaction between students and teachers in some of the classes observed. The evidence gathered from the online survey and focus group on students' use of digital technology did not support the type of activities outlined in the PISA report (OECD, 2015), highlighted by the student remark: "I prefer teachers guiding me using pen and paper, and this guidance is lacking when digital technology is used" (student participant – focus group).

Regarding teachers developing their competence with digital technology, a longitudinal six-year study on the value of laptops for teachers in New Zealand schools concluded that laptops did make a significant difference to teachers' expertise in ICT (Cowie et al., 2008). Over time, this initiative and the national ICTPD programme, has led to gradual incorporation of e-Learning processes and tools into classroom practice that goes beyond administrative convenience (Cowie et al., 2008; Ham, 2009). The evidence gathered from classroom observation in this study, has suggested that teaching was beyond administrative convenience, especially regarding teachers who are actively using OneNote Class Notebook. An example is a teacher participant distributing learning tasks to students and tracking student progress in real time. Overall, however, the advantages for students in the study appeared to be organisational, and a help for students with additional needs such as poor handwriting. The advantages for teachers were felt to be the dynamic interactions with students for timely feedback and feed forward.

Disadvantages of digital technology for teachers and students

Often students appeared to be grappling with the overuse of digital technology, with students' expressing dissatisfaction with the amount of time they spent on the device. They observed: "I get tired of staring at the screen for six hours"; and, "I feel a pen and paper approach is better because I do not connect with information on OneNote" (student participants – focus group).

The focus group also discussed the lack of face to face time with the teacher and their heavy reliance on technology. They felt that teachers did not explain or teach sufficiently, and were expecting technology to take care of those aspects with students learning content from online resources. If the use of digital technologies for learning is no more than the passive consumption of information, rather than collaboration, networking and connected learning, then the use of digital technologies is counterproductive (Henderson, Finger & Selwyn, 2016). But the use of digital technologies, according to Henderson et al., (2016), is productive when teachers help students develop agency, with activities that encourage effective learning. Fullan (2011) has expressed similar concerns and suggested that high yield instruction and technology need to come together. When that occurs, then teachers may extend student use of digital technology beyond consumption and administrative uses, into transforming learning that would not otherwise be possible with traditional methods. The digital pedagogies that participating teachers employ are potentially promising, but their overuse and reliance on digital technology appear to nullify the opportunities for face-to-face encounters that students were expecting at NEC. The literature (for example, Groundwater-Smith et al., 2001; Macdonald & Hursh, 2006) also points to the technological changes coupled with educational changes, adding workload pressures to teachers.

The use of digital technology at NEC, as discussed, reveals the advantages and disadvantages for students and teachers. While students and teachers were comfortable and confident users of digital technology, the apparent advantages for students were very limited, considering the potential educational benefits enabled by digital technology. It was counterproductive, considering the concerns expressed by students. For the teachers, however, the benefits of digital technology were significant such as the adaptation of OneNote Class Notebook. They appeared to be happy with the change leadership and to work collaboratively and strategically to upskill their knowledge, and make an effort to employ innovative teaching practices, using digital technology.

The preferred learning approaches

It is interesting to note that only 10% of the students who participated in the online survey preferred a fully digital learning approach. The reasons for a fully digital learning approach appeared, however, to be for convenience, administration and ease of use, rather than the possibility of improved learning methods. The majority of students who preferred a blended

learning approach referred to the negative effects of a fully digital learning approach, including digital distraction, and missing face to face time with teachers.

A blended learning approach that uses both paper and digital content

It is interesting to note from the classroom observations, that even though most of the students used digital devices, a few of them used both paper and computers. Even though most of the student work was handed in digitally, there were a few occasions teachers insisted on printing students work for marking. For example, a teacher participant mentioned to me during her classroom observation that she would ask students to print and hand in their work for marking and feedback, as she could track students' incremental development and prevent plagiarism. This explanation raises questions about the unrealised potential of OneNote Class Notebook. Is the software insufficient to meet teachers' needs? Is it because teachers are not equipped to use the software to prevent plagiarism? Another teacher participant, who claimed to be an extensive user of digital technologies, encouraged her class to pick up printed books for further research since they cannot 'copy and paste' as easily from a digital copy. This is one of the influences of digital technology.

The reasons listed in the online survey for favouring more digital content were for purely pragmatic reasons: "I type faster than writing"; and, "my work is always backed-up" (student participants – online survey). The *New Zealand Curriculum* (2007), however, explicitly states that the schools must explore new and different ways of learning, by using ICT. This implies that ICT is there to enhance learning, therefore, any e-Learning strategy must support students' cognitive endeavour. Yet, the finding above is short of that goal.

Some students preferred digital technology for research, however, they implied that traditional methods were insufficient. The evidence suggested that they preferred digital technology, owing to the advantage of accessing information instantly. Having access to digital technology need not necessarily provide them with the required search techniques for using logic operators like; OR, AND or NOT, however, the students may not have the information literacy strategies to synthesise relevant information, or acquire information, or contribute new understandings to the existing body of knowledge in that area. These skills have to be taught and learned.

One of the teacher participants suggested to her class that they borrow books from the library, besides the online resources. In the post-observation discussion, she explained the reason for her suggestion being to help them focus on the topic with printed books, rather than going

online and getting distracted. Students getting distracted by digital technology is a recurring theme. The research findings of Hattie (2012), show that there is very little improvement in learning outcomes when technology is used, and Fullan, Langworthy and Barber (2014) suggest that schools must reimagine the existing use of digital technology.

Paper-based vs Digital resources for learning

Several student participants in the study preferred paper-based activities, citing that they memorised the content better when they wrote on paper and that external examinations required handwritten answers on printed assessments. One student reflected: "… I feel if the teacher teaches from the front, writing notes on the board, that makes us physically write down the notes…"; "…we are kind of spaced out and ignore the work when it is on OneNote... "; and, "writing them physically on paper helps me memorise the notes better" (student participants – focus group). It appears the student participants yearned for explicit teaching, and opportunities for memorising content. Based on the evidence from the past half-century, and in the context of our knowledge of cognitive architecture, Kirschner, Sweller & Clark (2006), contended that minimally guided instruction is less effective, compared to approaches that place a strong emphasis on explicit teaching. Their findings pointed to the superiority of guided instruction, and an active role played by the teacher in student learning. The second point arising from the student participants in relation to memorising content, is that while they may seem to be heading back to the rote learning of yesteryear, the current NCEA external examination system still requires students, to some extent, to memorise content besides demonstrating high order thinking, as outlined in the SOLO Taxonomy (Biggs & Collis, 2014).

This theme of taking student voice into consideration was reflected by the majority of students, who preferred a blended approach. The evidence points to concerns expressed by students on the disappearance of the traditional role of teacher and teaching. It appeared that some students preferred explicit teaching by a teacher, suggesting the prevailing teaching practice did not cater to those students.

The significance of OneNote Class Notebook

OneNote has been part of Microsoft Office suite of products since 2003. In 2009 NEC entered in partnership with Microsoft and implemented OneNote, changing its staff appraisal system from a printed folder to an e-portfolio. In 2014 the Class Notebook component was added to OneNote (NEC Staff Handbook), allowing staff to use it as a digital notebook, to support the

appraisal system of the school. The school-wide implementation of One Note Class Notebook in 2015, at the time of the case study, has had implications for teachers and students like any change that new software brings. The analysis of the online student data reveals that around 70% of the teachers used OneNote Class Notebook, which indicates that OneNote Class Notebook played a significant role in teaching and learning at NEC.

Innovative uses of OneNote Class Notebook

According to Anthony Salcito (2018), Vice President of Worldwide Education at Microsoft Corporation, teachers can use OneNote Class Notebook as a 'phygital' classroom. 'Phygital' is a composite of 'physical' and 'digital'. What it means is that teachers can use the software during timetabled classes, where students are physically present, and as a digital classroom that is open 24/7 for students. Students and teachers can come in and go out of this phygital classroom, enabled by OneNote Class Notebook, anywhere any time and on any device. For Guhlin (2016), the new generation of learning management systems (LMS) like Google Classroom and OneNote Class Notebook, is gaining more popularity amongst educators, while the older forms of LMS like Moodle and Blackboard, remain powerhouses of centralised control for teachers. The new generation of LMS has become popular owing to their ease of use, and after several iterations, by proactively encouraging user feedback, offer powerful online tools that empower teachers and students to connect, create, collaborate, and facilitate organisation and learning (Guhlin, 2016). OneNote Class Notebook offers various features through the Content Library, Collaboration Space, Teacher Only and Student Notebook for teachers and students. Some of these new features include: handing out and collecting assessments, tracking student progress, and providing summative and formative feedback. With the recent release of the new software 'Microsoft Teams', this will envelop OneNote, adding more features that were not as easily achievable with OneNote. For example, handing out, collecting, marking assessments, and offering feedback and feed forward.

As observed during the case study, all the teacher participants knew how to create and use the Content Library, Collaboration Space, and Student Notebook with their classes. The evidence suggests that they knew how to create and distribute content to students as the year progressed. Two teachers demonstrated that they knew how to track students' progress, mark and give feedback using OneNote Class Notebook. One of them used Microsoft Teams. The benefits that Microsoft Teams brings to OneNote are, however, beyond the scope of this study. During the data collection, teachers mentioned to me that the school was encouraging and training

teachers to create Microsoft Teams the following year when OneNote Class Notebook would be a major component of the new software.

Upside and downside of OneNote Class Notebook

Like any other software, OneNote Class Notebook had both positive and negative characteristics. OneNote Class Notebook as part of O365 suite of products has been through several updates. The software is now available in several formats – desktop, online, windows app and mobile app. Each format has its interface, but the content is updated in the same OneNote file. This allows users to access the file on any device. The software was introduced as an all in one software for users to store and retrieve all types of files. The software has close resemblances to printed notebooks/organisers with colour coded tabs for each section. The non-editable Content Library allows teachers to provide content; the Collaboration Space allows students to work in groups to co-construct outcomes, and the individual Student Notebooks provides each student their own workspace. The new terms 'digital inking', and 'inking your thinking', have become popular due to the writing and sketching features of OneNote. 'The pen is mightier than the keyboard' became a popular slogan during the promotion of OneNote Class Notebook (Mueller & Oppenheimer, 2014). The pages on OneNote Class Notebook provide a blank canvas where users can write, sketch, and brainstorm ideas using pen-enabled, touch devices. None of the student or teacher participants used this feature of OneNote Class Notebook. Several add-ons were available such as 'Learning tools' to help students with special learning needs. 'Immersive Reader' for example and several other tools may potentially replace teacher-aide support that special needs students currently access. Giving feedback and feed forward by audio recording teacher voice while marking students work on OneNote Class Notebook is another feature. During the data collection, it appeared that the teacher participants did not use the Learning tools and Audio recording features.

A recurring feature that appeared in the data collected from students and teacher participants was the complaint about the amount of time OneNote Class Notebook takes to synchronise. In theory, when students are working in the Collaboration space, all participants should instantly see each other's contribution. But it appears the participants are not able to see other student's work instantaneously. The student participants also complained about the amount of time it took to access Class Notebook at the start of class. According to Nielsen (1994), a 10-second delay in downloading website or software will often make users lose interest and move away

to another task. These technical issues may be contributing to making OneNote less desirable application to use.

This theme considered the significance of OneNote Class Notebook, and the associated change, or lack of adaptability, to students and the teacher's voice. Even though OneNote Class Notebook offered several innovative features, only some of these were evident in the teaching and learning at NEC. The partnership agreement with Microsoft, prevented NEC using Google Classroom, which limited the choice for teachers to choose other e-learning platforms. It appeared that the partnership agreement encouraged the deployment of Microsoft products without critical analysis.

Analytical tools for evaluation of the implementation of OneNote Class Notebook

Puentendura (2006) developed the SAMR model as a way for teachers to reflect on their use of technology in their teaching practice. This four-level taxonomy-based model was intended for selecting, using and evaluating the use of technology in schools. The first two levels, Substitution and Modification, are referred to as 'Enhancement', where technology tool acts as a direct substitute, with or without functional improvement. The evidence in this study points towards the use of OneNote Class Notebook for enhancement, for the majority of the activities during classroom observations. For example, teachers attaching pdf, word files and web links to the Content library, and students downloading the resources and attaching their completed task files to the Student Notebook, for teachers to mark. There was no evidence of the transformation of learning design, where significant task redesign or creation of new tasks, appeared, as in the top two layers of the SAMR model (Puentendura, 2006).

The ITL Research (2011), highlighted the key role that ICT played in deepening and extending the learning beyond the classroom into problem-solving and innovation (Fullan, 2011). The ITL Research developed the 21st Century Learning Design (21CLD) Rubrics for 21st century skills. They identified these skills as knowledge construction, self-regulation, collaboration, skilled-communication, and use of ICT. According to the use of ICT Rubrics, OneNote Class Notebook appeared in this study to have the potential to achieve up to level 4. But OneNote Class Notebook did not offer the capabilities to achieve the highest possible level 5, as shown in figure 7. According to the rubrics, students must be able to design an ICT product for authentic users to achieve level 5. OneNote Class Notebook allows sketching, mind mapping

and storyboarding that supports the design of an ICT product, but lacked the features for the creation of a product for authentic users which is required at level 5.

The taxonomy of educational technology (Bruce & Levin, 1997) evaluates if the technology is

Use of ICT for Learning: Decision Steps

Students have the opportunity to **use** ICT?
— NO → 1
— YES ↓

ICT supports students' **knowledge construction**?
— NO → 2
— YES ↓

ICT is **required** for constructing this knowledge?
— NO → 3
— YES ↓

Students are **designers** of an ICT product?
— NO → 4
— YES ↓

→ 5
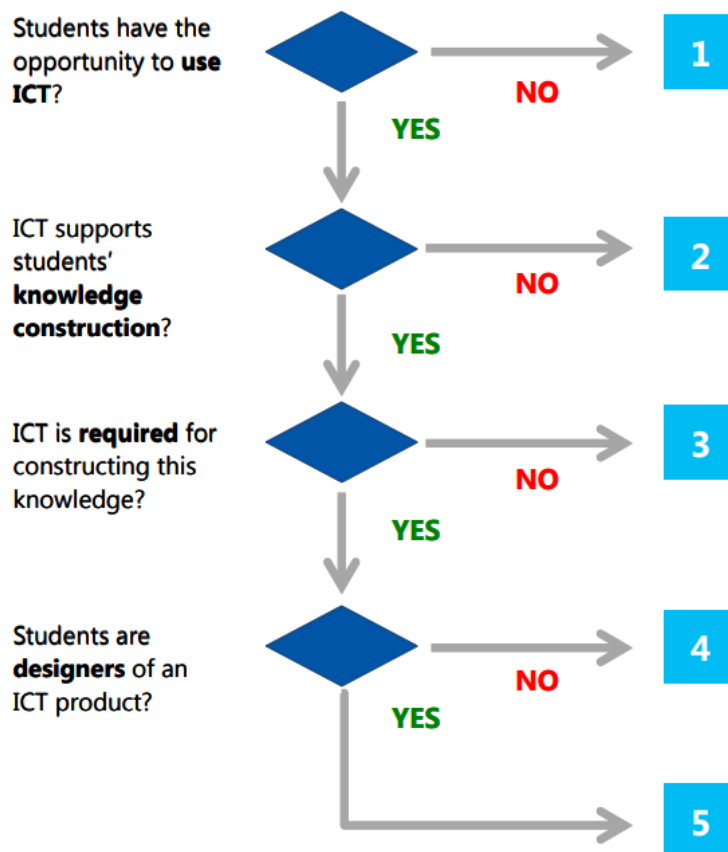
Figure 7: Use of ICT for learning rubrics. Picture was taken from ITL Research (2011).

used as media for inquiry, construction, communication, and or, self-expression. It is clear from the data gathered in this study that OneNote has been used by teachers and students for 'communication' and 'construction'. It was evident that teachers communicated the content to students and vice-versa. The Collaboration Space of OneNote supports knowledge construction as it gives read and edit rights, to all members of the Class Notebook, allowing peer-reviewed knowledge construction. The Student Notebook also supports knowledge construction, as teachers and students can co-construct knowledge. 'Self-expression', in creative arts is possible for students and teachers, with a stylus pen, although no students or teachers seemed to use the stylus pen during data collection. 'Inquiry' is very limited with OneNote, as the search option

in the software allows searching the data on Class Notebook, with no options to search wider databases available on the web.

This theme analysed and discussed the implementation of OneNote Class Notebook with the help of the SAMR Model, 21CLD Learning Rubrics for use of ICT and Taxonomy of technology use. According to the SAMR model, the use of OneNote Class Notebook was at 'modification'. The 21CLD Rubrics for use of ICT suggested the potential use of OneNote was up to Level 4, and, according to the taxonomy of technology, OneNote was used for communication, knowledge construction and self-expression. This analysis highlights the untapped potential of OneNote Class Notebook.

Conclusion

This discussion suggests that school-wide use of OneNote Class Notebook on its own in its current format may not make a huge difference to student learning. The teachers appeared to be unaware of, or not willing to explore the innovative features of the software application as outlined by the Innovative Teaching and Learning Research (2011). The students appeared to be happy with the software and demonstrated that they were confident and competent users of the technology. The teachers, however, appeared to be unaware the conclusion of Kennedy et al. (2010), that the current generation of students consisted a range from 'power users' to 'basic users', within the student body when it came to digital competencies, interests and dispositions.

While the technology may change the role of a teacher, from being a source of knowledge and controller of the learning process to a bystander, facilitating learning. But the literature (for example, Groundwater-Smith et al., 2001) points to the teacher having a complex role to play even in a technology-rich school like NEC. The use of current digital technology such as OneNote Class Notebook provides enhancement, compared to previous methods of teaching and learning. There is, however, minimal evidence of transformational educational change, due to OneNote Class Notebook. Tapping into the unrealised potential of OneNote Class Notebook driven by new pedagogies for deep learning (Fullan et al., 2014), may potentially transform teaching and learning which may not be otherwise possible with traditional or current substitutional methods. Pedagogy needs to drive technology (Fullan, 2011), and the essence of innovative teaching practices advocated by ITL Research (2011) provides the framework for that pedagogy.

Chapter Six: Conclusion

The purpose of this chapter is to bring together the findings from Chapter Four and the discussion from Chapter Five, to present five major conclusions in relation to the main research question and sub-questions. In this case study at New Era College (NEC), I explored the use of digital technology with a specific reference to Microsoft OneNote Class Notebook to critically evaluate its effect. I sought and gained a deeper understanding of the school-wide implementation of OneNote Class Notebook and how it affects teaching and learning. Within the framework of the research question, and sub-questions, the phenomenon was explored, initially by collecting data from an anonymous online student survey, student focus group, classroom observations and post-observation discussion with participating teachers. The main question and sub-questions were:

What can be learnt about how digital technology influences and affects teaching and learning in a secondary school through the study of the introduction of a specific software application?

- What is the nature of educational change associated with the use of digital technologies for teaching and learning?
- What is OneNote Class Notebook, how does it differ from other similar tools, e.g. Google classroom, and what is its significance as a digital learning tool?
- What is the emergent value of the OneNote application to teaching and learning to the case study school?
- In what ways could traditional methods of teaching and learning achieve the same outcomes as using OneNote Class Notebook?

Having analysed the findings, five significant conclusions from the study can now be presented. These conclusions contribute to answering the main question and sub-questions. The evidence from the study has indicated that digital technology is an integral part of teaching and learning at NEC and that OneNote Class Notebook is a widely used digital learning tool. Students highly valued a blended approach to learning than using a fully digital approach. Even though OneNote Class Notebook has the potential to automate learning, students preferred interacting with the teacher face to face. The teachers still have a significant role to play in the teaching and learning process, despite the possibilities offered by OneNote Class Notebook. Based on the conclusions from the study, recommendations are made for teachers and school

leaders, Microsoft in Education and policymakers at the Ministry level. Finally, the limitations of the study and areas for further research are outlined.

Conclusion 1: Doxa of digital technology

Doxa means considering an assumption as fact when it is not. The supposedly inherent benefits of digital technology are doxa (Grenfell, 2007, as cited in Wright, 2010), and this assumption needs to be tested against evidence. There is strong evidence to suggest that digital technology can positively impact on student motivation and engagement, but the evidence is weaker in how these tools can lift student achievement (Hattie, 2008; Newton, 2018; OECD, 2015). Digital technology offers tools for other building blocks for effective learning, for example personalised learning, collaborative learning, and inquiry-based learning. The use of digital technology without considering its influences and effects, has, however, the potential to be counterproductive (Henderson et al., 2016).

One of the counterproductive elements voiced by students is the distraction of digital devices. Students believed overuse of digital technology was tiring and distracting. Therefore, an adjustment is needed by shifting away from looking at technology as an end in itself and looking towards using technology as a tool for all kinds of learning. The transformative nature of technology can turn the traditional methods of teaching on their head (Pahomov, 2014). This transformation goes beyond teaching and learning in a formal classroom setting and how students interact with teachers, peers, and those outside the school to support their learning. Technology can engender motivation, constant engagement and sustained engagement leading to improved authentic learning opportunities (Pahomov, 2014). Positive transformations that technology can bring to teachers' practice and students' learning do not happen automatically, simply by providing digital infrastructure, devices, and tools, but by meaningfully integrating technology into the teaching and learning process guided by the New Zealand Curriculum (Ministry of Education, 2007). Meaningful technology integration democratises a classroom, giving equal opportunities to all learners (Pahomov, 2014).

Conclusion 2: Role of a teacher – pedagogical shifts and relational practices

Hood (2018) noted that student-focused and student-oriented learning requires teachers to have deep knowledge of individual students, and theories of learning. In addition to this knowledge, teachers require an understanding of learner agency, self-efficacy, motivation and the interest of students in structuring learning opportunities, contexts and dispositions to facilitate student engagement. Teachers require strong technological, pedagogical and content knowledge

(Koehler & Mishra, 2009) taking into consideration the students' background, prior knowledge, and learning challenges they face, and their interest to create learning activities and learning contexts meaningful to the learners. If students do not see the point or purpose of their activity, they may not take an interest in taking responsibility for their learning (Hood, 2018).

Integrating technology into inquiry-based education with authentic learning experiences (Ministry of Education, 2017) is a challenge as schools and teachers "fall into embrace/reject dichotomy" (Pahomov, 2014, p. 3), when it comes to using digital technology. This dichotomy creates a 'digital split'. Those that are 'jumping on the bandwagon' are recognised as innovators and early adopters (Straub, 2009) in any implementation of innovative technology. The teacher participants volunteered for this study may belong to this group, since they expressed no hesitation to participate in the study. The group proclaiming digital technology a 'distraction', and who resist the changes in education brought about by technology are recognised as late adopters, or laggards (Straub, 2009). This might be the group that teacher participants were referring to during teacher post-observation discussions. Pahomov (2014) argues that the split between the two groups is a result of the "misguided focus on the what of technology, instead of the why and the how." (p. 3). The teachers who oppose technology may have missed out on innovative educational opportunities. At the same time, teachers who embraced new technology 'uncritically' might also miss the opportunities. The teachers who embrace new technology may focus too much on technology, rather than critically evaluating the opportunities and possibilities that the new technology could bring to the curriculum and teaching.

Equipping the student with skills and dispositions requires teachers who are open to pedagogical shifts. They must have the confidence to learn and relearn to continually improve their practice.

Conclusion 3: Blended learning trumps a fully digital learning approach

Contrary to the popular belief that the current generation of students has an unbreakable relationship with devices, the students at NEC preferred blended learning, a mix of digital and non-digital learning activities. Even though the concept of 'digital natives', is a highly contested and problematic term (Bennett, Maton & Kervin, 2008; Kennedy et al., 2010), the current generation appears to have an unbreakable attachment to digital devices, and experience separation anxiety and fear of missing out (FOMO). The current generation can process images faster and compartmentalise information more efficiently (Birkerts, 2016, as

cited in Cladis, 2018). They are 'wired' differently for operational thinking in a digital-first language. Birkerts (2016) (as cited in Cladis, 2018), argues that the brain and the mind are two fundamentally different resources. Our mind enables us to think independently, process, and create, whereas the brain carries out a task, that requires rote cognition, similar to muscle memory. In other words, the brain computes mechanically, and the mind thinks creatively. Neuroscientists fear that digitising nearly every learning activity has the potential to decay the 'thinking' mind. Therefore, a mix of tech and tech-free learning activities will help students experience life humanly by interacting with people, nature and tech-free surroundings (Cladis, 2018).

At NEC, the student voice was clear as to the overemphasis and reliance on technology, to the point where students felt that teachers were forcing them to use digital resources. The data shows that the majority of students preferred blended learning over a fully digital learning approach, suggesting student desire for teacher interaction, and a mix, of non-digital tools for authentic inquiry-based learning.

Conclusion 4: No apparent change in teaching and learning practices

According to Rogers (1995), digital technology adoption and implementation is a process, not an event, "a complex, inherently social, developmental process" (Straub, 2009, p. 645). School leaders are challenged to see beyond the possible benefits of digital technology tools, to consider the implications of change on those it affects most. The individuals adopting new technology can then reveal a successful implementation (Straub, 2009). The collected data shows that OneNote was an integral part of the teaching and learning process at NEC and that the level of adoption appeared to reflect a natural transition from SharePoint Sites to OneNote Class Notebook. The SharePoint Site, used before the implementation of OneNote Class Notebook, was a static website for teachers to organise content and upload related resources like course outlines, supporting materials, assessment tasks and marking schedules. The classroom observation and focus group discussions on the use of OneNote Class Notebook, were mainly around how teachers organised content and other resources. The primary use OneNote Class Notebook was similar to a filing cabinet, as noted in the classroom observation journal, with no apparent change in teaching and learning practices due to the implementation of OneNote Class Notebook. Multiple files in Word, PowerPoint and pdf formats were attached for students to access and download subject content.

There were a few exceptions, however, where teachers were using OneNote Class Notebook as an innovative digital tool, and this innovative pedagogy would not be possible through traditional methods. For example, the use of collaboration space and tracking student progress on learning activities.

Conclusion 5: Unrealised potential of OneNote Class Notebook

Taking notes on laptops using the keyboard was a common practice at NEC. Yet Mueller and Oppenheimer (2014), argue that notetaking on laptops results in shallow processing. In three studies, it was found that students using keyboards for note taking, performed worse on conceptual questions compared to students who used longhand note-taking. While: "taking more notes can be beneficial, laptop note takers' tendency to transcribe lectures verbatim rather than processing information and reframing it in their own words is detrimental to learning." (Mueller & Oppenheimer, 2014, p. 1159). To overcome this limitation, the developers of OneNote created each page as a blank canvas for users of pen-enabled devices to take hand written notes, sketching mind maps, annotating pictures and other media. None of the teachers or student participants, however, used these tools facilitated by the pen-enabled device. The observation notes reveal that students used their keyboard as the primary source for inputting data, and appeared to be unaware of other input methods, such as the use of the stylus pen for writing, drawing and annotating. Other affordances overlooked included the audio and video recording capabilities of the software for students to add content, and for teachers to give audio and video feedback to students.

One of the high-yield practices that John Hattie found in his meta-studies of over 800 reviews was: 'timely feedback and feedforward' (Hattie, 2008). Two teacher participants extensively used OneNote Class Notebook, to give students feedback and feedforward, and another teacher demonstrated how the assessments were handed out and tracked for progress, then collected back, marked and handed back to students with feedback and feedforward. None of the other teachers or student participants, however, were making use of these innovative features.

Digital technology is an integral part of NEC. It affects and influences almost every aspect of teachers' and students' lives at school. All participants used or were encouraged to use OneNote Class Notebook. Some student participants were very happy and felt that their learning was improved by digital technology, while some were against the over-reliance on technology, and wanted face to face time with teachers and teachers to teach and explain to them, rather than directing them to online resources. NEC is in partnership with Microsoft and

in a privileged position to access professional learning and training in Microsoft's educational software and digital pedagogies based on ITL Research (2013). OneNote Class Notebook and similar products like Google Classroom and Apple Classroom provide a Cloud-based platform for teachers and students to access digital resources for instant access on any Internet capable device. They offer innovative features to develop some of the 21st century skills like collaboration, communication and knowledge construction. The emergent value of OneNote Class Note was that the majority of teachers and students regularly used the software. The tool was, however, underutilised and sometimes counterproductive, as staff and students did not know how to use it the way that the designers intended. The traditional methods that focussed on student-centred pedagogies were still seen as valid, yet OneNote Class Notebook has the potential to offer teaching and learning possibilities that are not available through traditional methods. Those possibilities must, however, be explored in the context of pedagogy driving technology, not the other way.

Recommendations

For school leaders

The changing paradigms have the potential to disrupt education. Emerging technologies and possibilities they offer are placing new demands on school leaders and systems. The new pedagogical approaches to accommodate the changing needs of the learners are challenging organisational structures. In this context, Gilbert (2015) warns that the new inputs in education have the potential to gravitate back to old ways of thinking, but within-system change, initiated by allowing the interaction between stakeholders – teachers, students, school leaders, and parents can produce the type of change required (Gilbert, 2015).

The provision of OneNote Class Notebook is not enough for it to be effective if those concerned do not know what it's is for and how to use it. OneNote Class Notebook, as an e-Learning tool, can stimulate a more dynamic and effective and positive learning environment. The interface (OneNote 2016) that teachers use, and the interface (OneNote Online) students use, are different; as sighted during the classroom observation. As a result, teachers and students found it difficult to navigate around various sections of OneNote Class Notebook, when teachers demonstrated their desktop version. This observation suggests that teachers need to understand that students are not automatically navigating around the software unless they are specially guided. In addition to this, teachers need to actively teach students how to use the technological tool educatively, for authentic learning purposes, otherwise very little will change for learners.

Teachers require training in how to get the best out of OneNote Class Notebook as a tool, regarding: time, space, place, opportunity, and intellectual energy.

The recommendations for school leaders are to:
- initiate small incremental change for system-wide adoption of new technology for its intended purpose
- train staff on required pedagogical shifts and link those shifts to digital technology such as OneNote Class Notebook
- provide the rationale of technologies which is more important than training on emerging technologies
- provide ongoing training to improve teachers' technological capabilities and confidence
- provide pen-enabled laptops and train teachers on innovative teaching and learning possibilities that the designers intended for OneNote Class Notebook.

For teachers

Teachers are expected to craft a new narrative around learning (Richardson, 2012) owing to the possibilities offered by technology. In this new narrative, learning that used to happen only in schools can happen anywhere, any time with anyone or any device. OneNote Class Notebook offers that flexibility and freedom for students to take charge of their learning journey to reach their own, personally determined goals. Selwyn (2015) has, however, challenged the norm assumed of the 'universal learner', "who is self-motivated, well resourced, inherently sociable, altruistic, rich in time and good will, happy to experiment and able to fail with confidence" (p. 142).

The evidence in this study suggests that over-reliance on technology is counterproductive. Teachers may encourage thinking and active learning, rather than passive consumption of information when accessing via digital platforms. Otherwise, it is easier to passively ingest information than actively create it, analyse it, and generate intuition from it. What is required instead, are classroom practices that create digital learning experiences and presentations, that are: "flexible, shareable and interactive." (Cladis, 2018).

The recommendations for teachers are to:
- reassess their pedagogical and relational practices

- work on the pedagogical shifts required to take advantage of innovative ways of learning the use of technology
- tap into the unrealised potential of OneNote Class Notebook
- train students on educational technology and be sceptical of the myths around students' capabilities in using learning technologies
- encourage students to buy pen-enabled laptops by demonstrating the innovative learning possibilities offered by OneNote Class Notebook.

For Microsoft in Education

The advice regarding response time for students has been about the same for the last 30 years (Nielsen, 1994). A response time of 10 seconds, is about the limit for keeping user attention focused on web interaction. The findings in this study confirm that students often found that response time was longer than normal. As a result, they became distracted while waiting for the software to load and synchronise.

The literature (for example, Abbott, 2015) is clear about the additional workload pressure and associated stress for teachers because of frequent educational change coupled with technological change. The teacher voice in this study confirmed that frequent change in OneNote Class Notebook interface, features and functionality was frustrating.

The recommendations for Microsoft in Education are to:
- improve infrastructure to make access and synchronising of OneNote Class Notebook easy for users
- allow enough time (1-2 years), for users to get through the learning curve before bringing in new changes.

Limitations of the research

Even though an effort was made to capture the experiences and perceptions of teachers and students in the case study, the limited scope of this research did not allow for more in-depth discussion. This included teachers who opposed these technological changes and school leaders who were encouraging the use of digital technologies and OneNote Class Notebook. This was in response to local, national and international calls for technology integration into education. During this study, Microsoft Teams was deployed, which took OneNote Class Notebook to another level, however this study did not capture those changes. Another significant change

that occurred during this study was the release of the revised Technology curriculum (Ministry of Education, 2017), that directed the discussion on the use of digital technology to a new level. These two new changes were also not included in the study.

This case study provided an analysis of the phenomenon under consideration, which is the influences and affect of digital technology with specific reference to OneNote Class Notebook at NEC. While it did not provide a universal representation of experiences and perceptions of secondary schools in New Zealand, the findings and recommendations relating to the context of NEC may be applied to other schools in New Zealand.

Areas of further research

While the presence of digital technology and what can be learnt about its influence, and effect are not new to New Zealand secondary schools, the implementation of OneNote Class Notebook as a digital learning tool is still emerging. A natural progression of this research could be to explore how Microsoft Teams, that incorporates OneNote Class Notebook, could improve teaching and learn in secondary schools.

If the new digital curriculum promises to transform students from passive consumers and users of technology, to creators, then exploring the changing focus of digital technology as a tool for learning that offers possibilities to an essential part of learning similar to literacy and numeracy would be a natural progression of this research. In other words, computational thinking and coding may become new essential literacies.

Final word

Digital technology is often criticised (Hood, 2018), for dehumanising the acts of learning and teaching. This raises a critical question – how does digital technology improve an individuals' relationship with others, and the social and political contexts in which they learn and act? Kellner (2004) warned that technology could be an obstacle, or burden to genuine learning, without proper re-visioning of pedagogy and educational practices. He added that technology itself does not necessarily improve teaching and learning (Kellner, 2004).

Even though the New Zealand Curriculum (MOE, 2007) encourages schools to provide an education based on principles, values, key competencies and subject-specific achievement outcomes, the primary focus in secondary schools appears to be only on the back-end of the curriculum document, that is heavily subject specific. Accordingly, New Zealand secondary

schools appear to be focussed on credit collection by students attempting standards-based internal and external assessments. These credits can be exchanged for national qualifications.

Perhaps it is important to keep in mind that at the heart of education is a collective, social enterprise, and to consider that education is not only about academic learning and gaining qualifications. Digital technology plays a role in this enterprise, and can support student learning, but it is the people who are using digital technology who are the drivers of those outcomes, not machines.

The multinational technology companies are often criticised as intruders into schools by offering access to free Cloud-based technologies. The literature reviewed in chapter 2, however, supports the use of educational software in conjunction with innovative teaching and learning practices. Therefore, partnerships with multinational companies may prove beneficial to schools, but student-centred pedagogies should be prioritised, rather than the use of technology for its own sake.

The nature of change in teaching and learning at the case study school appears to be a natural transition from SharePoint Sites to OneNote Class Notebook with no apparent transformational changes. A much-anticipated transformational change may appear when traditional teaching methods change to innovative teaching and learning methods (Conole & Alevizou, 2010) that support co-constructed, student-centred pedagogies. Then the use of educational software like OneNote Class Notebook can support such a transformation as a digital tool. Therefore, a sustained transitional change coupled with school-wide uptake of innovative teaching practices as drivers of change modelled by some teacher participants may potentially lead to transformational changes necessary for fulfilling the intentions of the New Zealand Curriculum (MOE, 2007).

The lens used for this study is a transformative worldview, a view to bringing change in the lives of participants by raising awareness of the change brought by the use of OneNote Class Notebook. This transformative agenda will be fulfilled when the innovative features of the software are explored instead of the current practice of using only the basic features of the OneNote Class Notebook software.

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Appendix A: Student information sheet for online survey

MR PATCHIGALLA IS INVITING STUDENTS TO COMPLETE AN ONLINE SURVEY

The questions will be on your use of digital technologies and OneNote Class Notebook for teaching and learning.

The survey will collect your responses. No login or personal details will be collected. The survey may take 5-10 minutes to complete.

If you wish to volunteer for this study, please scan QR code or go to https://tinyurl.com/y8xqal3v. By taking part in this survey, you are giving consent for your responses to be used in the research project. The survey closes after 100 participants – so, don't delay!

If you require further information, please contact Mr Patchigalla by email (tear-off below)

Project Supervisor Contact Details: Leon Benade: lbenade@aut.ac.nz

Approved by the Auckland University of Technology Ethics Committee on *14 May 2018*, AUTEC Reference number 18/134.

Research email: mvn5008@aut.ac.nz	Research email: mvn5008@aut.ac.nz	Research email: mvn5008@aut.ac.nz	Research email: mvn5008@aut.ac.nz	Research email: mvn5008@aut.ac.nz	Research email: mvn5008@aut.ac.nz	Research email: mvn5008@aut.ac.nz	Research email: mvn5008@aut.ac.nz	Research email: mvn5008@aut.ac.nz	Research email: mvn5008@aut.ac.nz

Appendix B: Student online survey

Use of digital technologies and OneNote Class Notebook

This is an annonymous survey for students of Botany Downs Secondary College on the use of digital technologies. By taking part in this survey, you are giving consent for your responses to be used in the research project conducted by a master's student from Auckland University of Technology. No login or personal details will be collected. The survey may take 5-10 minutes to complete.

* Required

1. In your opinion, how important it is for you to have a computer device for learning? *

   ◯ Extremely important

   ◯ Very important

   ◯ Somewhat important

   ◯ Not so important

   ◯ Not at all important

2. What is your preferred digital device? *

   ◯ Laptop

   ◯ Desktop

   ◯ Mobile phone

   ◯ Other

3. Specify digital device if 'Other' is chosen in the above question

Enter your answer

4. Below is a list of possible uses you have for your various digital devices. Indicate in hours the approximate time you would spend each week on each of these activities. *

First three activities for school and the rest for non-school reasons.

	None	1 hour	2 hours	4 hours	6 hours	10 hours	Over 20
1. Class work	○	○	○	○	○	○	○
2. Homework and/or Research work	○	○	○	○	○	○	○
3. Communicating with teachers and students	○	○	○	○	○	○	○
4. Web browsing for non-school reasons	○	○	○	○	○	○	○
5. Watching YouTube	○	○	○	○	○	○	○
6. Watching videos	○	○	○	○	○	○	○
7. Social media/Online chat	○	○	○	○	○	○	○
8. Gaming - online/offline	○	○	○	○	○	○	○

5. Is your preference to learn using: (Select one) *

○ Digital devices only

○ A blend, but more digital

○ A blend, but more paper-based

6. Please explain your choice for the above question. *

    Enter your answer

7. How do you rate the importance or value of O365 Sites (used before OneNote) for your learning? *

○ Extremely important

○ Very important

○ Somewhat important

○ Not so important

○ Not at all important

8. In how many subjects are teachers actively using OneNote Class Notebooks with you? Please select one *

○ 1

○ 2

○ 3

○ 4

○ 5

○ 6

○ 7

9. How do you rate the importance or value of OneNote Class Notebook for your learning? *

○ Extremely important

○ Very important

○ Somewhat important

○ Not so important

○ Not at all important

10. Please explain your answer to the above question

Enter your answer

Student Information Sheet

A critical evaluation of the implementation of OneNote Class Notebook at one New Zealand secondary school
Hi! Mr Patchigalla is doing research – this is what it's about.

- ❖ I am currently studying a Masters in Educational Leadership at AUT and want to know more about how Botany Downs Secondary College is developing the use of **OneNote Class Notebook**. I am looking for six volunteers from Year 12 and Year 13 to spend about an hour in a focus group.

- ❖ My research will help me to understand the kind of changes to teaching and learning at this school as we move from using 365 SharePoint Sites to using **OneNote Class Notebook**.

- ❖ I am asking Year 12 and Year 13 students as they are using OneNote Class Notebook. If I get more than six volunteers, I will make a random selection.

- ❖ If you are willing to volunteer, please fill in a consent form and place it in the collection box at Reception.

- ❖ You can also volunteer by emailing me (address on the tear-off on the poster, or at the bottom of this sheet)

- ❖ The focus group will be held on Wednesday, 20 June 2018 in Room L1.1 during the lunch hour (some refreshments provided).

What will happen in this research?
- ❖ I will contact the selected volunteers

- ❖ We will set up a time for the focus group discussion

- ❖ We will meet at school for no more than 60 minutes during school time.

- ❖ You will get some notes from me about **OneNote Class Notebook** to check for accuracy.

What is the risk?
- ❖ Nothing!

- ❖ You might feel shy during the focus group.

- ❖ Your discussion will help my research, and nothing we discuss will be discussed with your teachers. Parents, caregivers or the principal.

- ❖ But if you do feel uncomfortable during the focus group, then feel free to leave the room.

What are the benefits?
- ❖ The research could help the teachers at this school staff.

- ❖ We will learn more about our digital strategies at this school.

- ❖ Other teachers and people in education will also be interested in how we are using **OneNote Class Notebook.**

❖ This research will help me get a degree!

What about privacy?

❖ What we discuss must not be discussed outside the focus group with others.

❖ Your names will not be used in my research, and nor will the name of our school.

Please reply within one week

Any concerns?

Contact the Project Supervisor, Dr Leon Benade, 09 921 9999 ext 7931   email: lbenade@aut.ac.nz

OR

The Executive Secretary of AUTEC, Kate O'Connor, ethics@aut.ac.nz, 921 9999 ext 6038.

Researcher Contact Details:

Prasad Patchigalla   email: mvn5008@aut.ac.nz

Project Supervisor Contact Details:

Leon Benade   email: lbenade@aut.ac.nz

Approved by the Auckland University of Technology Ethics Committee on *14 May 2018*, AUTEC Reference number 18/134.

Appendix D: Focus group indicative questions

Student Focus group questions

1. What are some of the ways you use digital technologies in your classes?

2. Thinking about the use of digital technologies for learning: where do you mostly use digital technologies for learning, and in what way do these technologies most help you learn?

3. How do you know they are helping your learning?

4. What are the differences between learning with digital technologies and traditional ways of learning with pen and paper?

5. What is your understanding of OneNote Class Notebook, and what are its key features?

6. What are the differences between learning with OneNote Class Notebook and learning with SharePoint Sites?

7. Name and discuss one specific change that stands out for you in the shift from SharePoint Sites to OneNote Class Notebook.

8. What is difficult about using OneNote Class Notebook for your lessons?

9. What does success look, sound and feel like when learning with OneNote Class Notebook?

10. What are the ways OneNote Class Note book has influenced your learning?

Examples of sentence starters to probe respondents and follow up.
What do you mean by …….?
Would like to expand further?
Why do you say that?

Appendix E: Student consent form

Consent Form: Focus Group

AUT
TE WĀNANGA ARONUI
O TĀMAKI MAKAU RAU

Project title: A critical evaluation of the implementation of OneNote Class Notebook at one New Zealand secondary school
Project Supervisor: **Leon Benade**
Researcher: **Prasad Patchigalla**

○ I have read and understood the information provided about this research project in the Information Sheet dated 24 February 2018.
○ I have had an opportunity to ask questions and to have them answered.
○ I understand that identity of my fellow participants and our discussions in the focus group is confidential to the group and I agree to keep this information confidential.
○ I understand that notes will be taken during the focus group and that it will also be audio-taped and transcribed.
○ I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.
○ I understand that if I withdraw from the study then, while it may not be possible to destroy all records of the focus group discussion of which I was part, I will be offered the choice between having any data that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.
○ I agree to take part in this research.
○ I wish to receive a summary of the research findings (please tick one): Yes○ No○

Participant's signature ....……………………………………………………………

Participant's name: ....……………………………………………………………
Participant's Contact Details (if appropriate):
……………………………………………………………………………………………..
……………………………………………………………………………………………..
……………………………………………………………………………………………..
……………………………………………………………………………………………..
Date:

Note: The Participant should retain a copy of this form.

Appendix F: Teacher information sheet for classroom observation

Date Information Sheet Produced: 23 February 2018.
Project Title: A critical evaluation of the implementation of OneNote Class Notebook at one New Zealand secondary school

An Invitation:

My name is Prasad Patchigalla. I am currently doing research towards a Masters in Educational Leadership at AUT. I am conducting research into the use of digital technologies with specific reference to OneNote Class Notebook. I would be grateful if you would consider participating by allowing me to observe your classes and make notes on your use of OneNote Class Notebook for teaching and learning.

What is the purpose of this research?

The purpose of this research is to understand how teaching and learning at Botany Downs Secondary School is changing by critically evaluating the use of digital technologies with specific reference to the implementation of OneNote Class Notebook, and analysing how this use differs from the use of 365 SharePoint Sites. The question of whether this influence is leading merely to a period of transition or a more fundamental transformation is at the centre of the study. The results will be published in a dissertation and a journal article.

How was I identified and why am I being invited to participate in this research?

The teachers of Year 12 and Year 13 who are using OneNote Class Notebook have been identified and invited for this study which will critically evaluate the implementation of OneNote Class Notebook. If more than the required number of senior level teachers agree (that is, 6 teachers), then the potential participants will be grouped by gender, with three from each gender group to be randomly selected.

How do I agree to participate in this research?

You can volunteer for this study by emailing me or filling in a consent form and placing it in the collection box.

What will happen in this research?

If you are selected to participate in the research, I will contact you to set up a time to observe one of your classes for 30 minutes. The protocol is that I will come to your class at the agreed time. You may briefly introduce me to class and the purpose of my visit. I will sit in a corner and take notes during the classroom observation. You will be emailed or shown a copy of my notes to check that it accurately reflects your use of OneNote Class Notebook.

What are the discomforts and risks?

There are no likely risks associated with this research, though you may feel understandably shy or uneasy by my presence in your classroom. This observation is not to be thought of as an appraisal, but merely data gathering and information–building process.

How will these discomforts and risks be alleviated?

If you do feel uncomfortable during an observation, feel free to ask me to leave your classroom.

What are the benefits?

The potential benefits of this study are the recommendations of the study, which will be shared with the school staff. This will potentially benefit the school and wider community, and contribute to the school's future digital strategies. The new knowledge added will also contribute to the field of educational use of digital technology in New Zealand and other countries. This research will also help me to complete my Master of Educational Leadership degree.

How will my privacy be protected?

You will be given the opportunity to select your own pseudonym that will be used throughout the writing of the dissertation. Any identifiable information that may potentially reveal your identity will be removed from the transcripts and pseudonyms will be used during the writing of my dissertation to protect your privacy.

What are the costs of participating in this research?

There are no costs involved in this research, although I will be spending time in your classroom, and will later ask you to comment on my observation notes.

What opportunity do I have to consider this invitation?

You have one week to consider participating in the study.

Will I receive feedback on the results of this research?

You will be entitled to receive a digital copy of the dissertation if you request it on the consent form.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Dr Leon Benade, 09 921 9999 ext 7931   email: lbenade@aut.ac.nz

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC, Kate O'Connor, ethics@aut.ac.nz, 921 9999 ext 6038.

Whom do I contact for further information about this research?

Please keep this Information Sheet and a copy of the Consent Form for your future reference. You are also able to contact the research team as follows:

Researcher Contact Details:

Prasad Patchigalla   email: mvn5008@aut.ac.nz

Project Supervisor Contact Details:

Leon Benade   email: lbenade@aut.ac.nz

Consent Form: Classroom Observation

Project title: A critical evaluation of the implementation of OneNote Class Notebook at one New Zealand secondary school

Project Supervisor: ***Leon Benade***

Researcher: ***Prasad Patchigalla***

○   I have read and understood the information provided about this research project in the Information Sheet dated 24 February 2018.

○   I have had an opportunity to ask questions and to have them answered.

○   I understand that identity of my students during classroom observation is confidential to the class and I agree to keep this information confidential.

○   I understand that notes will be taken during the classroom observation and that these will be made available to me to check for the accuracy of the notes.

○   I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.

○   I understand that if I withdraw from the study then, while it may not be possible to destroy all records of the classroom observation of which I was part, I will be offered the choice between having any data that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.

○   I agree to take part in this research.

○   I wish to receive a summary of the research findings (please tick one): Yes○   No○

Participant's signature :   ....……………………………………………………………

Participant's name: ....……………………………………………………………

Participant's Contact Details (if appropriate):

………………………………………………………………………………………..

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………………………………………………………………………………………..

………………………………………………………………………………………..

Date:

Approved by the Auckland University of Technology Ethics Committee on *14 May 2018*, AUTEC Reference number 18/134.

Note: The Participant should retain a copy of this form.

Appendix H: Teacher post-observation discussion indicative questions

Post-Classroom observation discussion

1. Thinking about the use of digital technologies for teaching: where do you mostly use digital technologies for teaching, and in what ways do these technologies most help you teach?

2. What are the differences between teaching with digital technologies and traditional ways of teaching with use of whiteboard and printed handouts?

3. Name and discuss specific changes that stands out for you in the shift from SharePoint Sites (or similar) to OneNote Class Notebook.

4. What is difficult about using OneNote Class Notebook for your lessons?

5. What are the ways OneNote Class Notebook has influenced your teaching?

Examples of sentence starters to probe respondents and follow up.
What do you mean by …….?
Would like to expand further?
Why do you say that?

Appendix I: AUTEC approval

AUTEC Secretariat

Auckland University of Technology
D-88, WU406 Level 4 WU Building City Campus
T: +64 9 921 9999 ext. 8316
E: ethics@aut.ac.nz
www.aut.ac.nz/researchethics

14 May 2018

Leon Benade
Faculty of Culture and Society

Dear Leon

Re Ethics Application: 18/134 Transition or transformation? A critical evaluation of the influence of digital technology on teaching and learning at one New Zealand secondary school, with specific reference to the school-wide implementation of OneNote Class Notebook

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 14 May 2021.

Standard Conditions of Approval

1. A progress report is due annually on the anniversary of the approval date, using form EA2, which is available online through http://www.aut.ac.nz/researchethics.
2. A final report is due at the expiration of the approval period, or, upon completion of project, using form EA3, which is available online through http://www.aut.ac.nz/researchethics.
3. Any amendments to the project must be approved by AUTEC prior to being implemented. Amendments can be requested using the EA2 form: http://www.aut.ac.nz/researchethics.
4. Any serious or unexpected adverse events must be reported to AUTEC Secretariat as a matter of priority.
5. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEC Secretariat as a matter of priority.

Please quote the application number and title on all future correspondence related to this project.

AUTEC grants ethical approval only. If you require management approval for access for your research from another institution or organisation then you are responsible for obtaining it. You are reminded that it is your responsibility to ensure that the spelling and grammar of documents being provided to participants or external organisations is of a high standard.

For any enquiries, please contact ethics@aut.ac.nz

Yours sincerely,

Kate O'Connor
Executive Manager
Auckland University of Technology Ethics Committee

Cc:_____, mvn5008@aut.ac.nz

Appendix J: Personal code of ethics

- Exclude students and teacher from Digital Technologies department for conducting research
- Conduct focus group interviews and post-observation discussions only during Time allowance given by Student Support Grant and/or by the school
- No discussion or organisation related to research conducted during school time
- Photocopying, stationary and other resources are paid from a private account
- All electronic and paper correspondence is conducted from AUT student account, not from the school email account
- Data analysis, interpretation and reporting, must be done off the school site.