Attitudes and Decision Making in Digital Education

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Abstract

Schools face monumental challenges when implementing new digital technologies and training teachers and students in using new digital technologies and in the acquisition of better digital literacy. In this sequential mixed-methods research study, in Stage 1 surveys were conducted with 321 students and 100 educators in Independent coeducational schools with one-to-one digital technologies. Survey data analyses indicated that there were significant differences in attitudes and disconnects between educators and students. The survey analyses revealed that these disconnects were related to issues in training and decision-making in schools, which impacted on effective use of digital technologies, leading to 10 in-depth interviews with educators skilled in the use of digital technologies. Decision-making has been confirmed as a relevant factor limiting the use of digital technologies, impacting on implementations, limiting curriculum applications and undermining effective training regimes. This study uncovered poor management practices and makes recommendations for schools aiming to apply best practice in managing digital technology systems. One area for improvement was that the best-practice e-learning training involved one-to-one training on an as-needed basis, that was rarely provided at a convenient time for educators in the schools of this study. Revisiting the best practice pedagogies in schools would also offer improvements in delivery using digital technologies. One other key recommendation was that schools were advised to utilise a best-practice team approach to decision-making involving uses of new digital technologies in classrooms, having full representation from interested parties: The Principal, ICT Manager, Finance Manager, Curriculum leader, e-learning leader and high digital literacy teacher and student representatives as appropriate.

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Thank you!

David Dawson

Declaration

This Thesis contains no material which has been accepted for the award of any other degree or diploma, except where due reference is made. To the best of my knowledge, this thesis contains no material previously published or written by another person except where due reference is made in the text of the Thesis.

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1 Introduction

Schools face monumental challenges when they are implementing new digital technologies and training teachers and students in using new digital technologies and in the acquisition of better digital literacy: problems were caused in the schools of this study by a range of organisational malfunctions, poor decision-making strategies and misunderstanding of the training needs of teachers and students. This mixed-methods study elucidates qualitative and quantitative research findings that confirm poor decision-making strategies in schools and suggests a range of significant improvements in digital technology integration that schools could aim to implement.

Section 1.1 Background

1.1.1 The Digital Literacy Challenge for Schools

Digital literacy is a fundamental aspect of student learning in modern school curricula in the technological age. Without skills in digital literacy, students will struggle to come to terms with expectations placed upon them in a work environment. There are many expectations for a modern education in order "to prepare students for a world in which there is less order, less predictability and more chaos, where old solutions are running up against complex, apparently insurmountable challenges" (Bentley, 1998, p. 177). Assignments, research, design and even entertainment all require that individuals possess the capacity to undertake new challenges with technology and develop some mastery of them, yet individuals have varying views of what is essential and what should be developed within school curricula.

There is not one widely held definition that precisely describes digital literacy. Instead, there are various interpretations of what comprises digital literacy and numerous attempted definitions, which are explored in Chapter 2. These may overlap with concepts of information literacy, digital education, digital technology and design technology in contemporary school curricula. It is important to unravel any confusion in this area in order to clearly establish student needs in schools for a digital education, and to assist them in adapting to a changing technological world.

There is also one debate highly relevant to the view that digital literacy should be a fundamental component of the modern school curriculum: The 'Digital Native Debate'.

Digital Native Debate

The supposition, or meme of the digital native relies on the assumption that today's students are so attuned with technology that they need little instruction in digital literacy in schools. There is much by way of opinion in the literature about digital natives (Prensky, 2001) and the so-called 'Digital Native'. There are prevailing assumptions in the popular media and amongst commentators that this group of students is fundamentally different from their predecessors in the way they process information (Oblinger & Oblinger, 2005). At the outset of this study in 2010, the issue of the Digital Native was seen as significant in schools the researcher was involved with, hence we investigated this issue briefly through quantitative analysis of survey data, to determine if the student group is more diverse than is often assumed and examine correlations between access to digital technology and greater digital literacy.

The Digital Native meme is imbued with the assumption that students are more attuned to the use of digital technologies and possess more digital literacy skills than their digital immigrant teachers and parents (Eynon, 2010). This is a belief perpetuated by many commentators, who passively assume that there is a generational divide between younger, 'digital native' users (Strand, 2017), and older people, like parents and educators (Prensky, 2001). Furthermore, even contemporary commentators espouse digital native theory as doctrine (Krach, 2016), despite the suggestion of "young people's engagements with digital technologies [being] varied and often unspectacular" (Selwyn, 2009, p. 364), and other studies that both contradict popular portrayals of young computer experts (Bennett & Maton, 2010) and undermine the Digital Native concept (Bennett, Maton & Kervin, 2008). The current study seeks to determine if students and educators saw their own digital literacy as reflecting either of these assumptions by undertaking quantitative research through surveys in Stage 1. Specifically, the aim was to investigate: Are there attitudinal differences that impact on the use of digital technologies in schools? Do differences in attitude reveal disconnects that occur between stakeholders in secondary schools? In this case, the term 'disconnect' refers to a lack of agreement and suggests limited communication and difficulties. In addition, how do school curriculum decision-makers address the challenges of embedding digital literacy into curriculum content and pedagogy? Follow up interviews in Stage 2, with skilled educators in digital technologies, revealed: greater complexity surrounding this issue in schools; and the impact of these assumptions on decision-making which can undermine the acquisition of digital literacy at home and at school, by both students and educators.

1.1.2 The Importance of Digital Technology in Schools

There are numerous practical reasons that justify the use of digital technologies in the classroom. It is clear that society is changing from a world where communication has been fundamentally analogue, to one where it is primarily digital. This would be expected to be reflected in the classroom, yet this has not been occurring in many countries according to the literature. Commentators bemoan a "decline in most ICT literacies" in the USA, a situation which is likely mirrored in Australia (Foundation for Young Australians, 2017), and recognise that "to remain competitive in the global, high-tech marketplace of the 21st Century, we must revitalize Computer Science education in K–12 and make it part of the core curriculum for all students" (Wilson, Sudol, Stephenson, & Stehlik, 2010). It is argued that this has yet to occur in Australia, and even those schools that have one-to-one computer access for their students in Australia have not yet addressed this concern.

The socio-cultural changes that have resulted from the influx of digital technologies; and through the evolution of traditional media, like newspapers, radio and television, into online media services; are not often reflected in the curricula of modern educational institutions. Individuals are no longer merely passive recipients of information but are creative and innovative content producers (Hartley, 2009).

Jobs and employment are changing and many jobs require that employees produce and design digital content. There are strong indications in the literature that skills in using digital technologies are essential for gainful employment, and it is acknowledged that “a significant proportion of the unemployed of the EU lack basic ICT skills” (Tsitouridou & Vryzas, 2011, p. 36). Because digital technologies are used in everyday life, it would be expected that schools actively upskill students with tools which are readily used in entertainment and employment. It is suggested that technological access is related to the capacity to use it, and that “young people’s abilities to access digital technologies remain patterned strongly along lines of socio-economic status and social class” (Selwyn, 2009, p. 372). Therefore, students in schools with one-to-one technology access would be expected to be more highly skilled and to make the most of this advantage. On the other hand, we would expect students from less privileged schools to be less skilled since they are likely to be “as ‘digitally excluded’ as older generations” (Selwyn, 2009, p. 372). This study aims to determine whether there is a consistently high level of digital literacy in schools with the highest level of access for students, and whether there is evidence of excellent standards of use or whether there is more variation than would otherwise be expected.

In the author’s experience, as an e-learning leader in one-to-one digital technology access schools for more than 20 years, school digital technology use incorporates: the need for advanced hardware and software skill development, knowledge of risks and self-management, and understanding of online hazards and training in problem solving using digital technologies. Under the broad digital technologies umbrella are included: access to essential online research tools, sites and software associated with the development of critical thinking skills and teachers appropriating technology for use in technical innovation and creativity in the key learning areas of Information Technology, Art, Design and Media education.

Little is known in the literature about decision-making processes and the consistency of their applications with reference to the inclusion of digital technologies in schools. The basis for this study was derived from personal observations made by the author about the shortcomings in schools attempting to implement one-to-one digital technology programs. This study aims to uncover these approaches and reveal where the decision-making is most effective. This issue is discussed further in Section 1.1.5 and in Chapter 6.

1.1.3 Digital Technology Hardware and Software

It is argued that schools do not always make use of the most appropriate hardware and software for their teachers and students (Keane, 2012). School administrators have requests from vendors to purchase or trial their products and may not have the necessary skills to make informed choices (Dawson & Rakes, 2003). In many cases, the decisions are made due to reasons other than the needs of stakeholders. Some schools may have specialist ICT managers, while others are reliant on global decisions for their school system by district or detached administrators. It is shown in this study that in few instances are the views of e-learning professionals, educators or students considered when purchasing decisions are made.

Since students use digital technologies more in the home (Swager & Bottema, 2012), they are likely to be unimpressed with school attempts to meet their digital technology requirements. Yet the purpose of schools is arguably to prepare students for modern life in work and play and it would be reasonable to expect instruction in the use of the latest technologies by their place of education or employment. This shortcoming will likely lead to a disconnect between teachers, students and school administrators and decision-makers, and possibly a desire by students to use their home technologies at school. There is an obvious requirement here to glean research data from students and educators in order to elucidate this further, as it will impact on the classroom environment in terms of attitudes to digital technologies. These two groups may be referred to as 'stakeholders' throughout this study. This study aims to uncover and interpret such attitudinal data.

There are school attempts to block online access to Social Media technologies. ICT Technicians and Managers tend to have a bias towards greater ICT security of their digital technology systems to the extent that "there has been an hysterical level of security over-kill in most schools" (Willard, 2010). This security may limit access of stakeholders to the wider Internet and Social Media and disallow additional software beyond what the schools provide. Stakeholders often have needs beyond what schools are willing to incorporate into their digital technology systems, placing users in conflict with their technicians. This brings into question the ways in which technicians are acting to service the needs of the users in these cases. Numerous questions arise about the attitudes of stakeholders to policy decisions that have not been suitably addressed in the literature. In this mixed-methods research, these questions are investigated in detail through surveys and follow up interviews, in order to unravel the sometimes confusing pastiche of digital technology choices, policies and decision-making in schools. Of particular interest are the decision-making processes involved in schools and the individuals who are involved. This may include school administrators, ICT Technicians and Managers, financial Managers, specialist e-learning educators or others including parents and students. Various methods of decision-making are investigated in Stage 2 of this study through interviews with skilled educators.

1.1.4 Curricula and Pedagogical Challenges in Training

Schools were shown in this study to have little consistency in meeting their training obligations in terms of student and educator digital literacy, and in upskilling their stakeholders in the use of new digital technologies. In most cases, they failed to change their curricula rapidly enough to keep pace with changes in businesses, employment and in the home. These obligations rest upon school leaders who need to keep abreast of social and technological change, in order to rapidly adopt any new directions that may lead to educational opportunities and benefits for students. This will only occur through informing and training their educators and adjusting school curricula to reflect these changes. While schools remain committed to a traditional curriculum, they are unable to meet the challenges of digital technological change. This may occur through hardware acquisition or digital literacy needs. If social and employment manifestations of new digital technologies move ahead at a rate that outstrips secondary school curricula, then they will be seen by their stakeholders as archaic and outmoded reflections of past needs, rather than meeting those of the present. If this was the case, then it would be evident in stakeholder disconnect and poor adoption of new digital technologies in schools and classrooms. This phenomenon is investigated in Stage 1 of this study through student and educator surveys and interviews.

School curricula in digital technologies, where they currently exist, are seen to be superficial and not reflective of stakeholder needs in preparing students for work and future use, nor have they adequately prepared educators to incorporate the latest technology into their pedagogical practices (Khlaif, 2018). It is argued in this Thesis that some school leaders have challenged the need for digital technologies in schools, notwithstanding the later introduction of the Australian Curriculum in Digital Technologies (ACARA, 2018), subsequent to the research data sampling of the current study. At the same time, students and staff have not been educated in the risks and benefits of Social Media; for example: the impact of overuse; addiction resulting from gaming or Social Media sites; and the presence of online of predators and criminals who attempt to exploit naïve users, particularly children. In these cases, schools may be failing to meet their duty of care to make their communities aware of concerns such as: software piracy, privacy, security, copyright and personal online safety, that are not readily addressed by traditional school curricula. Furthermore, there are important learnings in 3D design and media production in voice, sound, animation and video that overlap with uses in home entertainment, and would assist school community members in making informed choices for home digital technologies that could enhance rather than disrupt school programs.

While the Australian Government has recently introduced the Australian Curriculum (ACARA, 2018), Australian and State governments have offered limited resources to provide schools with the capacity to incorporate ACARA's Digital and Design Technologies curriculum content. Many teachers will need further professional development in order to offer the new programs.

Schools in Australian states like Victoria, where this study was primarily conducted, addressed the need to incorporate this new curriculum content independently with little or no support from their school system administrators, funding or training provisions. This means that, at the time of writing, each school was required to provide everything from their own budgets, including money for equipment, technical support and professional training programs. They also needed to either squeeze the new subjects into a crowded curriculum, or embed them into other subjects that have a different set of learning priorities. Each school needed to decide which method to use based on its own priorities, staffing and objectives, and if schools chose the least disruptive option of introducing a digital technologies curriculum, it would mean little change from past years.

Educators who participated in the Stage 2 interviews in this research study, were not sufficiently equipped or trained to meet the challenges of a new digital technologies learning area. Educators with formal training in Information Technology, Media, Digital technologies and Design were rare in the schools in this study. At the time of writing, there was no obligation for schools to provide Digital Technologies curriculum content, and the consequences of failing to address their Digital Technologies and Design Technologies requirements were not outlined in anything other than a most cursory manner. In this instance, the onus then falls on individual schools or school systems and administrators to implement the program effectively. This research study examines schools prior to their adjustment to this new requirement, and reflects on how schools can best adapt to these demands in the future, taking into account the nature and needs of schools and individuals within schools who are currently using one-to-one digital technologies. The study has investigated this problem in the context of schools which use a laptop program, or digital technologies embedded via tablets, or where students bring their own devices (BYOD).

The use of digital technologies in schools has given rise to many challenges for school decision-makers. These challenges revolve around the choice of which digital technologies to use, the training of students and educators in the use of these technologies, the interface with technologies used in the home, the costs of digital technologies, the interface of digital technology curriculum requirements and the changes to traditional classroom practices and pedagogies. This leads to the question of how schools meet student needs in developing digital literacy and using digital technologies. [Note: This study does not specifically reference the Australian Digital Technologies curriculum model that has been introduced.]

1.1.5 Decision-making in Schools

School decision-makers in this study were overwhelmed by choices in digital technologies and they generally had neither the educational background nor skillset required to make sensitive and informed decisions that would benefit their stakeholders. School Principal-class leaders were often amongst the oldest educators in secondary schools, had the oldest qualifications, and rarely had any background in information technology or e-learning. They were unlikely to see digital technologies and digital literacy as being important priorities in the educational objectives for their schools. Decisions were likely to be biased by approaches from IT marketing representatives, limits placed upon technology implementations by predetermined financial measures and by expressed needs for system security from ICT managers. None of these factors were likely to give rise to improved student outcomes in terms of digital literacy, or access to the most suitable digital technologies.

At the core of these issues were questions surrounding how decisions were made about the uses of technology in classrooms and assumptions about the digital literacy of educators and students. Due to the complexity of implementing new digital technologies, schools need to develop a systematic approach to making informed decisions about new technologies. This would include financing new technologies and training people in the associated skillsets that are needed to use the chosen technologies. Through analysis of Stage 2 interviews with skilled e-learning professionals, this study demonstrates that many schools are not doing this effectively in the current school climate in Australia, while others have developed a more visionary approach.

Schools in this study did not share decision-making approaches that represented the opinions of stakeholders and best impact student outcomes. There are many possible decision-making methods that could be adopted by schools and each school sets up these processes at the behest of the school Principal. Decisions may be made by the Principal and then delegated to: The Principal's Administrative representative such as an assistant Principal or curriculum leader; the ICT Manager or ICT Technician; a head of e-learning or an e-learning team, or a combination of all the above individuals in a consultative or team approach. In each case, decisions may be vetoed by a Principal or by a Head of Finance who needs to fund the model chosen. Management of a system and setting of priorities for ICT Technician time allocations is also likely to be the responsibility of any of these individuals in a given school environment. In this study, the choices made in a number of schools were investigated and an attempt was made to determine the most effective decision-making process in implementing one-to-one digital technologies.

1.1.6 Possible Attitudinal Disconnects Between Stakeholders

Students proficient in using digital technologies and who are aware of educator shortcomings in terms of using digital technologies may lose respect for them as professionals in managing the classroom when new technologies are embedded. This phenomenon would be particularly pronounced in cases where there is a digital use divide (Office of Educational Technology, 2017) between skilled and less-skilled students, particularly in cases where some lack access. In instances where students are more digitally attuned than their educators, it would be expected that there would be attitude differences between students and educators towards classroom use of digital technologies. These differences in the ways these stakeholder groups use and view digital technologies may give rise to disconnects that may undermine attempts to use the devices effectively in the classroom. Student surveys would be useful in determining if this disconnect is pronounced and relevant to students. These were undertaken in Stage 1 of this mixed-methods study and discussed in Chapter 4.

Educators who are not skilled with using digital technologies may feel overwhelmed by the rapid influx of digital technologies into the classroom and be ill-equipped in using them. For many of these educators, upskilling their own capacity to use new technologies may not be feasible, due to a lack of knowledge of what is required or how to access relevant training. In a similar way, educators who are proficient in using digital technologies and who wish to use more advanced technologies may not be able to access them due to budgetary constraints preventing purchase, or because they are also not able to access advanced training in using digital technologies. In each of these cases, educators may expect their schools to provide useful guidance and appropriate training in using digital technologies. If schools with one-to-one access to digital technologies are not offering sufficient or appropriate training for these educators, or it is not offered at convenient times, or where educators are not able to access external professional development activities funded by schools, then an attitudinal disconnect between educators and school administrators or ICT managers may arise. Such attitudinal disconnects may be revealed through appropriate interview questions. These interviews take place in Stage 2 of this mixed-methods study and are discussed in Chapter 5.

Section 1.2 Research Questions

1.2.1 Major Areas of Focus and Research Questions in this Study

The premise underpinning this research is that digital technologies are not being used as effectively as possible in Australian schools (Brown, 2012; Keane, Keane, & Blicblau, 2016). Numerous studies and commentary outline the challenges for secondary schools in implementing new digital technologies programs (Hartley, 2009; Howard, Chan, & Caputi, 2015; Nielsen, Miller, & Hoban, 2015). It is argued in this Thesis that these challenges relate to decision-making and attitudes to digital technologies within schools. Since stakeholders would be likely to have different perspectives on the use of digital technologies (Brown, 2012; Howard et al., 2015), and varying self-efficacy (Aesaert, Voogt, Kuiper, & vanBraak, 2017; Prior, Mazanov, Meacheam, Heaslip, & Hanson, 2016), it is argued that attitudinal differences and associated stakeholder disconnects would be able to be determined through appropriate research methodologies. Therefore, the following research questions were devised in order to elucidate the nature of these challenges and possible ways of overcoming them:

1. What are the attitudes of the various stakeholders towards digital literacy and use of digital technologies in education?
2. What are the disconnects between stakeholders that impact upon the use of digital technologies in the classroom?

As there were also major perceived challenges for schools in upskilling educators and students in using digital technologies (Brown, 2012; Gray, Andrews, & Schroeder, 2012; Nielsen et al., 2015), it was viewed as crucial to acquire information about the effectiveness of this process for students and educators. Qualitative and quantitative methodologies were employed to illuminate this process and develop a better understanding of how schools address this challenge. Therefore, it was also necessary to investigate the following question:

3. How do schools train stakeholders in the acquisition of digital literacy and in using digital technologies and how effective are these methods?

The above issues were contingent on decision-making and decision-making processes which impact on both the views of educators and students about their school's implementation of digital technologies and the effectiveness of training strategies (Keane, 2012). It appeared from the Stage 1 survey analysis, that the decision-making systems that schools adopted were inconsistent across different schools and strongly influenced the effectiveness of the digital technology system, training and curriculum. Therefore, it was essential that an analysis of the following research question was undertaken in Stage 2, in order to determine the most effective decision-making strategies and best practices in schools at the time of this study:

4. How are decisions made in providing training in digital literacy and in implementing digital technologies in digital education? Are there decision-making and change management practices that allow for more effective provision of digital literacy and implementation of digital technologies?

In summary, there are four key research questions that this study aims to investigate:

1. What are the attitudes of the various stakeholders towards digital literacy and use of digital technologies in education?
2. What are the disconnects between stakeholders that impact upon the use of digital technologies in the classroom?
3. How do schools train stakeholders in the acquisition of digital literacy and in using digital technologies and how effective are these methods?
4. How are decisions made in providing training in digital literacy and in implementing digital technologies in digital education? Are there decision-making and change management practices that allow for more effective provision of digital literacy and implementation of digital technologies?

These questions can be summarised as representing the following areas that impact on classroom use of new and innovative technologies:

- Attitudes to digital literacy and digital technologies
- Disconnects impacting on the use of digital technologies
- Training in the acquisition of digital literacy and using digital technologies
- Decision-making impacting on training in digital literacy and provision of digital technologies

These four areas provide the foci of this research. through the Chapter 2 literature review, Chapter 3 methodology, Chapter 4 Stage 1 survey data analysis, Chapter 5 Stage 2 interview data analysis and Chapter 6 Findings synthesis and conclusions.

1.2.2 Useful Definitions of Terms Use in this Study

Throughout this research important terms are used, that need to be identified and defined for the purposes of this study. This requirement is undertaken in the following section.

Attitudes

In order to investigate attitudes to digital technology in schools and to gain an understanding of attitude differences between stakeholders, the term needs to be defined. Attitudes are a crucially important element in social psychology with three distinct elements: affective (feelings), behavioural (actions) and cognitive (thoughts) (Breckler, 1984). Each of these was thought to be essentially enduring for individuals, with some change over time, associated with Social Learning Theory (Bandura, 1977b). Attitudes may be effectively investigated through survey items that allow survey participants to select from: a range of options or rating scales in Stage 1, as these allow for quantitative analysis of items including self-efficacy (Bandura, 2006); and, in Stage 2, more open-ended interview questions or statements are presented, that provide qualitative research data. While both approaches are utilised in this mixed-methods study, quantitative data on attitudes is primarily provided from the Stage 1 Attitude Surveys of educators and students.

Individual responses to attitude survey items are most likely to reflect what the person is thinking at the time, adjusted through the lens of their interpretation of the given statement; so that participants "arrive at an evaluative judgment and the outcome of the judgmental processes is highly context dependent" (Schwarz & Bohner, 2001, p. 10). It is therefore important to set the terms of the attitude survey and provide suitable definitions for participants. Survey items must also provide sufficient information, since attitude judgements are constructed by individuals based on the information that is available at that time (Schwarz & Bohner, 2001). Therefore, the construction of the statements with which the participant might agree or disagree is particularly important, to remove any doubt about the meaning of the survey statement. In this way, participants' responses to the attitude survey items will reveal a "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly & Chaiken, 1993, p. 1). This definition of attitudes is most relevant in the context of the surveys undertaken in this research.

Social Media and Web 2.0

There is a tendency for schools to electronically block access to what is often termed Web 2.0, as well as blocking Social Media. While Web 2.0 focuses on user-created content and is technically broader than the term 'Social Media' which connects individuals (Rouse, 2015) the two terms were understood by individuals in pilot surveys here, as interchangeable. Sites such as Flickr, Instagram, YouTube, and LMS that students can contribute to, all display user generated content, and they also connect individuals as forms of Social Media. To avoid any confusion in this study, the term Social Media will be used.

M-Learning, Bring your own Device (BYOD) and Mobile Computing

In digital education, the term mobile computing is used as a generic description for hardware that ranges from mobile phones through to tablets of various types, to laptop computers. Table 3.4 shows the devices used in the schools of the interviewees. All survey participants were in schools that had a one-to-one laptop program, with staff and students using similar school-provided devices.

M-learning refers to learning with one-to-one digital technology in secondary or higher education. This term is device independent and generally refers to students that bring any device of their choosing to their place of study, although it could equally apply to school-provided laptops. In secondary education in Australia, the method of digital technology provisioning for students, where students bring devices, is referred to as 'bring your own device' or BYOD. Where a citation refers to m-learning, applying to student-brought devices, BYOD is the term used in this study rather than m-learning.

1.2.3 Stakeholders

There are numerous stakeholder groups involved with digital technology use in schools. These include: students, parents, educators, e-learning professionals, administrators, vendors and ICT Manager and Technicians responsible for maintaining equipment and services. It was impractical to focus on all of these stakeholders in this study, so Stage 1 surveys were used to gauge the attitudes of students and educators to digital technologies and digital literacy. In Stage 2, in-depth interviews with skilled educators in using digital technologies allowed discussion of broader issues relevant to implementing new technologies in schools. Generally, throughout this study the term 'stakeholders' refers to those engaged with school digital technologies in classrooms, the teachers and students.

The various stakeholder groups discussed in this study are outlined below:

Students

In the surveys undertaken in this study, 321 students participated. These students were enrolled at five Independent coeducational schools with one-to-one laptop digital technology programs.

Educators

The term 'educators' was used in this study to represent qualified teachers who may be in the classroom or who may be in a variety of other roles such as library resource centres, or in sports, curriculum, e-learning or other areas. The term 'teacher' was used to represent only classroom practitioners in this study.

Administrators and ICT Managers

School leaders and administrators such as Principals and Financial Managers are all faced with a plethora of decisions associated with the digital technologies system, including: financial decisions about insourcing and outsourcing; employment of ICT Technicians and network specialists; purchasing of the hardware and network infrastructure; and software and licensing. Curriculum leaders oversee the digital technologies curriculum for students and the training and professional development for teachers and other school administrators. In schools there may also be e-learning professionals who assist the training of others. There are also ICT Technicians or ICT Managers involved in school digital technology implementations. Each of the schools in this study had various combinations of employees involved in the digital technologies system.

Section 1.3 Significance of this Study

Stage 1 of this thesis contributes to understanding the challenges of implementing digital innovations in schools, through a quantitative comparative analysis of the attitudes of educators and students to each other's digital literacy and use of digital technologies in the classroom. Stage 2 used qualitative interview data analysis to further investigate these attitudes and their ramifications for decision-making in schools, in training teachers, and in teaching students to use digital technologies effectively and acquire digital literacy.

It is hypothesised that there are attitudinal differences, or disconnects, between the views of educators and students in how they view digital technology in the classroom, and in how they view each other's digital literacy. If this is the case, does this result from generational differences, differing attitudes towards how digital technologies should be used in the classroom, or a lack of digital literacy in educators or students? Furthermore, if such disconnects exist between educators and students, less effective use of digital technologies in the classroom is a likely consequence. This study aims to deconstruct this issue and provide advice for schools in implementing one-to-one digital technology programs.

Much of the commentary about digital technology in schools may rest more on assumptions about the behaviour of the generational groups and less on the complexities at play in actual learning institutions. There are wide influences that include socio-economic effects, gender issues, teacher training and ongoing professional development and generational effects, which impact on students, educators and administrators. Market forces and direct marketing by vendors, parental expectations and school funding from the Government, student fees and benefactors also play a significant part in a complex equation. School and ICT administrators face significant learning curves to navigate a path that demonstrates sensitivity and understanding of their stakeholders.

The findings in this study make significant recommendations about training and decision-making processes, that are unique in the field. The intention of this research is to provide guidance for schools in the complex domain of new technology exploration, in a world where digital technology is at the core of economic development and employment for the next generation. This study contributes to the literature in the field of digital education, through statistical and thematic analyses of quantitative and qualitative data pertaining to digital literacy and uses of digital technologies, that impacts on training and decision-making in schools. This has not been covered in a mixed-methods holistic way in other research in the field. Recommendations are made about best practice decision-making processes that could be adopted by schools.

1.3.1 Need for This Research and Literature Review

In Chapter 2, research findings that pertain to the research questions are discussed. These provide background and understanding in the field of school uses of digital technologies, particularly in one-to-one digital technology programs. An understanding of digital literacy is also sought in relation to this digital education. Decision-making in teacher and student training and in professional development and curriculum delivery of digital technology programs are also explored.

For many years there have been challenges for schools in implementing digital technology programs. Johnstone (2003b) points to the problems of employing digital technologies in the classroom, since there was a lack of leadership, from administrators down to teachers. Governments, he states, may pay for computer hardware but not for the professional development that teachers need in digital technologies (Johnstone, 2003a). There is a need for research to confirm whether or not this is the case in Australian schools. The Stage 2 interview data analysis in this study contributes to an understanding of this issue.

The Australian model has, for many years, been seen by the rest of the world as a massive shift towards a bright future, a future that was being emulated worldwide (Johnstone, 2003b). While there may be innovators in the education system who are implementing good digital technology programs, there is a need to access their opinions (Johnstone, 2003b), something that has rarely occurred (Johnstone, 2003a; Moyle, 2006), to investigate digital technology programs and impacts.

There are questions for the private sector since there are accusations of complacency, that having the technology is not enough; they need to use it for something meaningful (Johnstone, 2003b). This point is at the crux of the use of laptops in the classroom. Is digital technology used effectively in schools that have had access for a number of years? While Johnstone offers sage advice, there is also a need for research in adjacent areas in schools including “pedagogical practices” and the “aspects of knowledge, skills and competencies (that) should be included in the curricula” (Stergioulas, 2011, p. xii). There is also the need to research “the organisational structure of the school to support [the inclusion of digital technologies]” (Stergioulas, 2011, p. xii). Stage 2 interviews of this Thesis will address these areas and determine the types of activities that classroom innovators are employing, and whether “more focused teacher support (was) put in place [to facilitate the use of digital technologies]” (Passey, 2011, p. 135).

In Stage 1, student survey data was used to better understand digital technology classroom use. Previous research suggests that “students want to contribute their views to the administration, organisation, policy development and practices of teaching and learning with technologies” (Moyle, Wijngaards, & Owen, 2012, p. 15) and it is important to consider their viewpoint. Indeed, “it is crucial to listen carefully to them and learn from their experiences of growing up in changing media ecology" (Ito, Baumer, Bittanti, Cody, Stephenson, Horst, Lange, Mahendran, Martínez, Pascoe, Perkel, Robinson, Sims, & Tripp, 2008, p. 35). Nonetheless, students are rarely heard since, "the topic of technology use is not usually seen to be a suitable area for democratic negotiation" (Selwyn, 2011, p. 248), and they are usually detached from the decision-making in schools. Of interest in this study is also the issue of whether schools have adopted a strategic team approach to managing digital technologies, a method Keane (2012) suggested would be useful, whether this includes student participation or simply a variety of staff.

The common generalisation about digital native students being universally digitally literate has been challenged by numerous studies (Bennett & Maton, 2010), while one Australian study of university students, found that while "searching for information on the web, email, mobile telephony and SMS messaging are used very frequently by a large majority of students", more advanced digital technologies "that allow students to collaborate and to produce and publish material online are used by a relatively small proportion" and "few students were regularly using social bookmaking or creating and publishing podcasts" (Kennedy, Barney Dalgarno, Kathleen Gray, Terry Judd, Waycott, Bennett, Maton, Krause, Bishop, Rosemary Chang, & Churchward, 2007, p. 522). Hence, digital native students may not be as digitally connected as thought. There may be large numbers of students who do not see themselves as digitally literate and who lack confidence when asked to undertake more complex tasks. In this study, the surveys in Stage 1 provide relevant empirical data about skill levels of teachers and students in Australian secondary schools and contribute to the literature in this area.

There is "a comparatively thin body of literature that specifically focuses on the views of students and has collected data directly from students" (Moyle et al., 2012, p. 15). This scarcity of relevant research is compounded by very little information about "how student's learning with technologies is fostering deep rather than surface learning" (Moyle et al., 2012, p. 15). Additionally, "research is required into what conditions have to be met in education, in order to allow for optimal use of technologies in the future" (Swager & Bottema, 2012, p. 176). The Stage 2 interviews in this study, with skilled educators from schools with one-to-one digital technologies provides valuable information relevant to these issues.

Chapter 2 contains the Literature Review that describes in more detail the current research and findings into the areas relevant to the research questions of this study.

Section 1.4 Research Chapter Descriptions

1.4.1 Ch 3 Methodology

Chapter 3 describes the research methodology employed in this study. An emergent mixed-methods approach was utilised to acquire and analyse both quantitative and qualitative data pertaining to the attitudes of educators and students to each other's digital literacy and their use of digital technology in the school and home environments.

Research was conducted in two stages: In Stage 1, a statistical analysis of quantitative data was performed via detailed attitude surveys of 321 Year 9 and 10 students and 100 of their educators, in Independent coeducational secondary schools in Victoria, Australia. In Stage 2, qualitative data was acquired in the form of in-depth semi-structured, face-to-face interviews with ICT decision-makers and teachers skilled in the uses of digital technologies which were undertaken to provide a greater depth of understanding of the elements that give rise to the disconnects. These disconnects were found through the analysis of the Stage 1 surveys, relating to the use of digital technologies, training and professional development in digital technologies and associated problems in decision-making processes.

The findings of this study are relevant to the population of students and educators involved in digital education programs, particularly where there is one-to-one access to digital technologies. While these findings may strictly only apply accurately to Australian, or Victorian schools with one-to-one access to digital technologies, the findings are of interest and provide information relevant to school administrators and decision-makers who are implementing one-to-one digital technology programs in their schools.

Chapter 3 explores the survey statements, Likert scales and attitude measures. Examples of all types of statements and questions are provided, for example, ordinal, nominal and interval. The full text of the survey items is found in Appendix 1.

Stage 1 Survey Participants

For the Stage 1 surveys, students from Years 9 and 10 in Independent coeducational Victorian schools, with one-to-one laptop programs were selected to allow the highest level of consistency of digital technology access. 321 students completed the Stage 1 surveys. Educator participants were the teachers of the above groupings of students from the same Independent coeducational Victorian schools. In all, 100 educators completed the survey.

Stage 2 Interview Participants

The Stage 2 interviews were undertaken with 10 educators skilled in using digital technologies in secondary schools in Australia. These educators represented all three school sectors and several had taught at different types of schools. More detail is provided about these schools, the interviewees and the methodology used in Chapter 3.

1.4.2 Ch 4 Survey Data and Analysis

In Chapter 4, the Stage 1 survey data is shown and grouped into sections. This allowed for an investigation into the first two research questions.

Section 4.1 shows similarities in the attitudes of participants to survey statements through a number of comparison groups. In Section 4.2, attitudinal differences are investigated through disconnects in response to the survey items.

The group comparisons are shown for survey statements in the following four domains:

i) Attitudes to the acquisition of digital literacy

ii) Attitudes to online risks and security

iii) Attitudes to classroom use of digital technology

iv) Attitudes to home versus school uses of digital technology

For each of these domains, responses were grouped into the comparisons shown in Figure 4.1. There were eight comparisons according to individual self-assignment into student or educator groups of high and low digital literacy (DL).

Self-assignment into the high DL group was made through agreeing to the survey statement, 'I have a high level of Digital Literacy'. Participants were then assigned accordingly into high or low DL categories. The responses of each of these groups to the remaining survey statements were then filtered to allow detailed analysis.

Groupings of students and educators, with high and low DL, allowed several filtered result comparisons to be performed. Attitudinal similarities and differences of each of these groups to their comparable survey responses were then analysed. These are discussed in detail in Sections 4.1 and 4.2 and detailed reflections and conclusions based on the results are drawn.

1.4.3 Ch 5 Interview Data and Analysis

Qualitative data from Stage 2 semi-structured interviews with 10 educators skilled in using digital technologies in their schools, was analysed through thematic analysis of coded interviewee responses to six semi-structured questions. This allowed an investigation into the final two research questions, and reflections were made with reference to the initial two questions, where interviewee responses provided relevant information.

The interviews revealed discrepancies and inconsistencies in decision-making and school policies surrounding the integration of digital technologies in classrooms which may relate to budgetary constraints, professional development and other attitudinal factors. At the centre of these problems was the issue of developing adequate student and staff access policies on the school-provided laptops.

In-depth qualitative analysis of the survey data using numerous analytical techniques is described in Chapter 5 and Chapter 3. Findings and conclusions that related to the research questions were then drawn.

1.4.4 Ch 6 Findings Synthesis and Conclusions

The findings are presented and data are analysed under the sections titled: Attitudes, Disconnects, Training and Professional Development in Digital Technologies and Decision-making Processes.

It is suggested in Chapter 6 that schools with a more transparent and consistent decision-making process towards the implementation of new digital technologies, will have greater acceptance of policies surrounding their use. If teaching staff and/or students have greater ownership over policies, the use of digital technology will therefore be likely to be regarded more favourably. It is proposed that schools with consistent and more visionary decision-making processes with regard to implementing digital technologies will be seen to be more effective by stakeholders.

Finally, recommendations are made on how improvements can be made to contemporary pedagogies, decision-making in digital technologies, training and professional development, and improvements to the integration of digital technologies in schools.

2 Literature Review

Section 2.1 Introduction

The primary aim of this study was to investigate underlying reasons for the ineffective use of digital technologies in secondary schools where students have one-to-one access. Specifically, decision-making in implementing new digital technologies in schools, and the quality and quantity of training stakeholders to acquire digital literacy, are explored as possible limiting factors. In this literature review, there are several important issues which underscore the significance of this research. These include:

- Attitudes to and measures of digital literacy and use of digital technologies by students and educators (Section 2.2)
- Disconnects impacting on the use of digital technologies in digital education (Section 2.3)
- Training and professional development in the acquisition of digital literacy and using digital technologies (Section 2.4)
- Decision-making impacting on training, curriculum, and on the provision and integration of digital technologies (Section 2.5)

Where possible, research has been identified that relates to secondary schools in Australia and that focuses on schools with one-to-one access to digital technologies. Otherwise, research has been found that relates to higher education or primary schools in Australia and elsewhere.

This chapter reveals that effective use of digital technologies (DT) in schools remains unsatisfactory. There is some evidence that ineffective DT use and poor decision-making is more prevalent in schools than would be expected. Additionally, there are few studies that acknowledge the important social cognitive issue of whether attitudinal disconnects and poor decision-making are contributing to the ineffective use of DT in schools. Investigation into this issue is the pre-eminent, central focus of the current study.

Section 2.2 Analysis of Attitudes to Digital Literacy and use of Digital Technologies

In this section, the available research in digital literacy and use of digital technologies (DT) in education is analysed. This topic is further explored through relevant research into teaching practice with DT, including mobile technology use and bring-your-own-device (BYOD) by students and educators at home and at school.

There is evidence in the literature to suggest that digital literacy is vitally important in modern schools and that digital technology use has become widespread throughout the community, including in schools, although its use in education is less than optimal and schools need more support (Office of Educational Technology, 2017).

2.2.1 Defining Digital Literacy

Firstly, a definition of what comprises digital literacy needs to be established. Digital literacy is a term that overlaps with information literacy, and this term originally stemmed from the definition by the USA Presidential Committee on Information Literacy: Final Report. In this, “computer literacy, civic literacy, global literacy, and cultural literacy” were pursued and promoted as a means to a stronger knowledge economy, by means of creating “better thinkers, problem solvers, and inquirers” (PCIL, 1989). This report predated the World Wide Web, and acknowledged that traditional literacy alone was no longer adequate: “What used to suffice as literacy no longer suffices; what used to count as effective knowledge no longer meets our needs” (PCIL, 1989).

In seeking an effective description of what skills are necessary for students and teachers to acquire to be seen as ‘digitally literate’, there are four generally agreed components of digital literacy according to Bawden and Robinson (2011):

> 1. Underpinnings: literacy per se, computer/ICT literacy;
>
> 2. Background knowledge: the world of information, nature of information resources;
>
> 3. Central competencies: reading and understanding digital and non-digital formats; creating and communicating digital information; evaluation of information; knowledge assembly; information literacy; media literacy;
>
> 4. Attitudes and perspectives: independent learning; moral social literacy.
>
> (pp. 54-56)

These point to a need for stakeholders in education to achieve an understanding of four principal areas: The first relates to a general capacity to use computer hardware that is used to connect and communicate. The second refers to a capacity to engage in online access to information in order to find what is sought, with suitable search terms and use of appropriate online resources. The third indicates that stakeholders require knowledge about traditional and digital media, together with the ability to evaluate the available information. The fourth points to individual factors that relate to attitudes and social influences, since without understanding their own social connections, individuals are unable to make suitable global interpretation of their findings.

There is an implication here that schools and educators need to adjust their curricula to provide the capacity for students to interpret online offerings and evaluate what they are exposed to. This list raises questions pertinent to the research questions in this study. What are the attitudes of school leaders, administrators and educators towards the importance of digital literacy? Are schools offering students adequate opportunities to develop computer/ICT literacy and skills in using the available online resources and tools for collaboration and media production?

Recent research into university students suggests the importance of digital literacy as a necessary prerequisite for learning, that it is more than just using DT. It involves how to manage information resources and engage in critical thinking (Tang & Chaw, 2016). If secondary educators agreed with this sentiment, digital literacy would be placed as a central focus in school curricula.

In an investigation into the variations in definitions of digital literacy across different cultures, Helsper (2011) has mapped out the relative importance of digital literacy in compulsory school education. Educational authorities expound direction and definitions for educators to follow and there is strong overlap between digital literacy and media literacy in the various official government definitions used across the globe. In the UK, it is the Office of Communications that offers a definition of (digital) media literacy as “the ability to access, understand and create communications in a variety of contexts”, in comparison with New Zealand’s definition of digital literacy as: “the ability to use digital technology, communication tools or networks to locate, evaluate, use and create information” (Helsper, 2011, p. 143). All of the important elements that are necessary in any description of digital literacy, are shown, concluding that suitable definitions of digital literacy: “all incorporate access, technical, critical and creative skills” (Helsper, 2011, p. 143). These elements each represent separate focus areas related to digital education in schools, but there is little research into uses of Social Media in developing social and communication literacy, or in determining whether students see creativity as being an element of their digital education. This study aims to contribute to the literature by providing quantitative analysis exposing student and educator attitudes towards digital literacy. For the purposes of the surveys undertaken in this study, the Gilster (1997) definition is more than adequate being concise, easily understood and clearly articulated.

According to Glister (1997), digital literacy **“**refers to a way of reading and understanding information” and “[it] is the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers**”** (Gilster, 1997, p. 28). Although online multimedia content is omitted, which was virtually unachievable at the time, and the description avoids specifics about expertise in using particular digital tools, hardware and software, his definition incorporates the importance of multimedia, access to information online, and the necessary capacities of comprehension and application. In the years since this publication, the Internet may have changed, but the definition remains flexible enough to be equally relevant today and it has the advantage of being simple enough for most people to understand. For these reasons, this definition has been employed in the surveys and interviews in this study.

The Digital Native Debate

Since today's students are often assumed to be 'digital natives' (Prensky, 2001), and "visually literate" multitaskers (Oblinger & Oblinger, 2005, p. 16), who are more digitally astute than their predecessors, it would be expected that students from schools with one-to-one laptop programs, such as student participants selected for the surveys in this study, would represent the digital native 'elite'. Based on digital native theory, students with one-to-one access to DT devices might be assumed to have high levels of digital literacy. However, Lebens (2009) found, in a rare study into the attitudes of children from various economic backgrounds towards computers, that the provision of DT equipment is not as important as commonly assumed, and that other factors such as "general literacy, level of education, community resources and social resources" (Lebens, 2009, p. 256) contribute to the digital divide.

There has also been commentary and research (Bennett & Maton, 2010), suggesting that the existence of the digital native is no more than a popular myth. One paper offering a critical perspective on digital native notions, suggests that "young people's engagements with digital technologies are varied and often unspectacular" (Selwyn, 2009, p. 364), contradicting popular portrayals of young computer experts. Here it is argued that there is little, if any, empirical research grounding upon which the digital native theory is based, and that it rests more upon moral and ethical debates about the behaviour of children. Research suggests technological access is at the root of capacity to use it, that "young people's abilities to access digital technologies remain patterned strongly along lines of socio-economic status and social class" and that many are "as digitally excluded as older generations" (Selwyn, 2009, p. 372). In debunking the digital native theory, there are strong indications that "use at home and at school remains rather less expansive and empowering than the rhetoric of the digital native" and that "surveys of adolescents show a predominance of game playing, text messaging and retrieval of online content" (Selwyn, 2009, p. 372). It has also been suggested that the digital native debate is beset with a type of panic that underpins arguments for educational and pedagogical change (Bennett, Maton, & Kervin, 2008). These research findings have been reiterated more recently by Kirschner and De Bruyckere (2017) who concluded that "there is no such thing as a digital native" and that the "ability to multitask, does not exist" (Kirschner & De Bruyckere, 2017, p. 140). There are strong arguments for the importance of training pre-service teachers in when and how to use DT effectively, and that schools need to focus on developing DT skills in students and teachers since these “need to be properly taught and acquired” (Kirschner & De Bruyckere, 2017, p. 137). It is apparent in these studies that although both teachers and students have DT in their lives, they are likely to use them differently, according to their interests and roles.

Further findings emphasise possible gender, education and age-related factors affecting online usage patterns: “younger people, men, the non-disabled and those who are bilingual use the Internet for a wider variety of activities” (Helsper, 2011, p. 149). In addition, “young people are engaged in creative and social ways even when their digital lives are relatively narrow”, although they are less inclined to go online for “knowledge-gathering activities” (Helsper, 2011, p. 152). These findings are unrelated to educational settings and more indicative of home use. There is also a need to know how students perceive their educators’ digital literacy, since they are likely to have a different fundamental focus and pattern of use. Hence, are schools viewed by students to be at the forefront of digital innovation and developing skillsets relevant to the students?

Despite the above findings, not all research suggests that there is a strong generational digital divide. In one higher education study on the generational digital divide between students and educators, the findings “question assumptions that have been made about a ‘digital divide’ between ‘digital native’ students and their ‘digital immigrant’ teachers in higher education today” (Waycott, Bennett, Kennedy, Dalgarno, & Gray, 2010, p. 1202). There are indications that the reality is more complex than has otherwise been assumed, and that the apparent divide is dependent on “the role technologies play in the lives of both students and staff” and a greater understanding of their perspectives is important (Waycott et al., 2010, p. 1202). This would seem to represent a common sense position. Higher education staff specialising in engineering and computing for example, are likely to have a strong grasp of the technology they use. Some mirroring of this phenomenon in secondary schools amongst teachers who regularly use technology would be expected. Whilst the Waycott et al. (2010) study involved higher education students, the so-called digital divide between secondary education teachers and their students is implied.

The digital divide may be more intricate than has previously been assumed: Different uses of DT and varying skill levels of students and educators may account for some of this complexity. Certainly, it is evident that while the availability of DT in the classroom is important, its mere presence is unlikely to boost digital literacy, and that many teachers have skill levels unsuited for developing effective DT classroom activities (Fernandez-Cruz & Fernandez-Diaz, 2016). Consequently, there is a need to determine whether attitudinal and skill differences in uses of digital technologies exist between students and teachers, beyond the expectations of generational variations.

Measuring Digital Literacy and Self-Efficacy

Social Cognitive Theory (SCT) (Bandura, 1986) indicates that attention, retention and motivation, are critically interwoven in the learning process (Bandura, 1977b; McLeod, 2016), and that individuals learn from their peers and their immediate environment. Positive attitudes to the learning process and environment are critical to its success. Few studies have been undertaken that measure attitudinal factors that impact on the acquisition of digital literacy in secondary schools. This study aims to fill this gap in research and in the literature.

Self-efficacy is also seen as crucial to the learning process and an individual's personal expectations of efficacy will determine "how much effort will be expended and how long it will be sustained in the face of obstacles and aversive experiences" (Bandura, 1977a, p. 191). In this research Thesis, it is argued that self-efficacy is a valuable determinant of efforts made to develop higher levels of digital literacy in both students and educators, consistent with Bandura's theory of self-efficacy. Self-efficacy has been shown to be an effective tool in measuring competencies and Bandura has created a methodology to best measure this characteristic in learning (Bandura, 2006).

Measures of self-efficacy have also been shown to be effective predictors of Information and Communication Technology (ICT) competency, when investigating accusations of over-estimation. For example, Aesaert et al. (2017) have shown that in primary students, self-estimates of ICT competencies are highly accurate. Other authors also associate self-efficacy with impact on learning and engagement with DT. Prior et al. (2016) have made associations between "outcome expectations", "acceptance of new online tools" (Ifinedo, 2017, p. 189), and ICT and digital literacy (Prior et al., 2016; Siddiq, Gochyyev, & Wilson, 2017). Although most of this research pertains to higher education students, with the exception of Siddiq et al., there are similar findings that show "digital competence", also associated with educators' "self-reported efficacy" (Instefjord & Munthe, 2017, p. 37) and adult levels of "digital media literacy" (ACMA, 2009, p. 37). Therefore, students and educators in this study were asked to rate their own ability to use digital technologies, together with their digital literacy, consistent with SCT Theory, using Bandura's scaled approach to measure self-efficacy (Bandura, 2006).

This discussion provides a broad basis for the training elements for an effective acquisition of digital literacy, to be incorporated into school curricula. It also raises significant questions relating to provision of hardware and software resources, online access and use of online tools such as Social Media that have been touched on by previous research (Ifinedo, 2017; Selwyn, 2009; Siddiq et al., 2017; Waycott et al. 2010). Are Australian schools providing students with adequate technical underpinnings and allowing students sufficient access to digital tools to engage their critical and creative capabilities with DT? Are they encouraged to develop their digital literacy? These questions need resolution.

There is little doubt that access to computers and the Internet is continuing to increase (Office of Educational Technology, 2017) and that this familiarity allows the development of greater self-efficacy. As seen here, self-confidence and self-efficacy are concepts stemming from Social Cognitive Theory and are associated with fundamental learning principles.

In attempting to confirm that self-efficacy is related to digital literacy in secondary students and their educators, the current study required students and educators to rate their own digital literacy as well as their ability to use DT in the classroom situation. They were also asked to rate the digital literacy of the other group to provide quantitative information on perceptions in secondary school classrooms. The measures were then used to determine attitudinal differences at play in digital education. These factors may underpin the classroom use of DT and the development of digital literacy and are primarily absent from the literature.

2.2.2 Attitudes to Online Risks

Control Over Digital Technology Use in Schools

Schools have been known to limit student access to DT even when they are available. While "young people as consumers demand the latest technology tools and are avid users, schools often tend to object to their use in classrooms" (Johnson, Dyer, & Lockyer, 2012, p. 195). In fact it has been shown that "staff reluctance, more than student reluctance, remains a major barrier to effective integration of technologies" (Bruneel, Elen, Wit, & Verhoeven, 2012, p. 234). This may happen for a number of different reasons including: concerns about Social Media and gaming dependency; perceived online risks or hazards; curriculum priorities; and school decision-making or policies. It can also be related to technical security implementations. Commentators have suggested that the level of security lockdowns in most schools is excessive (Willard, 2010). There is a need to investigate the reasons why schools limit student access to DT and why some educators object to the use of it in classrooms.

Gaming, Internet and Mobile Dependency

Schools may restrict classroom use of DT due to concerns about online and gaming addictions in students. It is suggested in the literature that this is a serious psychological concern. Several studies have investigated the risk levels for adolescents to possible addictions including: mobile addiction, Internet addiction, gaming addiction, Social Media addiction, e-mail addiction and Internet pornography addiction (Block, 2008).

South Korea is one country with huge concerns about Internet and gaming addiction, subsequent to a series of deaths in Internet cafes (Block, 2008). In one study in South Korea, one in ten participants were identified as Internet addicts (Park, Kim, & Cho, 2008). There was also a clear association between Internet addiction and exposure to parental violence, and both were more prevalent in South Korea than Taiwan. However, it was not clear whether the parental violence resulted from frustrations with their children who were Internet addicted, or whether the addiction arose as a result of parental violence. In a nationwide survey of random participants in Germany, addiction was found to be less widespread than in South Korea, although approximately ten times more boys than girls exhibited addictive gaming behaviour (Rehbein, Kleimann, & Mössle, 2010). Although local research is lacking in this area, this indicates that there are cultural factors at play in Internet and gaming addictions. Nonetheless, there may be some justification for schools demonstrating caution about DT use in classrooms.

For schools considering the introduction of mobile phones or other mobile devices as part of a BYOD policy, there is also the problem of device dependency, particularly mobile phones. Approximately "40% of young adults admit using their mobiles for more than four hours a day" and the addictive quality becomes evident when "many are deeply upset if they miss calls or messages" (Young & Nabuco de Abreu, 2011, p. 269). Furthermore, typical addiction withdrawal symptoms are apparent when "switching off their phones causes them anxiety, irritability, sleep disorders or sleeplessness, and even shivering and digestive problems" (Young & Nabuco de Abreu, 2011, p. 269). There are serious educational ramifications for online addicts and their families, in whatever form the addiction takes, since "online addicts and avid gamers have worse grades in school ... addicts have a higher rate of absenteeism and a high level of anxiety about school" (Young & Nabuco de Abreu, 2011, p. 253). Thus, this issue may be more complex than is often assumed and there are good reasons for schools setting rules and boundaries.

Since most students are likely to have phones, preventing access to DT is not likely to be effective. Schools and counsellors need to be aware of the complexity of the problem, as online addictions may point to other conditions "such as depression, attention deficit/hyperactivity disorder, anxiety, stress, relationship troubles, school difficulties, impulse control problems or substance abuse" (Young & Nabuco de Abreu, 2011, p. 271). One recent study challenged the assumption that excessive gaming is necessarily related to psychological problems, suggesting that gamers are more motivated by "achievement, escapism and social interaction" and that it is primarily used as a coping strategy rather than compulsive addictive behaviour (Kardefelt-Winther, 2014, p. 118).

For some members of the community there is an upside to online communication. Marginalised individuals with a variety of socially isolating disorders including phobias, anxiety, depression or

Autism Spectrum Disorder (ASD), may benefit from online communication as it provides “new ways of developing and continuing relationships” (Young & Nabuco de Abreu, 2011, p. 269). Hence, there are few doubts that “online communication is an alternative medium to build connections” (Young & Nabuco de Abreu, 2011, p. 269), and schools clearly have to balance the needs of these groups by training students to effectively engage in online communication while assisting those who may be vulnerable to addiction. The student-teacher relationship is also placed under pressure and negatively impacted by adolescent Internet addiction (Jia, Li, Li, Zhou, Wang, & Sun, 2017), and schools are facing pressure to limit access to a potentially harmful technology. The need to train students and teachers in responsible Internet use and in awareness of Internet addiction risk factors and coping mechanisms, is therefore more important than ever before.

In adolescents, access to online gaming and Social Media increases the risk of Internet addiction (Kuss, Van Rooij, Shorter, Griffiths, & Van De Mheen, 2013). This is seen by some school policy makers as justification to exclude them from schools, while more progressive commentators believe that students should be taught how to deal with these inevitable risk factors (Willard, 2011). These issues are complex and require comprehensive research, with recent findings challenging assumptions that gaming is addictive and compulsive, since it may be a coping mechanism for social anxiety, loneliness and stress (Kardefelt-Winther, 2014). Therefore, it is crucially important that community support services identify addicts and provide treatment. Although gaming and Internet addictions are usually more evident at home than at school, schools could contribute to this process by assisting in identification and treatment if detected. In the United States “attempts to measure the phenomenon are clouded by shame, denial, and minimization” (Block, 2008, p. 306). If these addictions are widespread and unacknowledged, there may be ramifications for schools implementing DT programs. The challenge faced by school leaders and policy makers is that schools are utilising DT that comes with the risk of triggering compulsive behaviours and addictions in young people. There is a role for schools in this complex interplay between DT and human psychology, in informing students, parents and teachers about safe Internet use and addiction minimisation strategies. The question that remains is whether schools are doing this effectively? The interplay between online restriction and informative education is investigated in the current study and contributes to the academic understanding in this field.

2.2.3 Attitudes to Classroom Use of Digital Technologies

Perceived threats from addiction aside, youth investigation utilising the Web, can be highly engaging and productive. It can be used as a publishing medium and it offers opportunities for true self-expression in a global society, in ways that have not been available previously. There is a coherent argument that schools should provide adequate training in DL, since it is essential for future work.

Schools have a responsibility to encourage access to DT, and educate students in developing digital literacy (DL) and creative capacities (Office of Educational Technology, 2017).

Pedagogical Challenges

Changes in business practice and employment mean that new skills will be necessary, especially in using DT. Historically there is awareness that the role of schools is "to prepare students for a world in which there is less order, less predictability and more chaos, where old solutions are running up against complex, apparently insurmountable challenges" (Bentley, 1998, p. 177). Amongst these challenges is the need to provide effective DL for participation in the knowledge economy and to enable future employment opportunities. Social commentators regularly discuss the connection between Internet and Social Media engagement, work and education; and argue that society needs to "conceptualise digital literacy as a competency bridge between young people's informal media use and full participation in the creative economy" (McWilliam, Hartley, & Gibson, 2008, p. 46). This argument places demands on schools as places of learning for the future, and challenges those who wish to see a return to traditional pedagogies, since a traditional content-based curriculum does not require access to DT, DL or creativity. If traditional pedagogies limit the acquisition of DL, do more progressive pedagogies like constructivism, where collaborative group and student-centred learning is seen as important, better contribute to DL?

Further educational and pedagogical theories contingent on the use of classroom DT have been developed. For example, the SAMR Model is predicated on enhancements in DT use through the four stages of: substitution, augmentation, modification and redefinition (Puentedura, 2013). At its most basic, this model suggests that some teachers who are beginning to use classroom DT, may simply be substituting traditional tools like pen and paper with DT, while their peers may be redefining traditional practices with more student-centred learning approaches. The model is intended to be used by educators to transform student learning experiences and boost achievement, and many in this study saw value in SAMR to enhance DT pedagogies, despite the fact that the model was not supported in the per reviewed literature (Hamilton, Rosenberg & Akcaoglu, 2016). However, pedagogical change is not a priority for many schools that prioritise test performance. One example of augmentation or modification would be the use of video to enhance content delivery. The results of one higher education study showed that the vast majority of students agreed that a video, when combined with a paper handout, was the best way to instil new knowledge (Pick, Begley, & Augustine, 2017). Modification and redefinition of schooling practices to provide students with 21st century skills would involve more focus on what has become known as the four 'C's: creativity, communication, collaboration and critical thinking (Keane et al., 2016). The provision of one-to-one DT for students, is seen as essential in personalising and transforming student learning.

While China is often cited by education and political leaders (Cullen, 2014) as an example of a successful education system, it is highly traditional and conservative, with a teacher-centred and test-based curriculum. This leads to little opportunity for the introduction of new DT or different pedagogies. Campbell (2012) anticipates a widening gap in China between DT used for entertainment at home and learning technologies employed in education. There is little optimism that this will change in the near future and competition with Australia's Asian neighbours in educational scores of numeracy and literacy, like PISA (ACER, 2018), is unlikely to be improved without a test-focussed approach. The suggestion is that Australian parents have fewer expectations of student school performance. This is a harsh appraisal of the Australian system since neither the USA nor the UK or other primarily English-speaking nations, feature in the list of countries ahead of Australia in the most recent PISA standards (OECD, 2018). Test-focused education seems to be at odds with pedagogies that are associated with the four 'C's and transformative DT use.

Digital education pedagogical commentary suggests that the shift to more constructivist practices in Western classrooms is gradually happening because **"**the role of the teacher is shifting away from the traditional, mainly transmissive, role to that of learning facilitator or learning companion" (Stergioulas, 2011, p. xi). Stergioulas expresses the importance of developing skills in using DT, and of schools embracing appropriate pedagogies which cultivate independent learning where students are "empowered by the new tools to participate and interact/collaborate as equals as well as to create, produce, publish, create or share content". Furthermore, research provides evidence of "new democratic, inclusive, participatory and more effective forms of school education" (Stergioulas, 2011, p. xii) . However, this level of optimism about educational change is not common in the literature and quantitative or qualitative data pertaining to student and teacher attitudes about the use of DT in secondary classrooms is rare. This study aims to investigate the effectiveness of DT in classrooms and its relationship to pedagogy.

Attitudes to Classroom Use of Digital Technology

There is evidence that computers may assist educational objectives. Using DT enhances general enjoyment in the classroom and computers can be used as a motivating tool for students to be more involved with their learning environment. This has been known in schools for a number of years. It was found that using DT in the classroom was "attractive, interesting and efficient" when DT incorporated use of multimedia elements (Rumpagaporn, 2007, p. 231). However, in this Thai study, the novelty factor may have influenced the findings, since only a small number of these students had DT access at home. There is therefore a need to survey students and educators in schools where there is one-to-one DT access, and students are familiar with the devices and their use, so that any novelty factors are minimised. Surprisingly, there have been few empirical research studies in Australian schools with one-to-one access to DT, although the benefits of school use of DT are widely known (Newhouse, 2014). In Stage 1 of this thesis, educator and student attitudes are therefore empirically investigated in schools where they have one-to-one access to DT via a laptop program.

There are numerous DT tools used in classrooms in digital education, including: hardware devices such as laptops, tablets and mobile phones, software installed on the devices, online web-based software and Learning Management Systems (LMS) also known as e-learning systems. In terms of school e-learning systems, studies suggest that self-efficacy is related directly to ease of use, and that enjoyment is the best predictor that an e-learning system will be perceived as useful (Abdullah & Ward, 2016). Research into one-to-one mobile technologies in higher education also suggests that there are learning gains and positive educational effects of one-to-one mobile DT (Mlotshwa & Giannakopoulos, 2016). However, the simple provision and deployment of one-to-one DT is not sufficient to ensure technological literacy, since self-efficacy and functional literacy are essential for the acquisition of technological knowledge (Ale, Loh, & Chib, 2017). Therefore, self-efficacy and functional literacy are associated with ease of use, technological knowledge and DL. Positive educational outcomes can be achieved by implementing DT programs as long as schools are sensitive to the psychological needs of system users which influence learning (Ale et al., 2017). The current research suggests that there is a lack of understanding of these factors amongst school decision-makers.

So called m-learning where students have one-to-one access to their own digital device, which is similar in some respects to 'Bring Your Own Device' (BYOD) in Stage 2 of this study, has become a recent focus for research in the higher education sector. The findings may have ramifications for secondary schools embarking on a BYOD approach to one-to-one DT access for their students. The use of m-learning tools has been shown to boost DL skills in higher education students who participated in the Mobile Information Literacy Tool (MIL) Project. It was concluded that mobile DT should be a core curriculum component in order to fill gaps in students' information literacy (Hanbidge, Sanderson, & Tin, 2016). However, m-learning has also been criticised for the unavailability of suitable online curriculum materials for distance education and the use of very small screens (Vrana, 2016). These findings may be noteworthy for schools considering introducing BYOD devices such as smartphones, tablets and laptops. Device effectiveness in educational settings would represent a useful focus for future research.

In Australia's Digital Revolution One-to-One Laptop Program (DEEWR, 2011a), where students from Years 9 to 12 were provided with laptops, which were integrated into the classrooms of students and teachers who were willing to engage with the new technology and who viewed it as important and relevant to their subject area. In a relevant Australian study, three subject areas were investigated in one secondary school study, with Science teachers being most accepting, followed by English teachers and finally Mathematics teachers who were most resistant (Howard et al., 2015). This study showed that beliefs and attitudes were crucial to the success of any new DT programs in schools, along with teacher skill and perceived subject area relevance. Policy and school decision-makers therefore need to be cognisant of a likely disparity among different secondary school teachers in their willingness to accept new DT in the classroom. These findings were reiterated in another higher education study of m-learning, where attitudes were determined to be a critical factor in participants' readiness to embrace DT and to collaborate and communicate (Al-Emran, Elsherif, & Shaalan, 2016). Despite these findings, however, attitudes are complex psychological phenomena and just because teachers express positive attitudes towards the use of DT, does not mean that this will necessarily translate into actual integration in classrooms.

There are confusing and complex factors at play in school DT use that occasionally give rise to apparently contradictory research findings. Teachers are individuals who bring past beliefs and external influences into the classroom, as well as professional expertise, so it is not surprising that teacher attitudes and beliefs impact on DT integration. Limited understanding and conflicting beliefs played a part in the decisions made by secondary teachers who limited student DT involvement, according to Chen (2008). On the other hand, in one primary school study, DT was seen to enhance learning engagement and access to information when there was positive teacher perception of the Apps used (Domingo & Gargante, 2016). There is therefore a need for more research into this area, particularly in secondary education where one-to-one device access is becoming more popular. This study seeks to examine attitudes in secondary education where one-to-one devices are used.

2.2.4 Attitudes to Home and School Use of Digital Technologies

The convergence of communication and DT to become Web-based, interactive, portable and personal seems to have come to fruition with the advent of smart-phones, tablets and other hand-held devices. This has created an overlap between home and school use, and while technology use has become widespread for school age students (Office of Educational Technology, 2017), adults also use new technologies. Although digital native theory has been challenged (Kirschner & De Bruyckere, 2017), there is still widespread use of the term. Its associated assumptions impact on educator and parent perceptions about younger users of DT at home and at school. Contemporary media commentary is imbued with digital native assumptions that may not be correct, such as the following commentary from Grail Research, (2011): "born into a digital world, Generation Z is proficient with and dependent on technology, making it a critical part of how they interact, play, and learn"; furthermore, "being adept media multitaskers, Generation Z has a desire for multifunctional devices with designs that are both simple and interactive" (Grail Research, 2011, p. 1). This may equally apply to older generations, including those of the teachers.

Swager and Bottema (2012) investigated the activities that students universally undertake on their hand-held devices, in the Netherlands. They found students used their phones for: "playing games and taking pictures, listening to music and making videos", emailing, downloading and using online radio or TV; concluding that "there are opportunities for the use of mobile technologies in education in the near future, provided education is properly prepared and adapted for it" (Swager & Bottema, 2012, p. 167). Students used school computers for word processing and searching the Internet, which are relatively benign activities in comparison with their use of personal devices. For these students, there was a significant acquisition of DL that occurred at home. Student participants in the study suggested that schools should provide every student with one-to-one laptops. This raises two critical issues: How well schools are prepared for the adoption of new DT used by students in everyday life, and whether students with access to school DT have a more positive attitude towards it. The aims of this research study were to determine whether students with one-to-one laptop computers have a positive attitude towards the use of DT, and how well schools deal with the issues that arise.

Laptop use at schools aside, students are evidently rapidly acquiring more portable technologies in their personal lives. For most people, there are many opportunities at home in entertainment and information access through the Internet. However, from the available literature it seems unknown whether people are able to "partake of both popular entertainment and purposeful growth of knowledge simultaneously" (Hartley, 2009, p. 10). Are we seeing an associated growth in DT knowledge from home activities, including from more intensive use for entertainment?

The fact that students find Social Media interesting and use it frequently does not necessarily mean they want schools to adopt it. However, in higher education there is an increasing body of research that suggests that Social Media use would enhance learning objectives and methodologies, and that students wish to use Social Media in their learning, even though educators are mostly reluctant (Faizi, Chiheb, & El Afia, 2015; Faizi & El Fkihi, 2016). Research with Flemish secondary students into the use of living and learning technologies, seems to contradict Brown's findings that secondary students want more access to Social Media in Australian classrooms (Brown, 2012). However, there are undoubtedly social and multicultural variations in opinions of the relative cohorts in these and other studies in different countries and educational environments. The Flemish students in this study did not want Facebook to become another aspect of school life. They "made a distinction between living technologies and learning technologies" and they want to "visit Facebook just for fun; to check friends' photographs, to post messages on their wall" (Bruneel et al., 2012, p. 242). It seems that these students desire to have their personal lives and privacy respected and students overwhelmingly do not wish to use Social Media for educational purposes. On the other hand, research into the DL of distance education students revealed that social learning and e-learning are valued by students (Farajollahi, Zandi, Sarmadi, & Keshavarz, 2015) and that social interactions via Learning Management Systems (LMS) can enhance learning objectives when students are learning in the home environment (Prior et al., 2016). This suggests that Social Media and e-learning can enhance both home-learning and school-based education programs when students undertake relevant school projects and research at home. Schools therefore might find it advantageous to encourage students to communicate and collaborate with each other via Social Media when undertaking school work at home.

There are also findings from research into pre-service teachers' perceptions and attitudes towards Social Media use, which suggest that they are confused about where to draw professional lines between personal online behaviour at home and at school; and when and where student online behaviour should be encouraged or restricted (Poth, McCallum, & Tang, 2016). Clearly, barriers between the home and school lives of teachers can become blurred and pre-service teachers require training on the professional expectations in relation to their online lives. Training needs in professional behaviour online are equally important for pre-service teachers who may be unaware of professional expectations in their communication online with students. In this study, interviews with teachers in one-to-one schools provide qualitative data on home versus school DT interactions, and investigate associated disconnects in DT implementation.

Section 2.3 Disconnects in Schools Implementing Digital Technologies in the Classroom

The second research question pertains to disconnects in the provision of digital technologies (DT) in schools, in DT training and in the acquisition of digital literacy (DL): What are the disconnects between stakeholders that impact upon the use of DT in the classroom?

Research into the disconnects that exist between teachers and students in schools, and between educators and those who make decisions around the provision of DT, reveals that there are huge challenges for school administrations and decision-makers that are often not being addressed. A disconnect refers to 'a lack of agreement' and suggests limited communication and difficulties. Hence, this literature review outlines the challenges and limitations faced by teachers and students in digital education where one-to-one DT has been implemented. This chapter is sectioned into disconnects that relate to the four areas of interest in the current study: the acquisition of DL, online risks, classroom uses of DT and home and school uses of DT.

2.3.1 Disconnects in Acquisition of Digital Literacy

There are tensions and disconnects between 'progressives', who support pedagogies that are consistent with one-to-one classroom use of DT, and 'conservatives' who want a return to traditional education. Progressive educators typically act more as guides and less as lecturers, in "a more vibrant, integrated, active, student-centred kind of instruction" (Kohn, 2000, p. 21). In student-centred research, both they and their educators "use the tools of digital literacy to examine content with a mind honed on rationality and scepticism" (Robinson, Neustadtl, & Kestnbaum, 2004, p. 258). This is reflective of the importance of the four 'C's: creativity, communication, collaboration and critical thinking (Keane et al., 2016). To enable the teaching of critical thinking and DL, a "pedagogy that leaves more and more in the hands of the learners" and involves negotiation and interaction between educators and students on many curriculum elements in specifically designed learning spaces, is required (Liambas & Kaskaris, 2011, p. 202). However, focus on these needs is rarely evident in the literature. In many schools throughout the world, there is resistance to internal change brought about through the integration of DT in education (Prensky, 2011b).

Conservative educators for many years have called for more focus on traditional test-focused methodologies with a teacher-centred dynamic, that requires strong discipline and a standards based education (Kohn, 2000). Research shows a reluctance amongst Dutch educators to adopt new pedagogies once they commence working in schools. Although both students and young teachers in training play games, use Social Media and communicate online, young teachers are reluctant to use their DT skills once they have been appointed to a teaching position, where teacher-centred 'chalk and talk' represents the norm (Swager & Bottema, 2012). In this study, the new teachers appeared to adopt the more conservative attitudes and classroom strategies of their mentors and school leaders, although it is not known if this is common elsewhere.

Conservative educators have been targeted by progressive commentators, emphasising the disconnect between these camps. Those resistant to adapting to technological change are labelled "digitally dumb", that "includes having access to digital technologies that are potentially enhancing yet refusing to consider the advantages they may offer" (Prensky, 2011a, p. 28). Prensky also suggests that many educators have attitudes entwined with old thinking traditions and that they dismiss technology entirely or use technology "in a thoughtless rather than a wisdom-enhancing way" (Prensky, 2011a, p. 28). These differences in attitudes indicate both the tensions at play in schools globally and the traditional educational pressures which progressive advocates of digital education must face when attempting to introduce new technologies into schools. These pressures include resistance to change, focus on test results and reliance on traditional pedagogies and methodologies. It is possible that this disconnect may limit the acquisition of DL in schools, even where one-to-one DT is available. The surveys and interviews in this study will shed more light on these disconnects, pertaining to DL acquisition in Australian schools.

2.3.2 Disconnects in Online Risks

Schools appear to use the perceived risks of online access to justify limiting student use of DT and the Internet in classrooms (Willard, 2011). These attitudes stem from much older arguments for traditional education, that technology disrupts the learning process, causing students to lose the ability to form logical thought (Postman, 1993) and having less ability in reading comprehension (Alexander, 2005). Although these older claims are unsupported by more recent research, they are mirrored by educators who anecdotally challenge DT use in classrooms, and believe that writing and educational values are somehow undermined by the subversive nature of the Internet (Birkerts, 1994). Although early theories of educational decline have not been supported by research (Robinson et al., 2004) there is still a great deal of educator scepticism about DT use in classrooms that is not likely to be shared by students. In higher education it has been shown that students have positive attitudes towards using their own m-learning (BYOD) devices (Al-Emran et al., 2016). It is conceivable that resistance to DT use in classrooms is for philosophical reasons and found amongst conservative teachers and decision-makers in some schools.

School Restrictions, Blocks and Lockdowns

Social Media and online gaming are two elements of the Internet that are often blocked in schools due to their distracting nature. There is evidence to suggest that many Australian schools do not have Social Media sites open for students and staff to use, although Australian Government sponsored cyber safety programs are delivered by e-safety professionals to instruct students in safe Internet practices (e-Safety Commissioner, 2018). However, the effectiveness of cyber safety campaigns in a vacuum, where Social Media is blocked, is dubious. "Trying to prepare students for their future without Web 2.0 in schools is like trying to teach a child to swim without a swimming pool" (Willard, 2011). Despite blocked sites at school, students do use Social Media regularly in their personal lives. Students in secondary schools are majority users of this technology, where they socially engage and communicate regularly (Swager & Bottema, 2012), although the educational content is debatable. However, there is more educational use of Social Media by the majority of secondary students, to discuss educational topics and schoolwork than has previously been assumed (Cullen, 2011). Students are therefore using Social Media for their education whether these sites are blocked by their schools or not, creating disconnect between students and school decision-makers. Students with phones, or in schools with BYOD access to DT in classrooms will have access to Social Media in the classroom if they bypass the school network via personal hotspots or proxy sites, when they use their phones generally, or on any personal device in their homes. Blocking of Social Media is therefore of dubious merit and students complain in cases where it is suddenly closed without consultation (Brown, 2012). Switching off Social Media will neither protect students through fostering self-management at home, nor assist them in rapidly adapting to suitable use of Social Media in the workplace. In the current study, students are asked to relate Social Media and gaming to DL and interviewees are requested to comment on school policies and disconnects surrounding these DTs.

While there has been limited quantitative research into one-to-one laptop programs in Australia, although anecdotes have emerged in the media about schools that forbid students from using the Internet for assignments, with the reason being that that information was simply too easy to obtain (Johnstone, 2003b). If this is common, it demonstrates an anachronistic disconnect between teachers and students. Canadian research into one-to-one DT found student frustrations with access, use and performance of technologies (Gray et al., 2012). These frustrations included teacher classroom restrictions, blocking of websites and prevention of personal email and personal hardware and software use, including music players, phones and laptops. Further complaints suggested poor Internet speeds and equipment maintenance (Gray et al., 2012). Research in Thai schools confirms that there are barriers and constraints in integrating DT, due to funding limitations, unqualified support staff and little professional training for educators. There are also concerns that school Principals have negative attitudes towards technology in schools (Rumpagaporn, 2007), and that they may undermine DT by restricting use. There are therefore factors that make it difficult to embed DT in classrooms that relate to negative attitudes, regressive decision-making, poor DL and little professional development. The current study provides more detailed insights into these limitations on the effective use of DT in schools, that relate to disconnects between key stakeholders in schools: students, educators and decision-makers.

Schools also see the serious and dangerous side of the Internet: cyber-stalking, stranger danger and cyber-bullying are much publicised major issues for schools. There are Australian Government policies, compelling schools to provide students with a protective online environment, “free from bullying, harassment, aggression and violence” (DEEWR, 2012). Therefore, there are challenges for schools to provide one-to-one DT access whilst simultaneously providing protection from cyber-bullying and harassment that impact on student well-being. Large numbers of secondary students experience cyber-bullying, and there are Government initiatives to counter it in Australia (DEEWR, 2012) and the U.S.A. (Office of Educational Technology, 2017). There are strong opinions that security lock-downs that prevent student access, based on “Techno-panic”, are neither effective, nor instructive for students in online strategies that they should use; that web security solutions should use risk minimisation and avoid using “scare tactics” (Willard, 2011). Security lockdowns alienate students and educators who are more optimistic about DT and Willard (2010) suggests the level of security overkill in most schools is bordering on hysterical. Students are prevented from online participation due to perceived threats from on-line predators. However, online contact with minors is involved in only 1% of actual sexual abuse cases and teachers and parents with less Internet access are more concerned about online safety than those that use the Internet more regularly. (Willard, 2010). This represents a considerable disconnect, if strongly supported by evidence. However, the attitudes of those with differing levels of DL in schools are not well documented in the literature. The current study aims to redress this shortcoming in Stage 1 with quantitative analysis of those with high and low levels of DL.

Teachers often blame DT for poor student concentration, and school lockdowns are like a new prohibition era of digitally walled gardens under strict control. Students perceive that the priority in these schools is protection, not digital literacy (Hartley, 2009) and react by losing focus or time wasting, referred to as 'cyber-slacking', by using DT in classrooms for non-class related purposes (Taneja, Fiore, & Fischer, 2015). Student attitudes toward one-to-one DT, ineffective use in classrooms and restrictions placed on their use seem interrelated. There is a question here about whether student disengagement from school DT is due to these lockdowns, to an uninspiring DT curriculum, to the school curriculum in general, or to the consumeristic engagement and escapism that they are likely to engage with at home. The current study also aims to contribute to understanding these issues.

2.3.3 Disconnects in Curriculum and Classroom Use of Digital Technologies

Educator Attitudes and Pedagogical Challenges

Research suggests that DT use in one-to-one classrooms may be limited due to negative educator attitudes about the contribution of technology, or to the "high access and low use paradox", where schools provide one-to-one DT but do little to encourage it, offering it symbolically, while they seek more efficiencies in student performance (Selwyn, 2011, p. 242). Educator beliefs and attitudes play a major role in the integration of DT in the education of their students in Taiwanese high schools. Educators are sensitive to the barriers that are likely to limit what they can do with DT and there are contradictions between their beliefs and teaching practices. Poor teacher understanding, that relates to training in using DT and conflicting traditional pedagogical beliefs are at the forefront of reasons for poor integration (Chen, 2008). Educators seem to be paying lip-service to expectations that they feel the need to integrate DT into their classrooms but there is a need to determine if there are disconnects between educators, students and school leaders. Possible disconnects are investigated in this study.

There is some perception that traditional teacher-centred pedagogy is inconsistent with the use of DT. In K-12 research of award winning teachers in technology education, those with student-centred pedagogical applications overcame barriers to DT integration more readily than others. Internal attitudes, support and knowledge were all significant factors in implementing classroom DT programs (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). There is evidence here of educator resistance to new DT and new pedagogies resulting from school culture and experience. Hence, educator resistance to DT might have more to do with the requirement to change pedagogical practice in order to implement it effectively. Educator resistance to changing pedagogy was also found in Norwegian schools, since teachers had a conviction to stay with the same practices that were used in the school and depended on its culture. A traditional school will be likely to limit rapid change through implicit teaching culture (Erstad, 2011). In this way, a traditional approach by schools to classroom practice and pedagogical styles will act to limit change. If the culture of the school is steeped in tradition, change will then be slower. One teacher in particular was confident in justifying this resistance: “students learned much more before these new technologies were introduced. I had long experience with teaching and know what works. New teaching methods create chaos” (Erstad, 2011, p. 89). However, it was also reported that change was gradually occurring and teachers were beginning to rely more on the Internet for information (Office of Educational Technology, 2017).

The effectiveness of DT use and provisioning in schools is implicitly challenged in such observations and needs to be queried. Teacher resistance, technical and administrative support, equipment and connectivity funding and decision-making, all have big impacts on DT use in the classroom. Student behaviour is another teacher concern. Even in higher education, student inappropriate DT use limits its effectiveness (Waycott et al., 2010).

School traditions, teaching culture and pedagogical styles are also strong influences that may act to enhance or restrict the use of DT. While teachers are changing classroom activities by using the Internet more, they may not be moving in the direction of more student-centred pedagogies, although (Orlando, 2013) argues this may not be necessary to improve digital education. Over-arching these issues in DT integration is the need to investigate the importance of school leadership and associated decision-making, that may facilitate more effective implementation of DT in the curriculum or not.

Funding Cause of Digital Use Divide

Each school also relies on Internet connectivity and financial support that may come with Education or telecommunication policies put in play by the government responsible. Schools in countries with less investment in education and telecommunications are not likely to be facing concerns about pedagogy or teacher resistance, as they may rely on a more traditional approach out of financial necessity. There is a clear ‘digital use divide’ associated with economic access factors (Office of Educational Technology, 2017), between students that transform their learning with DT, from those that don't. In Malaysian schools, for example, the challenges to DT classroom integration are due to Internet speed, insufficient hardware resources, training, strategic planning and decision-making by management (Ghavifekr, Ibrahim, Abdul Rahim, & Yue, 2017). Each school system in a country will be likely to face challenges that vary according to their needs. There are no doubts that wealth and Internet access are highly correlated as costs are always involved, that modern education has a basic need to utilise DT for information access (DEEWR, 2011b) and that low income is associated with both poor education and low Information and Communication Technology (ICT) or DT access for families in developing nations. It is therefore a major priority for developing nations to provide DT in education for the masses (Mubarak & Suomi, 2015). A digital divide in ICT literacy has also been found in Florida, U.S.A., based on race, gender and socioeconomic status (Ritzhaupt, Liu, Dawson, & Barron, 2013). The current study aims to provide information about the school systems in Australia, where one-to-one access to DT devices has generally been available since funding rounds of the Digital Education Revolution, through which senior Australian students in public secondary schools were to be granted a computer by the Federal Government (DEEWR, 2011a). Since this time, have Australian schools maximised educational outcomes through best practice programs in integrating DT, and do Australian schools suffer from a socio-economic digital divide in terms of DT access?

Technical Problems and Frustrations

Technical frustrations with how technology functions are frequently mentioned in the literature (Gray et al., 2012; Moyle et al., 2012). If this is commonly the case, then it represents a failure of the systems implemented by school leaders and decision-makers. The effectiveness of all computer systems is dependent on their reliability, since down-time in a classroom sense means that information or relevant software will not be available and a lesson may be disrupted. In one study of one-to-one school DT, poor reliability was cited as a reason for a less than ideal take-up of DT by teachers, one respondent indicating that "technology in the classroom is unreliable ... it limits the amount of learning time available as it constantly has problems, and is frustrating to both the students and the teacher" (Gray et al., 2012, p. 51). The need for reliable technology, support and upgrades is repeated in other Australian studies (DEEWR, 2009; Nielsen et al., 2015). Technical breakdowns, and a lack of support were also found in higher education (Waycott et al., 2010). If this unreliability is consistently a factor in secondary school settings with one-to-one DT, then there are major challenges for schools to overcome before DT can gain widespread acceptance by all stakeholders in digital education.

Software limitations and incompatibility have also been found in higher education, along with usability problems, poor online interfaces and navigation that is not intuitive or user-friendly. Online forums have been put into place for student discussion that have "functional limitations" and "technical breakdowns" (Waycott et al., 2010, p. 1208). These seem to point to low-levels of technical support, implementation issues and poor systems testing and design, that limit effective use of DT, including "educational programs that were incompatible with the computer systems that their students used at home or work" (Waycott et al., 2010, p. 1208). Many educators face frustrations with poorly designed systems that seem to be untested before being implemented. The current study intends to determine what secondary schools with one-to-one DT access in Australia are doing to overcome these issues.

Student Attitudes

Students face a number of frustrations with school implementations of DT that may be the cause of a disconnect between students and their educators and between the student body and school decision-makers. This may in turn create difficulties in using DT effectively in the classroom. While the literature lacks a great deal of primary data from Australian students on the devices they are provided with, studies do show student frustrations with a lack of updates, device limitations and poor IT support (Nielsen et al., 2015). In Alberta, Canada, there were a range of student complaints about restrictions to student-owned hardware and annoyance with blocked sites and software installations (Gray et al., 2012). There seems little doubt that secondary school students would face similar frustrations with hardware and software as the educators and higher education students mentioned above.

A second student concern was the way in which educators used DT in the classroom and how they incorporated it into their lesson plans and classroom activities. In Alberta, students thought there were few opportunities to use DT and that teachers should make more of an effort and be more open to using the Internet, complaining that the activities could be made more engaging and that teachers are not taking up the opportunities to use technology (Gray et al., 2012). Educators in Australia teaching students in one-to-one programs, have also been found to be reluctant risk-takers and innovators with technology, except where they "have an uncommon level of confidence and competence" (Nielsen et al., 2015, p. 429). Students also volunteered harsh judgements of educators when interviewed. In Alberta, the students observed "inadequate preparation" and "inappropriate use" of classroom DT, that teachers did not know how to use the technology and that a large number of teachers were avoidant of the technology provided (Gray et al., 2012, p. 51). This points to a significant disconnect in the attitudes of students and educators in laptop programs. In the current study, quantitative student data was collected in order to gauge the effectiveness of one-to-one DT in Australian schools.

2.3.4 Disconnects in Home and School Use of Digital Technologies

Home and school use of DT relates to technology availability and the learning opportunities that occur in each domain. There are strong arguments that students use and learn more about DT in the home. They also report greater Internet connectivity at home than at school (Swager & Bottema, 2012). This suggests that schools are not meeting the needs of their students in either DT or Internet provisioning. This would be likely to cause disconnect between students who have high expectations about the use of DT, and their educators who may not be able to provide the type of DT, Social Media or connectivity that students are accustomed to at home. If this divide was based on ability to use DT and digital literacy (DL), then there may also be disconnect between decision-makers and educators, and educators with high vs low levels of DL. The current study attempts to unravel some of these complexities by investigating these attitudinal differences and filling the shortfall in studies of student and educator attitudes (Moyle et al., 2012).

A digital divide in the way that students and teachers use DT might be a cause for differences in use at home and in the classroom. However, in higher education, educators are as likely to embrace the use of DT at home as their students, are not resistant to DT use and feel positive about its capacity to enhance learning (Waycott et al., 2010). Students do not always prefer more classroom use of DT and are more likely to use Social Media at home, although a majority recognise that Social Media may enhance their learning (González-Ramírez, Gascó, & Taverner, 2015). On the other hand, educators see Social Media more as playing a role in family life. These differences represent stages of life rather than a digital divide, and were overshadowed by similarities in use by educators and students. (Waycott et al., 2010). In one UK study into generational use patterns, a significant digital divide was identified between generations, confirming that students engage socially while educators gather more knowledge. There also are concerns that little is known about the types of digital engagements that are necessary in school DL programs (Helsper, 2011). Helsper (2011) further suggests that the Internet may mean something quite different to students and educators due to their different use patterns. While there are complexities in these literature findings, the challenge for schools is to engage students with DT in a way that students see as relevant and important. If the Internet does mean something different to teachers and students, due to home use patterns, it is probable that there would be a similar disconnect between their attitudes to the use of DT in the classroom.

There is some discussion in the literature that students may prefer not to use applications that they use for personal communication at school, since they see these as their “living technologies” while applications used in learning are seen as “learning technologies” (Bruneel et al., 2012, pp. 230-231). “Living technologies” include personal mobile technologies, Social Media, and gaming; while “learning technologies” include learning management systems (LMS) and specific tools used in an educational setting for communication or research. While the Bruneel et al. (2012) study involved higher education students, it raises the question of whether secondary schools have a responsibility to ensure students can use DT hardware effectively or whether schools should focus on learning technology software.

Due to the sheer pace of technological change, schools inevitably face problems in keeping up with new DT advancements. Young people have been found to have access to better DT in their private lives than at school (Passey, 2011), which is one reason it is surprising that large numbers of middle secondary students do not appear to have high levels of DL (Ritzhaupt et al., 2013). This might be a consequence of a digital use divide between those with best access and those with least DT access (Office of Educational Technology, 2017). This also is likely to contribute to a disconnect between students, who have good DT access at home and their educators; since students with the most advanced DT are less positive about classroom use (Rumpagaporn, 2007). This complex interplay of student and educator attitudes towards home and school uses of DT requires further investigation. Students appear to be “flat lining” and disengaged at school, in comparison to the excitement they feel about DT in their personal lives (Hannon, 2009, p. 2). The reasons for this are not transparent. If school DT equipment and classroom activities are falling flat, in comparison to home use, it is easy to imagine that students could become disengaged with school life. Are students with the best access to home DT less engaged with school DT and how can schools adapt to the needs of these students? What are they doing to assist students with low DL? Findings on these issues would have far reaching consequences for schools seeking to stimulate student interest and engagement.

Senior secondary students who have left the school system prematurely, referred to as marginalised youth, were investigated in one European study, in terms of their capacity to learn independently online with DT. They were found to embrace deep thinking and learning, and show a capacity for engaging with learning tools online when their schools had failed them (Johnson et al., 2012). This suggests that schools need to embrace the use of DT in the classroom, to further engage students and not alienate them.

Results from one Hong Kong study indicated that secondary school students who used Social Media platforms and wikis for collaborative editing of each other’s work, improve their writing skills (Chu, Capio, van Aalst, & Cheng, 2017). Secondary student engagement in school DT programs in the USA was also shown to be enhanced when Social Media and game design were employed in the curriculum (Reynolds & Chiu, 2016). Hence, one way forward for schools is to embrace new DTs and incorporate them into the classroom. However, research indicates that this does not sit comfortably within current educational practice.

Section 2.4 Training in the use of School Digital Technologies

2.4.1 Student Training in Acquisition of Digital Literacy and Use of Digital Technologies

In school digital technology (DT) integration, there is a necessity to train stakeholders, students and educators who are using DT in the classroom; as well as school leaders and administrators, and parents, either directly, or indirectly (Office of Educational Technology, 2017). Each of these groups require separate and individual arrangements, which may be formal or informal group activities, or one-to-one instruction. Schools may primarily be involved with the education of their students and teachers; however, there is a need to ensure that decision-makers are also engaged in the learning process and are committed to its integrity and success. Underpinning this process is a school vision, philosophy and pedagogy, which relates to the integration of DT and supportive infrastructure. This requires substantial financial investment. There is also a necessary commitment to time, curriculum and training resources (Facer, 2011, p. 237; Tsitouridou & Vryzas, 2011), without which the DT program will remain isolated from the other curriculum foci of the school. In many schools it is also apparent that the availability of hardware is not enough, and that implementing digital education has "failed to attain its objectives owing to logistical, administrative and pedagogical obstacles" (Tsitouridou & Vryzas, 2011, p. 31). This study provides in-depth appraisal of these obstacles and seeks to address these deficiencies.

There is some recognition in the literature of the complexities and interrelationships that pertain to teacher training and professional development. There is the important suggestion that professional learning groups, networks and communities, can enhance teacher skills and encourage idea sharing and inquiry learning (Tondeur, J., Forkosh-Baruch, A., Prestridge, S., Albion, P., & Edirisinghe, S., 2016). However, there are fewer views about how effectively schools finance these connections or provide in-house training.

Significant discussion of pedagogies that are most appropriate for a DT program are frequent in the literature. DTs in the classroom have been found to enhance cooperative learning and cooperation, problem solving, decision-making and higher order thinking skills (Keane et al., 2016), that can transform and "enhance learning and teaching" (Phelps, Graham, & Watts, 2011, p. 60). Similarly, Rumpagaporn (2007) found that "in order to enhance the learning process in the classroom, technology must be harnessed to support the students" (p. 69). However, it needs to be emphasised that the provision of DT in the classroom does not cause a shift towards a change in pedagogy. Instead, the "alternative explanation is that the introduction of a one-to-one computing initiative requires a shift toward student-centred practices" (Donovan, Hartley, & Strudler, 2007, p. 263). Although there might be a need for schools to change pedagogies if they wish to utilise DT effectively, teachers may require persuasion of the “effect of alternative theories of action” and “major disruption” (Hattie, 2012) in order to change the methodologies they are familiar with. Without the support of school leadership, this would be unlikely to occur.

Amongst the relevant pedagogies are the SAMR model (Puentedura, 2013), the four C’s (Keane et al., 2016) and constructivism (Bodner, 1986). As previously mentioned, these approaches may be at odds with traditional teacher-centred, knowledge and results-based frameworks (Campbell, 2012; Erstad, 2011), although schools may benefit from modern pedagogies in delivering DT programs (Keane et al., 2016; Romrell, C., & E., 2014). As mentioned, the SAMR model provides descriptions of the pedagogical enhancements that DT can enable in classrooms. This ranges from the substitution of reading and writing media, through to full redefinition of the educational process, where DT is utilised in student-centred learning (Puentedura, 2013; Romrell et al., 2014), in similar vein to constructivist pedagogy. Redefinition has positioned Social Media as a central component in collaborative online learning projects (Miller, 2014). In constructivist pedagogies, the focus is on the learner who accesses information directly and interprets it, so that “knowledge is constructed in the mind of a learner” (Bodner, 1986, p. 873). In this way, a traditional teacher-centred and knowledge-based curriculum is at odds with constructivism, where “students learned by building on knowledge and information already acquired” (Gregory, 2012, p. 95) While, it is uncertain how essential this pedagogy is in delivering DT programs, some research shows constructivist practices to be important in using DT effectively, as it “require[s] shifting the focus from teaching to learning, with more and more of the learning coming under the control of the learner” (Rumpagaporn, 2007, p. 69). Hence, in constructivism, the student is at the centre of the learning process, rather than their educator who is a ‘guide by the side’ rather than the ‘sage from the stage’ (Janssens-Bevernage, 2014). However, Orlando (2013) argues that important learning in the classroom may not “resonate with constructivist practices” and that teachers make use of DT in non-constructivist ways that “support the development of knowledge” (p. 243). It is also thought that there is a “positive relationship between students use of ICT with teachers’ ICT competencies” and that “ICT integration models” need to be developed (Almerich, Orellana, Suárez-Rodríguez, & Díaz-García, 2016, p. 122). Hence, teacher skills are at the core of how effectively DT is used in the classroom and may be unrelated to the pedagogies applied in individual classrooms.

While it might be argued in such pedagogical discussions, that gradual movement toward a student-centred learning model is an important objective in implementing one-to-one DT programs, the ways that teachers themselves use the resources may be more important (Webb, 2014). Pedagogies used in cases of DT integration need to be investigated (Webb, 2014) before it can be determined if teacher-centred methods are at odds with effective DT integration. Keane et al. (2016) paint a more complex picture in which 21st Century learning incorporates the 3R's, 4C's and SAMR model in order to truly transform learning through using DT tools, in a pastiche of relevant considerations. This may better represent the factors at play when teachers apply what they know, in individual cases. However, it is teacher learning, through professional development, that must be seen to be the most important element in this equation (Orlando, 2013; Phelps & Maddison, 2008) regardless of the pedagogies applied.

While pedagogy is a complex philosophical and psychological area, DT impacts on all pedagogical elements and decisions both by teachers and school leaders (Webb, 2014). For effective use of DT, it is possible that a more student-centred explorative approach in DT may improve learning, along with other approaches like the four C's and SAMR. However, the role for the teacher in this process is becoming increasingly complex and without appropriate professional development and time, the success of ICT integration relies on individual implementation (Webb, 2014) and its success in any school will be indeterminate. The current study will provide quantitative and qualitative data and contribute to an understanding of what is actually occurring in schools, both in terms of pedagogy and professional development.

The need for a shift towards more student-centred pedagogies may not be transparent, although self-learning is essential for the future employment and higher education of students (Bentley, 1998; Hartley, 2009). Indeed, in higher education there is a growing need for greater student independence in learning, creating a need for self-learning and management. Students in many countries, living some distance from educational institutions, simply cannot attend and market forces are forcing institutions to provide more independent online learning opportunities (Soegiarso, 2018). Hence, in a world where these forces pressure universities and students towards student-centred online learning, there is a greater need for more student DL. Only with high levels of DL will students be able to access online learning opportunities and learn independently.

This raises the question of whether teachers or school leaders are pushing towards a change in pedagogies in one-to-one DT programs, or whether the two are entirely disassociated, remaining with individual teachers (Webb, 2014). Are more student-centred learning practices, like collaborative group projects and individual online research, common in Australian one-to-one schools? This thesis will provide insight into this and related questions.

2.4.2 Need of Training in Digital Technologies for Educators and School Leaders

Due to the demands for greater digital skills in students leaving schools, there is an equivalent need for training of school leaders and educators both in the philosophical importance of DT skillsets and in the acquisition of appropriate skills, so that teachers can assist students. However, schools may not provide adequate focus on this form of professional development and teachers may not have received any significant training when they enter schools (Keane, 2008). Research into this issue revealed that teachers were not perceived to have an adequate level of DL. In Dutch schools, there was “some concern about the ICT-skills of teachers, especially amongst the students” (Swager & Bottema, 2012, p. 170), so that these students did not have a high degree of respect for teacher DL. Also, there were doubts that teachers had suitable experience and skills to develop a relevant DT curriculum, and this was considered an “important reason why [DT] is still playing a comparatively minor role in the pedagogical design of learning practices” (Swager & Bottema, 2012, p. 170). It is known that there is a “need to recognise teacher expertise as critical for efficient and effective learning” (Webb, 2014, p. 289) that applies equally to DT as to other areas. This raises doubts about the effective provision of professional development in DT for school leaders and teachers and without it, they may lack the knowledge and impetus to incorporate DT into school programs.

If schools do not provide this training for leaders and educators, then they are unlikely to recognise and acknowledge the importance of DL and utilising DT effectively in their schools. Research into these needs found that “teachers and leaders … believed that they have professional development needs in [DT]” (Keane, 2012, p. 61), that schools needed to address. This would be likely to create a disconnect between those with enhanced skills which they have acquired at home and those that do not have these skills. It is also known that students are able to learn well with DT without teachers, through research showing “a remarkable capacity for students aged 10 to 14 to learn in groups with Internet access but without teaching” (Webb, 2014, p. 285). Thus, students who have a great desire to utilise DT to further their learning may become disaffected. If this type of disconnect is occurring in schools, it needs to be exposed and addressed. It needs to be determined whether this disconnect is occurring in Australian schools that have one-to-one DT access.

If this disconnect was found, it would follow that students might prefer to learn at home and avoid schooling, if it were not compulsory. While there is little research in this area, there is some evidence that it is occurring and it has been suggested that “we have to understand more about why young people exercise choice to work remotely using ICT” (Johnson et al., 2012, p. 195) when given the opportunity. In this case, schools may need to develop a strong online presence to cater for students who are marginalised by the current traditional system. There is further evidence that students prefer to learn with DT: “about half the school students indicated that learning usually or always becomes more fun when ICT is involved, but that too little time and space was allocated to ICT at school” (Swager & Bottema, 2012, p. 170). This suggests that students would prefer schools to employ better uses of DT and online resources.

The reason schools seem hesitant to implement advanced DT and teachers resist incorporating it in their classrooms, may therefore be due to a lack of training of school leaders and educators. Fears that DTs may impinge on other curriculum areas are also apparent in the literature and a school focus on DT may need to be separate from the curriculum, otherwise it "sets a dangerous precedent where the interests of technology outweigh all other social, cultural and political concerns" (Selwyn, 2011, p. 245). Sensitivity to these factors appears to be a crucial element in the equation. The process of DT integration is therefore intricately tied to the DL of decision-makers, decision-making processes and the skills of decision-makers themselves in change management. Critical to this is that training in the acquisition of suitable skills, is supported by school leaders.

Section 2.5 Leadership and Decision-making in School Digital Technologies

Victorian Government school teachers were provided laptops from the end of 1997, joining the earlier introduction by many Independent schools (Johnstone, 2003b). Before long, many teachers were writing school reports, accessing databases and surfing the World Wide Web for relevant educational resources. Students were not far behind their teachers since the number of Australian students with access to the Internet and a computer at home, if not at school, is amongst the highest in the world. According to Australian Bureau of Statistics figures released in 2009, 72% of Australian households had home Internet access and 78% had access to a computer in that year, up from 16% and 44% in 1998 (Australian Bureau of Statistics, 2009), this had grown to 87% in 2016-17 (Australian Bureau of Statistics, 2018). For these reasons, school leaders in Australia had to adapt quickly to the demands for making decisions in acquisition of new digital technologies (DT) and training of educators and students in their schools. This meant that school Principals, with an educational background, had to engage in decision-making in an area with which they were unfamiliar. This caused limitations in school implementation of DT and "on-going barriers to integration such as access to computers, emerging technologies, pedagogy, professional development and leadership" (Keane, 2012, p. 50). These barriers and limitations are intricately associated with school decision-making.

School DT decisions are impacted by both the leadership style of the school Principal and the decision-making processes that are actioned. School leaders face many decision-making challenges to keep up with technological change, since schools may have a "terminal incompatibility" with new technology, being an "anachronistic relic of the industrial era ... rendered obsolete by contemporary digital technology" (Selwyn, 2011, p. 244). To compound this issue, studies into school leadership suggest that Principals generally lack training in Information and Communication Technology (ICT) and that DT integration into classrooms is related to the ICT leader's level of knowledge (Dawson & Rakes, 2003; Keane, 2012; Moyle, 2006). In this section, an analysis of the literature shows the challenges that are being faced in schools in terms of leadership and decision-making processes, in implementing and managing DT programmes.

2.5.1 Leadership Style and Decision-making in Schools

There are indications that many schools face a "leadership vacuum when it comes to information and communication technology" (Keane, 2012, p. 51), such that the difficulties for schools in making wholesale changes to pedagogy and integrating ICT into classrooms should not be underestimated. Aside from financial aspects, there are "decisions about procurement, technical support and professional learning" (Moyle, 2006, p. 5) that need to be made so that, together with curriculum change, this represents an entire change across the school, dependent on leadership style and strategies employed in the individual school.

There are four main types of leader that may be extended to more detailed types, these are: Autocratic, Bureaucratic, Laissez-Faire and Democratic (Essortment, 2018). Democratic and laissez-faire leadership offer increasingly distributed leadership styles that are reliant on a high level of skill in the workforce. Leadership styles in schools are dependent on the attitudes of the school leader, their training and the school context. Research suggests that there is a strong interplay between leadership styles and DT integration in schools, with more distributed leadership being more consistent with the collaboration between leaders and teachers seen as necessary in the integration process (Tam, Chan, Li, & Pow, 2018). More informal leadership that is distributed amongst teachers with high levels of DT expertise, resulted in powerful "feed-forward learning", a "synergy of learning processes" and "self-directed learning" in Dutch schools (Rikkerink, Verbeeten, Simons, & Ritzen, 2016, p. 245). Hence, more distributed leadership styles may be useful for schools wishing to enhance the training of teachers and students and boost the effectiveness of DT integration. Therefore, more democratic and distributed leadership enables end-user decision-making participation, in considerations about DT tools, pedagogies and processes involving DT integration.

2.5.2 Decision-making Processes

School decisions surrounding DT integration in a school, together with school culture and context, are critically important and the "values, attitudes and beliefs of school leaders and teachers" (Phelps et al., 2011, p. 47) strongly affect the school community's acceptance of DT as an important component in the school, as well as its effectiveness. Without supportive leadership and effective decision-making processes influencing training, curriculum and classroom use and DT acquisitions, the integration of the DT program will be limited.

Increasing school teacher participation in decision-making has been identified as one of the most important ways schools improve decisions being made by a Principal and autocratic, authoritarian attitudes are likely to restrict change in any school or organisational system (Gulcan, 2011). There seems no doubt that this would be relevant to technological change, where a shared school culture is important in effective implementation. There is a need to determine, in actual school settings, whether more democratic, participatory decisions result in better DT integration and effective classroom use.

If schools are adapting to change slowly, due to autocratic decision-making, then there are major challenges to school management processes to introduce more participatory practices. There is little doubt that decision-making processes influence strategic effectiveness of the decisions (Dean & Sharfman, 1996). Where "there is no shared decision making culture" in schools "more participation in decision making is needed", since inflexible decisions are one of the "obstacles in organizational development" (Gulcan, 2011, p. 650). There are clearly differences in the attitudes of participants in Gulcan's study; with teachers perceiving "the lack of [a] more participative managerial approach", while administrators thought the decision-making "structure [was] participative enough" (Gulcan, 2011, p. 651). The literature thus indicates that more cooperation in decision-making would be advantageous, but that this is not happening in the majority of schools. How do schools enhance decision-making processes surrounding the use of, and training in, DT?

Educators, ICT Leadership and Decision-making

Research into ICT school leadership shows that counter-productive school decision-making on DT issues by Principals, is a consequence of poor DT training since "Principal knowledge hasn't kept up with ICT" and they are likely to be "placing exaggerated trust in the network administrator" (Keane, 2012, p. 61). Keane indicates that ICT in schools has too much functional and technical focus and that educational priorities suffer. There are tensions in Australian schools between technical and educational issues in school DT implementations where the ICT Manager has a technical rather than an educational focus (Keane, 2008). Technical bias in school ICT Managers often appears in the literature, where large numbers of technically oriented, male network and ICT Managers use a "technical agenda" to influence "educational decision-making" (Lee, 2003, p. 202). However, the ICT Manager may not be trained in education and be overly focused on "what happens when the network breaks down" (Keane, 2008, p. 214). Lee also suggests that "in schools and systems across the Western World, technical staff have an inordinate and inappropriate impact on the educational agenda" (Lee, 2003, p. 202). This indicates that much of the DT lockdown and blocking in schools may be due to security or ICT technical factors. A technical focus is therefore not likely to have a positive impact on teacher use in the classroom as there needs to be curriculum focus. There is also strong evidence that teachers need more ownership of the decision-making process.

In terms of school DT leadership, it has been found that Principals have poor knowledge in ICT and need more training specifically on "infusing technology into the curriculum" and ways to "integrate technology into the teaching and learning environment" (Dawson & Rakes, 2003, p. 46). Unless a Principal has a good knowledge of DT uses in education, he/she will not be able to make appropriate technical and ICT/DT leadership appointments necessary to meet DT educational objectives. Technical issues may draw the DT focus away from classroom needs, towards technical priorities; and the ICT Manager may need formal training in education, with a focus on ICT delivery (Keane, 2012). This is vitally important in schools because "The Information and Communications Technology leader is someone who leads teachers, and leading teachers is a significant educational leadership task" (Keane, 2008, p. 215). It is also suggested that the ICT Manager needs to lead an "ICT Strategic Development Team" and be a member of the school's leadership management team (Keane, 2012, p. 60). This model suggests a more open democratic leadership process for there to be effective DT management in schools. This study aims to investigate decision-making and leadership structures to build on this understanding and contribute to the literature on this issue.

2.5.3 Decisions Impacting on Digital Technologies use in Classrooms

Learning versus Living Technologies

As discussed, there is some evidence of dissonance, disconnect and conflict in school integration decisions where new DT is concerned. In the home, students are likely to be free to explore DT and have access to some of the most up-to-date devices, programs and unfiltered online content (Prensky, 2011a). However, there are indications that one of the reasons for internal school conflict in ICT implementation is due to technical staff "inhibiting the integrated use of ICT and alienating staff" and that "this is happening at a time when the power and learning impact of ICT in the home is developing rapidly", confirming the growing divide between learning and living technologies (Lee, 2003, p. 202). If schools are making decisions that restrict access to the latest DT, then it is not surprising that this causes conflict between DT decision-makers and the users in the classroom, teachers and students.

Two of the DTs that students and educators are likely to use in the home are gaming and Social Media. Schools often aim to restrict access to both of these technologies. However, it is possible that students would not necessarily want Social Media in the classroom. There is evidence that both educators and students alike think that living technologies like Social Media and gaming, should be kept separate from school institutions. Research findings indicate that both students and educators see a strong "distinction between living technologies and learning technologies" and support the "hypothesis that the distinction between study (or work) and private activities is common to most adults, and not exclusive to students" (Bruneel et al., 2012, p. 243). When asked whether they would like to use Social

Media in education, Dutch students felt that "personal online environments should not be mixed with their learning in schools" (Swager & Bottema, 2012, p. 168). Hence, schools might experience some student resistance if they try to engage with them in their online social environments.

In one study, Social Media was readily used for learning activities by marginalised youth who were alienated from the regular school environment, although their educators thought that "the use of social networking sites is not usually recognized as learning" (Johnson et al., 2012, p. 183). These students were regular users of Social Media and this enabled them to use it in online learning, demonstrating that they could learn independently and effectively online. That they did this without educator involvement, challenged the ideas that these students could not be educated and that Social Media could not assist their education. Hence, Social Media may be of benefit in schools in enhancing learning through collaboration.

Although Dutch students maintained that personal online environments should not be mixed with school, they perceived significant benefits from playing computer games as these helped develop skills in decision-making, cooperation, concentration and problem solving (Swager & Bottema, 2012). While game design has been shown to be beneficial (Reynolds & Chiu, 2016), there are understood risk factors with gaming (Kuss et al., 2013; Rehbein et al., 2010) and schools were resistant to it. Newly qualified teachers thought that "'learning becomes more appealing with the help of games' [but this] was an insufficient reason to use games in education" (Swager & Bottema, 2012, p. 169). Surprisingly, students were divided about incorporating games in the classroom and "many students [felt] that 'fun' and 'learning' should not be mixed" (Swager & Bottema, 2012, p. 169). Therein lies the crux of the problem of incorporating the latest living technologies in the classroom: while there may be advantages in using some of these technologies, there is both a desire for them to remain separate and a resistance to introducing them. It seems likely that those with a better understanding of, and experience in the benefits of new DT would be more likely to want it utilised. If this is the case, there might be an even stronger argument that Social Media should be explored for educational benefits and improvements it can offer in meeting learning objectives (Reynolds & Chiu, 2016). This study aims to provide analysis of these technical barriers and complexities in a variety of Australian schools and contribute to understanding in this field.

Research indicates that teachers are challenged by poor student DL and that students are likely to use DT inappropriately for purposes unrelated to the curriculum (Waycott et al., 2010). If this is found to be the case generally, student misuse of DT would represent a major barrier to the integration of DT in classrooms. Low student DL would also mean that schools intending to integrate DT need to incorporate training programs so that DT is used effectively. This would mean that traditional curricula would need to make space for new DT offerings. It is not clear from the current research into this field whether this occurs in schools or not.

Curricula and Pedagogical Limitations

School curricula may be at odds with the introduction of DT as schools would need to add a DT component. It has been suggested that this change could involve “technology-based play and entertainment, informal communication and interaction with others, expressive activities and even the practices of simply ‘hanging out’ and ‘messing around’ with digital technologies” (Selwyn, 2011, p. 251). However, resistance by teachers and administrators, not to mention parents, is likely to limit this approach. Selwyn argues that these activities reflect what is exciting about technology in the homes of students and that these “constitute an integral element of participating with new media and have been shown to support young people's acquisition” (Selwyn, 2011, p. 251) of essential technological skills. Hence, when schools resist this type of play with new technology, they are actively restricting the learning that they might otherwise be expected to encourage. There is also the opposing related argument in higher education, relevant to secondary schools, that decision-making about implementing any new DT might be “driven by technology rather than pedagogy” (Waycott et al., 2010, p. 1208). Suspicions that this is occurring are not surprising given the huge number of specialist educational and technology vendors in the large education market. Educators in one study expressed concerns that there was too much of a corporate push in the education industry by people with profit as their primary objective, rather than pedagogy or education (Waycott et al., 2010). This study aims to seek the opinions of teachers experienced in DT, who understand their school use and decision-making processes and to contribute to an understanding of these issues.

Schools face conflict in facing DT change in which progressive educators wish to move from the notion of the ‘production line’, industrial school but there needs to be a direction that they are moving towards (Selwyn, 2011). Students purportedly did not believe they were being offered what they needed pedagogically to become skilled in using DT, and “felt their learning [was] restricted by the ICT related pedagogical practices in schools” (Johnson et al., 2012, p. 182). This suggests schools are struggling with technological change. This study seeks to explain strategies that schools are currently using to integrate DT and uncover the best training and decision-making models for implementing effective use of DT in schools.

Ethical and Acceptable Use Policies

There are legal and ethical reasons why student activities in schools need to be controlled to some extent. For example, schools need to protect minors from accessing illegal online content. Usage policies are one aspect of this process. The usage policies and agreements that schools require students and/or parents to sign are important for compliance with government policies to protect students online (DEEWR, 2012), and for students to understand the school's expectations of them while they are online. However, these are not always seen as valuable by students, who criticise their lack of effectiveness, projecting "a degree of cynicism about the purposes of acceptable use policies and agreements seeing them more as a way of protecting the school rather than the students" (Brown, 2012, p. 131). For such school policies to be accepted, students may need to be included in decision-making processes so that both students and educators can share ownership and responsibility for ensuring that they are applied and work to achieve the intended goals.

School Leadership and Decision-making

Suggestions are made in the literature that school leaders need to further adjust the decision-making process in schools to be more inclusive of students, so that students can feel ownership of the learning processes they are engaged in. There are reasons students should participate in decision-making and evidence that they could make valuable contributions. Students have shown concern about communication DT being misused to "spread gossip and rumour" and "broadcast unauthorised pictures and video by text over mobile phones" (Brown, 2012, p. 127). Students discussed privacy concerns for a teacher "who was the victim of the gossip spread by digital technologies", relating a story in which a "mathematics teacher's privacy and integrity was compromised by some students who took photos of him without his permission, and used them as a source of humour and derision"(Brown, 2012, p. 127). Students also displayed an awareness that schools could benefit from developing DL programs. There is also evidence to suggest that they want to actively discuss "ethical consequences" and acceptable use policies regarding online behaviour, since "they have some insightful observations to make in regard to the functioning of policy regulations" (Brown, 2012, p. 130). Student opinion is also seen as important for deep and autonomous learning to occur in schools (Johnson et al., 2012). However, despite these factors, there is little evidence that Australian students are actively engaged in the decision-making process in schools or in framing school policies. In fact, they feel that they have not been consulted at all (Brown, 2012).

Australian students have little faith that school leaders are equipped to make the best decisions surrounding the integration of DT in schools. They "did not think those in positions of decision-making and policy formation had the experiential knowledge to enable them to make well-informed decisions" (Brown, 2012, p. 126) and that they were distant and detached from the classroom and learning process. There seems to be valid cause for students to have little confidence in school leadership. The top down autocratic decision-making model employed in many schools seems to be completely at odds with what students and teachers want (Gulcan, 2011; Waycott et al., 2010). This also delegitimises student DT experience at home which gives them valuable and relevant experience that schools could benefit from (Brown, 2012). Similarly, skilled educators could contribute to the decision-making process and are often ignored (Gulcan, 2011). These findings indicate that for DTs to be best integrated into classrooms, there needs to be more ownership of the DT system, otherwise there will be resistance from the stakeholders. With a more open decision-making structure, DT could be incorporated in "more of a self-governing process that is acceptable both to students and teachers" (Selwyn, 2011, p. 250). For this to occur, perhaps both groups of stakeholders need to be recognised as being able to make valuable contributions and participate in the decision-making process.

There is evidence in the literature that a team approach to DT decision-making might be beneficial (Keane, 2012), as it would be likely to enhance ownership and boost the effectiveness of DT integration. One approach might be to include in this team, stakeholders who are most highly skilled in classroom uses of DT. There is, a need for primary research to determine decision-making structures currently in place in Australian schools with one-to-one DT access. This study will contribute to the field by providing relevant qualitative data and findings.

Section 2.6 Literature Review Conclusion

In this Chapter, literature readings pertaining to the first research question on attitudes towards digital literacy (DL) and digital technologies (DT) in schools, amongst the digitally adept and digitally challenged, show that the relevance of DL for students has been established. Following from this, definitions of DL indicate the importance of utilising online resources and communication tools to access and process information. The most useful definition of DL for the purposes of this study, being easy enough for all stakeholders to understand, is provided by Gilster: "digital literacy is the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers"(Gilster, 1997, p. 28).

We have also seen the relevance of attitudinal theory and the importance of self-efficacy (Bandura, 2006) in measuring capacity to use DT, suggesting that it could also be used to self-rate DL. Research indicates that self-efficacy may be as accurate and perhaps more important than measures of specific skillsets in uses of DT (Aesaert et al., 2017; Prior et al., 2016), since self-belief relates to confidence and likelihood of future use. There may also be attitudinal disconnects between students and their educators towards DT uses in schools and digital native theory would suggest that this is due to differences in DL (Prensky, 2011b). However, this is far from certain, since the theory itself is under challenge. This gives cause for the quantitative research in the current study, into the disconnects that limit uses of DT in schools; being the focus of the second research question: attitudes towards disconnects in DT, occurring in schools.

Research suggests that schools may not be very effective in training stakeholders in the acquisition of DL and skills in using DT (Keane, 2012). There is a need to investigate whether these limiting factors in DT are associated with less than adequate training in schools. If these skills are not up to the expected standard, then schools would be unlikely to be preparing students for future employment, where skills in effective use of DT are at a premium (McWilliam et al., 2008). Therefore, there is a need to investigate the third research question into training in schools in DL and uses of DT, through qualitative research into the opinions of educators skilled in using DT in schools.

Research has revealed that educator and school administrators may fear the risks that are associated with online access for students, and that these are causing lockdowns and restrictions that are preventing effective use of DT (Willard, 2011). These restrictions apparently arise from school decision-makers who may have a limited knowledge and skillset in DT, or be subject to other external influences (Webb, 2014). This gives rise to the need for the fourth research question that pertains to qualitative evaluation of decision-making strategies that allow for the provision of DT, training in DL and the use of DT.

A mixed-methods study design which involved surveying and interviewing key stakeholders in schools with one-to-one access to digital technologies, was used to address these four questions. The methodology is outlined in detail in Chapter 3.

3 Methodology

Section 3.1 Description of Mixed-Methods Methodology

3.1.1 Focus Areas of this Research

This mixed-methods research study investigates attitudes and decision-making pertaining to digital technologies (DT) in digital education in Australian schools. An emergent mixed-methods approach was employed, involving a sequential explanatory research design and methodology, through collection of quantitative survey data and statistical analysis; and subsequent collection and coding of qualitative interview data that then underwent thematic analysis. This methodology revealed a detailed understanding of the disconnects that limit both digital literacy (DL) and the effectiveness of DT use in Australian schools.

Initially, the researcher, through discussions with educators involved in the implementation of school one-to-one DT, established that there was a need to investigate reasons for a range of perceived disconnects in the utilisation and provision of DT. Educators, is a term used in this study to denote Principal class teachers, non-classroom teachers and classroom teachers. Students and educators appeared to be disconnected from each other's capacities and motivations to use and apply the available DT as confirmed anecdotally through the opinions expressed by teachers skilled in the use of DT.

Surveys were originally conducted to provide quantitative data for statistical analysis. An emergent mixed-methods approach (Creswell, 2007, p. 54) became necessary, subsequent to the analysis of the Stage 1 quantitative survey data, that revealed training and decision-making were perceived to be highly relevant to the disconnects and issues involved with integration, provision and dissemination of DT programs in the survey schools. Subsequently, interviewees were then able to provide detailed qualitative data, in Stage 2, for in-depth analysis on a range of issues and considerations that enriched the Stage 1 quantitative statistical findings and gave rise to more thorough analysis pertaining to the research questions, described in Chapter 1, and outlined below.

The set of working methods utilised therefore involved two distinct research stages: Stage 1 with quantitative data obtained via surveys of attitudes to DT in Independent coeducational schools with laptop programs in Melbourne, Australia; followed by Stage 2 qualitative interviews with data obtained from teachers skilled in classroom use of DT. These quantitative survey findings then informed a series of qualitative interview questions for further research investigation pertaining to the research questions. Findings from statistical analysis of the survey data, were then able to be enriched with Stage 2 qualitative interview findings. In total, 10 semi-structured interviews with interviewees skilled in using DT in Australian schools, underwent coding and thematic analysis, that gave rise to detailed findings. In this sequential mixed-methods research, Stage 1 and Stage 2, therefore have their own methodologies, topics, definitions and descriptors, each being detailed in the sections that follow. The reasons for this sequential explanatory design was to provide both complementarity and expansion of the original quantitative data and findings. In this way, the qualitative findings allow for more in-depth interpretation and explanation of the quantitative findings, in a mixed-methods approach consistent with that identified by Creswell (2007).

The main aims of this mixed-methods research project were to investigate the following four broad research questions:

- What are the attitudes of the various stakeholders towards digital literacy and use of digital technologies in education?
- What are the disconnects between stakeholders that impact upon the use of digital technologies in the classroom?
- How do schools train stakeholders in the acquisition of digital literacy and in using digital technologies and how effective are these methods?
- How are decisions made in providing training in digital literacy and in implementing digital technologies in digital education? Are there decision-making and change management practices that allow for more effective provision of digital literacy and implementation of digital technologies?

The first two of these are investigated in Stage 1, through the survey instrument, with the subsequent quantitative analysis detailed in Chapter 4. Stage 2 interviews provided more in-depth perspectives on the first two questions, whilst also allowing investigation into the remaining two research questions.

Section 3.2 Participants

3.2.1 Target Population

The use of digital technology (DT) devices has been widespread in schools worldwide, over a number of years (Hartley, 2009), with programs in Alberta, Canada (Gray et al., 2012) and in many schools in Australia. Since the late 1990s, there had been growth in the number of Australian schools that encouraged students to bring one-to-one devices to school (Johnstone, 2003b). The devices used in schools have varied from laptops and tablets, to smartphones. Schools with students and teachers that are using DT regularly together in classrooms, or schools that may be considering adopting one-to-one DT in the future, represent the target population that this study relates to.

While this target population and school types are broad, the relevance of the survey data, obtained from Independent coeducational schools with one-to-one laptop programs, may be limited, given the highly specific nature of the laptop programs investigated in the surveys. On the other hand, the range of schools that were referred to by the interviewees, was larger, representing all school types and a large variety of DT access styles for students. General findings from this study in terms of classroom use, attitudes to DT, training and professional development, and decision-making styles, is expected to be able to assist decision-makers in determining risk factors and inform best practice in utilising DT in digital education classrooms that are similar to the target population.

3.2.2 Stage 1 Participants in Quantitative Surveys

Stage 1 Selection of Survey Schools

There were three main school sectors in the State of Victoria, Australia at the time of this study: Government schools, representing a basic educational opportunity; Catholic Church schools, with a fee-paying private education and, finally, Independent schools which were likely to have more substantial tuition or enrolment fees for a private education. The researcher had personal experience in each of these school types.

In each sector, secondary school students were educated from the age of approximately 12 to 18, being in secondary school class groupings from year 7 through to year 12. Years 1 to 6 were found in the primary division of schooling in Victoria. In year 12 groups, students competed to gain entry to a range of university courses.

More detail about the various levels and types of access to DT in the individual schools are elucidated in the findings in Chapters 4, 5 and 6.

In this study, Independent Schools offered the most expensive educational opportunity in Victoria, a choice for parents who paid substantial fees for the education of their students. These schools often provided students access to a one-to-one laptop program. Some of these schools were single sex schools whilst others were coeducational.

In the design of the Stage 1 surveys, schools were sought out that were similar to ensure consistency, due to the potential variety of responses to differing DT systems. Coeducational schools were chosen, in order to remove single sex distortions of survey responses; and schools were selected that had one-to-one laptop programs for students to maintain device consistency and ensure response validity. The schools which best suited these design requirements were thought to be Independent coeducational schools with laptop programs. Five such schools were selected in Victoria, Australia, from those identified, that allowed teachers and students to participate in the surveys. This selection was thought to maximise survey reliability in terms of the relevance of participant responses to the survey items.

One limitation of the findings from the Stage 1 surveys, is that these would have a high degree of validity for other schools of the same type and arguably less reliability to schools of different types, or with differing styles of DT provision.

Stage 1 Survey Participants

Students who undertook the Stage 1 survey were 321 students in Years 9 and 10 in five Independent coeducational schools, with laptop programs from Years 7 – 12. Most of these students had laptops from year 7 to 9, or three full years prior to undertaking the survey which was undertaken at the end of the school year. Hence, the vast majority of these students were familiar with DT use and had their own laptop and an Internet connection both at home and at school according to the school e-learning leaders. Each school had a one-to-one laptop program and a history of using DT in the classroom. The students undertaking the survey were between 14 - 17 years of age and were old enough to understand the nature of the study and provide informed consent. Students were not asked their age or date of birth in the surveys, or any other identifying characteristic, other than gender.

Stage 1 educators who participated in the surveys were 100 teachers at the same Independent schools of the Stage 1 students. In this way, the educators had similar access to DT as the student participants. The educators and students who undertook the survey were provided with a web link to the online survey by a school administrator.

All in all, 321 students and 100 teachers from five Independent coeducational schools were surveyed using the final version of the survey entitled: Attitudes to Digital Technology and Digital Literacy. Ethics approval was obtained from the Swinburne University Human Research Ethics Committee (SUHREC), as noted in Section 3.4.2. The surveys took place from October 2010 to March 2011.

3.2.3 Stage 2 Interviewees in Qualitative Research

Snowball Sampling of Interviewees

Interview participants were accessed to represent the following groups: highly skilled ICT specialists, e-learning specialists, highly skilled teachers in using DT, teachers from non-ICT areas and school ICT decision-makers.

The researcher held the role of President of the Victorian Information Technology Teachers Association (VITTA) from 2003-2006, hence, some interview participants may have known the researcher indirectly, through his role in this professional association. To avoid possible bias, friends and colleagues of the researcher were not interviewed. In selecting interviewees, the method used was 'Snowball Sampling' (Statistics How To, 2018).

In this method, experienced DT specialists who had presented at conferences in digital education were invited to participate, after recommendations from conference participants. Five such presenters agreed to participate. Following this group, through further discussions with skilled users in DT and the first group of interviewees, three skilled users of DT with no formal ICT training were nominated and agreed. There were also two school curriculum leaders chosen, who were also involved in DT training of educators, and were identified by DT educators from the first or second groups as highly knowledgeable leaders in this area. These two also participated. This process, of interviewing and selecting further interviewees took place over fifteen months from June 2012 to September 2013. In all, ten interviews were conducted and it was determined that there was significant repetition in the observations made by the interviewees, reaching saturation, and such a large amount of qualitative data available for analysis, that this process was brought to a close.

This sample contained educators from each of the school sectors, who worked, or had worked at the full range of types of schools in Australia: Independent, Catholic and Government, of both single sex and coeducational variety. There were ten schools from the various school sectors in which interviewees worked and most interviewees also discussed previous schools they had been employed at.

Interviewees were asked to comment on attitudes to school use of DT, school decision-making and training in DT, during a semi-structured interview process that took place over a period of time ranging from 30 minutes to 70 minutes.

Section 3.3 Instruments

3.3.1 Stage 1 Survey Instruments

A combination of different survey statement/question strategies was employed, including Ordinal, Nominal and Interval items. This allowed for participant response comparisons thus providing greater reliability and validity of results. This triangular comparison methodology was specifically used for the survey items providing self-estimates of digital literacy (DL).

Definitions used in surveys

Several terms were thought to be of critical importance in this study and respondents needed to be provided with consistent definitions of terms that were repeated in the surveys. The following definitions were used in the surveys. These appeared on each of the online survey webpages:

- **Digital Literacy** – Digital literacy is the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers

35. Please rate your self-perceived ability to use digital technologies in education/classroom situation.

Poorly skilled Poor to moderate skills Moderately skilled Moderate to high skills Highly skilled

Uncertain

- **Digital Technologies** – all computerised or computer-aided devices e.g. laptops, desktop computers, mobile phones, digital cameras, interactive whiteboards, tablets, readers etc.
- **Social Networking/Media** – interactive Web sites where users can post photos, messages and chat with others e.g. Facebook, Myspace, Bebo etc.
- **Web 2.0 Technologies** – a website that allows its users to interact with other users or to change website content e.g. YouTube, Flickr, social networking sites, blogs, wikis, forums etc.

Ordinal Survey Items

Likert scales have been common and useful survey tools used to determine attitudes since their inception (Likert, 1932). Likert scale survey items were structured as five point ordinal items with an additional uncertain category, as shown in the example below. In all, there were forty-nine (49) ordinal Likert scale statements used in the surveys. Example:

1. Students often use digital technologies inappropriately in the classroom.

|-----------------------------------|------------------------------|-----------------------------|-----------------------------|

strongly disagree disagree neither agree nor disagree agree strongly agree

uncertain

One other additional ordinal statement was used, referring to self-perceived ability to use digital technologies (DT). This was able to be compared directly to the five-point Likert scale statement: "I have a high level of digital literacy". This was then used to validate the findings provided by the self-assignment of DL, since belief in DL should relate to self-perceived efficacy in ability to use DT in the classroom (Prior et al., 2016). Additionally, one interval item requested participants to estimate the number of the other group (educators or students) who had a high level of DL for group comparison on these findings:

Discussion of Ordinal Likert Scale Items and Chi Square Analysis

Likert scales have a number of design options for participants to respond to survey statements. A Likert scale may theoretically be a simple three-point scale where a participant can 'agree', 'disagree' or 'neither agree nor disagree' (Likert, 1932). There is also the five-point Likert scale, used in this study, with 'strongly agree' and 'strongly disagree' added to these choices. Further detailed scales are also available with seven or nine points. These seem to provide little benefit when researchers are intending to gauge direction of attitude and some intensity of feeling, as is the case here.

While Likert himself used means for calculating responses to Likert scale items by allocating a number from one to five for responses, (Likert, 1932), this is unlikely to be the most effective methodology. Likert scale items analysed through a numbering system and calculated means are being treated as interval items, with set assumed distances and differences which can be measured through different responses, when no such distances exist (Clayson & Dormody, 1994). It has been shown that Likert scale items should be treated as ordinal items (Carifio & Perla, 2007), that may be grouped and analysed accordingly, as is the case in the analysis provided in this study. It needs to be emphasised that Likert scale responses do not represent interval or ratio values, as along an axes or a set measure, with values that could be interpreted as numerical responses for statistical purposes. There can be no meaningful average made from such values (Clayson & Dormody, 1994), although there are no doubts that participant responses are meaningful and that they can be treated as comparative.

In this study, participants were presented with a series of 5 point Likert scale statements, within the context of digital education, upon which they passed judgement. A comparison was able to be made for the participant's directional responses, as in the cases of 'agree' or 'disagree', together with some degree of strength of feeling, as in 'agree' or 'strongly agree'. The Likert scale is the most appropriate survey methodological item to represent survey items in this way (Carifio & Perla, 2007; Likert, 1932). It was selected due to its capacity to measure both strength and direction of attitudes. The sixth, 'uncertain' option was put to the right on the survey screen design, so participants would not assume it was part of the continuum from 'strongly disagree' through to 'strongly agree'. By using this option, participants could withdraw their intention of indicating their attitude to particular survey statements.

Although a five-point ordinal Likert scale was applied in the surveys, it was determined for analytical purposes to collapse responses on these items into three categories, in many instances, in the same way as Phelps and Maddison (2008), have shown to be effective in digital education. 'Agree' and 'strongly agree' were combined into an 'agree' category, 'disagree' and 'strongly disagree' were combined into a 'disagree' category and the 'neither agree nor disagree' and 'uncertain' responses were combined into an 'undecided' category. These three categories could then be further processed through parametric analysis using Chi square statistical comparison of responses for the purpose of determining significant differences between the respondent groupings, as discussed below. For some items, where intensity of feeling was seen as important, the full five-point scale was retained.

Occasionally, in other studies, the ‘uncertain’ or ‘undecided’ categories were ignored and a 1 degree of freedom Chi square analysis was used in parametric analysis, to provide significant differences for the ‘agree’ and ‘disagree’ options for the two comparative groupings. Further observation of the survey data showed that the response differences of the comparison groups to the ‘undecided’ category was thought to be significant, with large and varying groups of respondents choosing ‘neither agree nor disagree’ or ‘uncertain’ responses. The number of ‘undecided’ responses was not consistent for educator, student and high and low DL groups. For this reason, the ‘undecided' category was included in a two degree of freedom Chi square analysis, with three participant response categories for each group and survey item. These measures of numbers in each group were used for comparative graphing and relative analysis between groupings. This method was consistent with the Likert scale analysis methods recommended by Carifio and Perla (2007), to avoid interval scale assumptions and improve analysis reliability and also to avoid distortions that could be caused by eliminating neutral responses (Clayson & Dormody, 1994; Garland, 1991).

Nominal Statements

For several survey items it was appropriate to use nominal survey items. This method was used for survey participants to allocate themselves into gender or preferred subject areas with multiple options being available for selection. One nominal question was employed to gauge participant views on the effectiveness of the Internet as an educational resource, with multiple options available.

59. Circle your gender. [Male __ Female]

58. Circle your preferred area(s) of study.

[Eng - Sci – Maths - Hums- LOTE - ICT – PE/Health – RE - Art – Music (other)________________]

Interval Statements

There were several items on the surveys that were interval in nature. These responses related to estimates of percentage of the other group that had a high level of DL, number of hours per day of technology use, frequency of using digital technology to enhance learning, frequency of use of video in the classroom and the number of Social Media sites.

48. My accounts on Social Networking sites (e.g.: Facebook, MySpace, Twitter, Bebo etc.) would number

|--------------------|--------------------|--------------------|--------------------|

0 1 2-3 4-5 >5

Reliability, Consistency and Validity of Survey Items and Responses

The following measures were employed in designing the survey items in order to ensure consistency, validity and reliability:

Survey respondent groups were sought who had the similar educational experience in using digital technologies in education, being from Independent coeducational schools. This provided group consistency, to enable greater reliability of survey data.

Internal consistency was achieved to provide greater survey reliability, through the following procedures in generating survey items:

- Surveys were laid out in a consistent manner with each statement in identical format. Wording used was similar on all survey items;
- Statements were developed to be as consistent as possible for both educators and students, that related to their use of digital technologies in education;
- Wording was consistent throughout the surveys, basic terminology and plain English was used, aside from the definitions provided;

Validity was achieved for the survey items by using the following procedures in mapping out the surveys areas:

- Areas were identified that would be meaningful for the survey participants. These were used as headings for six groups of survey items, acting as a guide through the survey for the participants. These areas were: 'Attitude to use of digital technologies', 'Digital Technology at home', 'Training in digital literacy', 'Digital Technologies in the classroom', 'Attitudes to digital technologies and digital literacy', and 'My digital literacy';
- Where items were thought to be able to be misinterpreted, different wording of a similar question was used to cross check responses to ensure attitudes were consistent;

- All Likert scale items allowed participants to select an 'uncertain' response that was not on the five-point Likert scale, in order to express uncertainty of an item's meaning, or their own choice;
- All survey items were voluntary and each item was able to be skipped by participants, for any reason. This procedure contributed to the validity of responses, since these items were not included in participants' responses.

3.3.2 Stage 2 Interview Instruments

Development of interviewee questions stemmed from mind-mapping coded DT elements and their relationships, from background literature readings, survey findings, comments from survey participants and observations of the researcher. Mind-mapping has been shown to be a useful tool in identifying qualitative research areas (Burgess-Allen & Owen-Smith, 2010).

Mind-mapping and Coding of Digital Education Elements

Figure 3.1 is a mind-map showing the themes and topics relevant to the provision of DT and DL training programs in schools and education generally. These themes and topics were developed from responses and comments on the survey items and from relevant research uncovered in the literature review. Brainstorming and discussion with research supervisors allowed these questions to be refined through a series of iterations. From this mind-map, a series of interview questions were developed.

Mind-mapping software was used to formulate a visualisation of areas that would be investigated through the semi-structured interview process. This mind-map was also used to display the themes and topics that were later employed as nodes for coding and qualitative analysis of the transcribed text of the interviews. The final mind-map, which was produced using Microsoft Visio software, showed links between DT decision-making, attitudes to changing DT, both positive and negative, DL and access to DTs. Thus, these themes gave rise to the final interview questions. These semi-structured interview questions are shown in Table 3.2.

The mind-map also contains additional nodes that were identified as being linked to the main themes. These nodes were used to guide the qualitative analysis of the interview data, in qualitative analysis software, to assist qualitative mapping and coding.

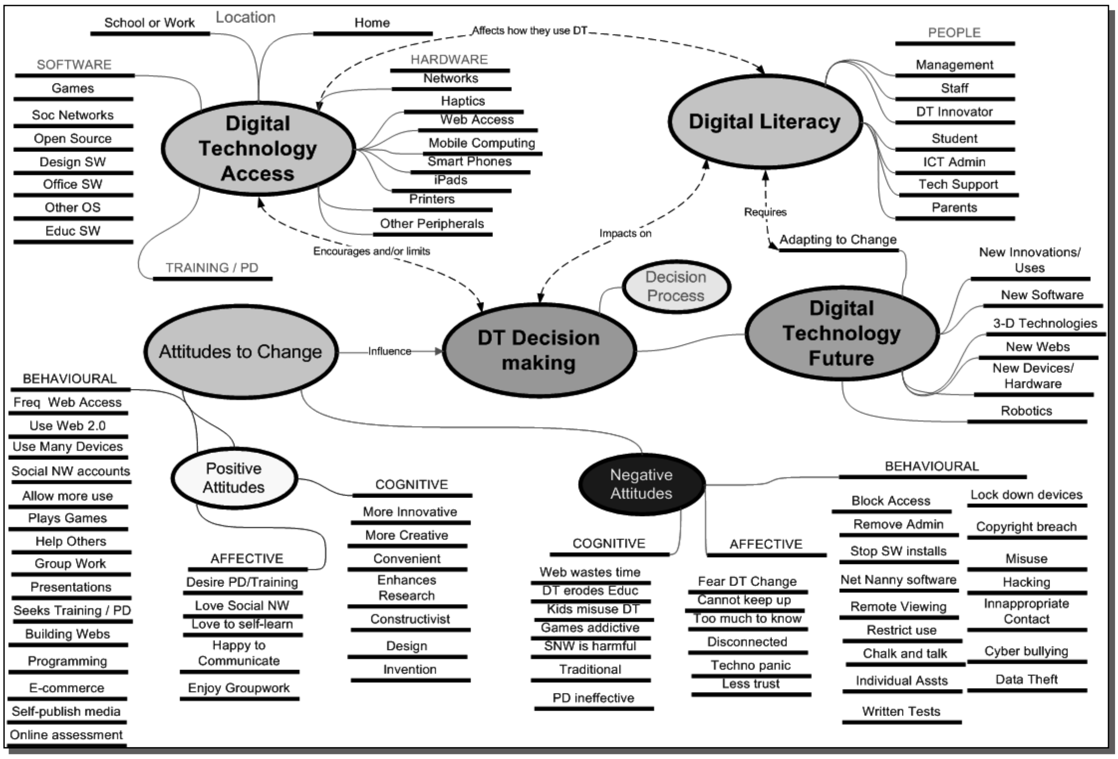

Figure 3.1 Mind-map showing areas of interest and overlapping issues. From this overview interview questions were formulated Note: SW = software; HW = Hardware; OS = Operating system.

Interview Structure

The Interview methodology was constructed in order to be conversational, with six statements made by the researcher at appropriate times to trigger interviewee responses to the specific items, to guide the interviewee towards the research questions relating to attitudes and disconnects in school use of DT, training in DT and school decision-making in DT. However, the statements used were constructed so that the interviewee felt part of a conversation and was free to raise any element that came to mind, sometimes speaking for a number of minutes before the next question was raised by the researcher, so that they did not lead or funnel responses in a particular direction. The researcher avoided additional commentary and kept to the script of the questions in each interview. The themes and text of the interview questions is shown in Table 3.1.

Table 3.1 Themes and text of the six interview questions.

Themes	Interview Question
Digital technology – past and present evolution – digital literacy	Let's start by talking about how technology has changed over the years you have been teaching – after all, for most of us the Internet is only a few years old in its present form … and now students have phones on the web … how rapid is change happening in your school and life? How have you coped with the demands?
Access to digital technology, training, learning and professional development	How do schools that you know about cope with the demands of training teachers, and even students, in the use of digital technology in schools and education? Do you have access to the training and technology that you feel you need?
Use at School vs Home - Learning technologies and Living Technologies	Do you think people use and learn about technology more effectively now at home than at school ... especially kids … can they access school digital materials from home? Can they use the equipment they need at school?
Positive attitudes: Innovators and Innovation in using digital technologies in schools	Who are the innovators in your school that you know about and what are they doing in their use of technology … do they let kids publish their stuff online … do they use collaboration ... or outside communication?
Negative Attitudes: difficulties in access to digital technologies - filters and fears	People talk about school as "walled gardens": and the Internet has challenged that ... Does your school block the Internet and Social Media for classroom use – how effective is it? Do kids still use it? Outside? What do other schools do? Schools put in place a great many rules in the offline environment that are intended to keep them safe, or to encourage particular behaviours. In other words, the school is not a "natural" social environment and nor should it

	necessarily be. How does this manifest when it comes to online media and information technology in classrooms?”
Negative Attitudes: Mobile Technologies – Security and Online Risks and Dangers	The media talks a lot about the huge risks in kids using new technology – like mobile phones, iPads and laptops or gaming in the bedroom – and Facebook and meeting predators – what do you think? Should we be using these in schools?
DT Decision-making – decision-making processes and digital technology teams	While we are on that topic – how does your school make informed decisions about innovative and new uses of technology … is there a process … or a team involved?
Future predictions and uses of digital technologies in schools	Where do you think we will be in five or ten years with technology – will we still operate in the same way in classrooms … will there be more group work and adoption of modern pedagogies like constructivism?

Section 3.4 Procedures: Mixed-methods Design

3.4.1 Mixed-methods Design Rationale

An emergent mixed-methods approach was utilised to acquire and analyse both quantitative and qualitative data pertaining to the attitudes of educators and students to each other's digital literacy (DL) and their use of digital technology (DT) in the school and home environments, training and decision-making in digital education. The reason for selecting the Stage 1 survey method was that it was a convenience sample of students and their educators who could give a detailed appraisal of their laptop programs, without being device specific. This then gave rise to the Stage 2 interviews that were determined to be necessary in order to tease out in detail the disconnects and attitude differences that became apparent from a cursory analysis of the Stage 1 data.

This emergent mixed-methods approach (Creswell, 2007) involved a sequential explanatory research design and associated methodologies. This was required since the research was conducted in two stages. Stage 1 involved a statistical analysis of quantitative data obtained via detailed attitude surveys, of 321 year 9 and 10 students and 100 of their educators, conducted in Independent coeducational secondary schools in Victoria, Australia. Subsequent to the analysis of the Stage 1 quantitative survey data, an emergent mixed-methods approach became necessary, since Stage 1 findings revealed DT training and decision-making were perceived to be highly relevant to the disconnects and issues involved in integration, provision and dissemination of DT programs in the survey schools. Stage 1 quantitative data and findings are discussed in Chapter 4.

The interviews in Stage 2 were then able to provide detailed qualitative data for in-depth analysis on a range of issues and considerations that enriched the original quantitative statistical findings and gave rise to more thorough analysis pertaining to the four research questions. In Stage 2, qualitative data was obtained from in-depth semi-structured, face to face interviews with ICT decision-makers and teachers skilled in the use of DT. This additional feature of this research provided a greater depth of understanding of the elements that gave rise to the disconnects, found through Stage 1 analysis, that related to attitudes towards DT, disconnects, training and professional development in DT and school decision-making processes in DT. Stage 2 qualitative findings are discussed in Chapter 5.

The findings of this study are relevant to the population of students and educators involved in digital education programs, particularly where there is one-to-one access to DT. While these findings may strictly only apply accurately to Australian schools with one-to-one access to DT, the findings are of interest and relevant to school administrators and decision-makers who are implementing one-to-one DT programs in their schools. Findings from Stage 1 and Stage 2 are combined through thematic analysis and cross referencing of the qualitative and quantitative findings. This analysis of findings is shown in Chapter 6.

3.4.2 Ethics Procedures

Ethics Procedures were overseen by the Swinburne University Human Research Ethics Committee (SUHREC) and this research passed stringent ethical clearance tests. Ethical guidelines were developed for participating schools and Information Statements developed, as shown in Appendix 5.

There was some potential for students and educators to feel observed and spied-upon in this study. Ethical procedures were therefore developed that preserved anonymity. In order to avoid any feelings of survey participants being blindsided by complex questions, all questions were also phrased in basic English and definitions were also intentionally kept in simple language with more complex definitions avoided. Definitions were placed on every page of the surveys. There was also an attempt to offer all participants follow-up support and more complete explanations of the research, although this assistance was not sought. For this reason, the ethical standards were thought to be successful and adhered to. One of the shortcomings of studies of this type is that participants may have further feelings that relate to their surveys, that may cause some disquiet, however, it is unknown if this occurred in this study.

Further permission instruments, in accordance with ethics standards and Swinburne University guidelines were developed for school administrators, teachers, parents and students. These permission instruments were produced and delivered to school representatives. Appendix 5 shows the consent and permission instruments used for parents, students, teachers and school administrators. Parents and students were each provided with permission instruments, so that either could withdraw the students from the study. In addition, students and educators could voluntarily refuse to answer any or all questions during the survey itself.

Interview participants were accessed from the following groups of educators: highly skilled ICT specialists, teachers highly interested in DT from non-ICT areas and school and/or ICT decision-makers. The educators in these groups either self-identified themselves, or were identified as such by others who nominated them in the snowball sampling approach.

In order to preserve the anonymity of the interview participants, they were advised that they would not be identified in any publication and are identified in this study only by pseudonyms. They responded directly to the researcher's request for interview, without school involvement, in order to encourage open discussion about the nature of their school's provision of DT. Data collected from interviews has not identified participants or their schools. Since these face-to-face interviews were not associated with schools directly, permission from school Principals was not required. An educator interviewee permission instrument was used for interview participants. This is shown in Appendix 5.

Schools have not been identified except by type. School descriptions are intentionally nonspecific.

No data matching occurs between permission instruments and transcribed data; hence anonymity has been preserved.

Schools and individuals in this study were identified only by type and pseudonym in the analysis of survey and interview data. No details of any individual or school are to be published in any form that could identify any interview participant, survey participant or educational institution.

Section 3.5 Procedures: Stage 1 Quantitative Surveys

3.5.1 Survey Population

Surveys were undertaken in order to investigate the first two research questions:

- What are the attitudes of the various stakeholders towards digital literacy and use of digital technologies in education?
- What are the disconnects between stakeholders that impact upon the use of digital technologies in the classroom?

The survey investigation provides an understanding of the attitudes of student and educator stakeholders towards the elements raised in the survey questions and statements. The survey statements were grouped into the following areas, in order to guide survey participants: attitudes to student use of digital technologies; home use of digital technologies; classroom use of digital technologies; attitudes to digital technologies (DT) and digital literacy; training and digital literacy; and my digital literacy.

Students participating in the surveys were 321 coeducational Independent secondary school students, aged 14 to 17 years, in years 9 and 10 of secondary school in Victoria, Australia. Educators participating in the surveys were teachers of the above groups of students. The selection of these groups was discussed in Section 3.2.2.

Selection of Student Age Group

Selection of student age: The student survey participants had used a school laptop for several years. It was thought to be ideal if students had been involved in a laptop program for a number of years, hence younger students were excluded. Senior students, in Years 11 and 12, were excluded from participating due to their needs to undertake senior school educational programs. Discussions with leaders in the survey schools confirmed that they would be reluctant to agree to surveys involving senior students. Each school leader, in charge of administering the surveys at their school, nominated the preferred year level, either Year 9 or 10 that they would arrange to participate in the surveys and the date the survey was to be taken.

Survey Procedures

The following procedures were observed in order to undertake the surveys:

Surveys for both teachers and students were developed which were expressed in plain language so that all participants could understand what was requested of them. All survey items allowed voluntary responses and participants were permitted to withdraw at any time throughout the survey. This had the effect of changing the number of responses on each survey item. This was taken into account during analysis of survey data.

E-Learning and other relevant curriculum coordinators were contacted at each of the five schools. These individuals acted as representatives for the researcher and distributed permission instruments to the participants. These leaders acted as go-betweens between the researcher and the school Principals, who ultimately approved survey distribution to the students in their schools. Meetings either in-person or online were conducted with the school leaders who administered the surveys. Email and phone contact continued up to and following the days when the survey was conducted.

Survey Focus Areas

Survey statement lists are shown in full in Appendix 1. There were 49 ordinal Likert scale items, one other ordinal item; 4 nominal items and 5 Interval items in the surveys.

Research survey statement and questions were developed relating to the following areas with focus and thought given to each of the attitudinal components of emotion, cognition and behaviour for each of the issues. Survey statements were generated after discussion with research supervisors and other researchers in the digital media and digital education domains, outlining areas relevant to digital education that had appeared in the recent literature at the time of survey development.

Survey statements were developed to enable investigation into the following areas relating to digital education:

- Confidence in ability to use digital technologies;
- Attitude to others using digital technologies;
- Attitude to the effectiveness of digital technologies to deliver curriculum materials;
- Training in digital literacy;
- Frequency in utilising digital technology resources;
- Anxiety or attitude about ineffective or distracting use of digital technologies in classes;
- Attitude to future developments in digital technologies;
- Attitude to those with high-level of digital literacy;
- Attitude to those with lower level digital literacy;
- Estimate of how many students/educators have a high level of digital literacy;
- Self-assignment to digital literacy level;
- Use of digital technology at home;
- Attitude to Social Media and Web 2.0 digital technologies;

Development of Survey Instrument through Pilot Survey

There was a repeated iteration of survey question and statement development, exploring both the content and methodology of the survey items, through testing of items and reflecting on feedback from educators, researchers and students.

The development of items was accompanied by the testing of a university-provided online survey instrument, 'Opinio', for effectiveness, using a pilot version. More than eighty students and a number of educators attempted to login to the survey at schools known to the researcher, in order to test the robustness of the survey tool. There were also a number of paper surveys used at the pilot stage of item development. This process led to the selection of another instrument, 'Survey Monkey', as the initial online tool chosen had limited effectiveness and allowed for only limited logins and responses from participants. The final instrument chosen was a professional, commercial, online survey tool with guaranteed connections for large numbers of participants.

The pilot also allowed for further feedback from educators and students and discussions around the nature of the survey instrument. Discussions and focus groups were also held with both students and teachers who participated in the pilot study around the nature and wording of the survey items. This allowed for fine-tuning of the survey items.

Validity checking of survey items was undertaken through the pilot survey mentioned above. This pilot survey of students and educators allowed both for validation of the survey instrument and fine-tuning of the survey items. Participant feedback led to the inclusion of an 'uncertain' response, as some students in the pilot survey pointed out that they should be able to not check a Likert item response if they did not understand the meaning of the survey item. These discussions also led to there being voluntary withdrawal from every item on the surveys. It was also decided, subsequent to the above discussions, to allow optional open-ended written comments during the survey, to provide the opportunity to collect some qualitative data and gather voluntary, personal responses from survey participants.

The students and educators who participated in the pilot did not participate in the final version of the survey, as this may have distorted the findings. The data obtained from the pilot surveys was not used in results analyses or findings in this study.

The final survey was then developed in the new online tool and permission instruments were developed for the final group of selected schools.

Distribution of Consent and Permission Ethics Instruments

Permission instruments were delivered to all schools and campuses and, where appropriate, the researcher was on-hand to oversee the collection of data.

Survey permission instruments for staff, School Principals, students and parents were developed.

Staff participants were freed by the school administrations for access as participants for surveys. This was achieved through school administrators signing the permission instrument.

Students were presented with permission instruments which were delivered to student homes via their schools. No students declined to participate, either themselves or through their parents.

Anonymity of all survey participants was assured for all participants.

Withdrawal from any survey items was permitted.

Open-ended written responses for survey participants were also permitted at the end of each survey section.

Some staff and students chose not to respond to some of the survey items.

The full text of all permission instruments is made available in Appendix 5.

Survey Duration

The student and educator survey research and instrument development commenced and survey statements were developed over several iterations including sample and pilot surveys, when the final survey version was completed. Survey schools were then contacted and selected during and survey timing organised. Final surveys were undertaken by participants in the five schools selected.

Survey participants took from between 20 minutes and one 60 minutes to complete the survey.

All of the surveys took place over a six-month time-frame from October 2010 to March 2011.

3.5.2 Stage 1 Survey Procedures Discussion

Five Independent coeducational schools with one-to-one laptop programs were chosen to participate in the survey to ensure consistency in cohort and hardware availability. Each school had in excess of 1000 students. Each of the schools was coeducational with similar numbers of male and female students. It was thought that this sample would provide a good comparison between students of each gender to allow for later analysis of differing student attitudes to digital technology and digital literacy, if desired.

In addition, each of these schools had a laptop program for students from Year 7. The students undertaking the survey were either in Year 9 or Year 10, so that they had generally experienced a laptop program in a secondary school for at least two years. New students at the schools were, however, not excluded from this study, since they were not able to be identified because of the anonymous nature of the surveys. None of the selected schools reported large numbers of new students in the years that undertook the surveys.

There were a number of issues at each school that meant that for one reason or another, a particular group of students would not be made available on the day of the survey. Thus, the final group of students chosen to undertake the survey was further randomised, in that students were not consistently withdrawn from one type of class or another. At each school, random student sampling occurred through students of a particular group or year level being available during the hour that their particular school had allocated for students to undertake the survey. This meant that large numbers of students who had accessed the permission instrument did not participate in the survey.

None of the e-Learning Leaders who distributed the surveys thought that student debriefing was desirable, necessary or appropriate. It was agreed, through discussion with these survey school e-Learning Leaders, that there was minimal ethical consequence for participants undertaking the survey and little reason to undertake debriefing, as the survey had little impact on the participants. Educators, students and parents were all provided with an option to contact the researchers in the event of any concerns. However, none were raised.

One challenging aspect in organising the surveys was that each school ICT Leader had a unique perspective and specific requirements about surveying their school's students. Specific discussions took place with each leader. Each of the schools was assured that they would not be named in any publication, or specifically identified. School leaders were pleased with this element of the research design and the ethical considerations of the schools. Without this consideration, the surveys in this study would not have been able to be completed.

Each student and educator needed to use a school-provided laptop on their school network and reliability was problematic in the pilot survey, so hard-copy versions of the questions were therefore provided to final survey schools to overcome this. This enabled those who did not have access to the laptop on that day, for one reason or another, to take part in the survey by doing a paper-based version. Approximately 40 of these paper versions were received from schools in various locations and entered into the online tool manually by the researcher, so that the data could be downloaded for data analysis. In the case of this survey, approximately 9% of participants completed manual versions in schools that purportedly had one-to one DT and online access.

Raw data was collected from each of the ten surveyed groups which included: five student groups and five educator groups from the five Independent coeducational one-to-one laptop schools. This raw data set was then statistically analysed.

Section 3.6 Procedures: Stage 2 Qualitative Interviews

3.6.1 Interview Qualitative Research Topics

Initial analysis and findings from survey data led to a mapping of elements and nodes relevant to digital literacy and digital technology training and provisioning in schools. The themes for the main interview questions were derived from the issues that were raised through the survey responses, together with the mind-map of the areas of digital technology applications in schools. Interview topics were then derived from this mind-map, shown in Figure 3.1.

Interview questions were developed from the following broad topics: positive and negative attitudes to digital literacy and digital technology, attitudes to access to digital technology, training in digital technologies, home and school use of digital technology, decision-making in schools about digital technologies and digital literacy training programs, and future developments in digital technology and schooling.

Interviewees were then identified from participants at digital technology conferences and contacts made with other educators interested in digital technology with experience in schools with a digital technology program. This involved the Snowball Sampling methodology (Statistics How To, 2018) described in Section 3.2.3.

3.6.2 Interview Procedures

Interview data was captured digitally from all interviews, using Adobe Audition software, with a digital microphone. The audio files were then saved to hard-drive and backed-up. This was stored in a locked filing cabinet, together with online backups to ensure the security and integrity of the data. No names were stored with the digital copies of this data and the participants' anonymity was preserved. This data was kept and disposed of in accordance with Swinburne University data and privacy policies.

All names of the interviewees were coded to preserve anonymity and the links to the original names were stored in a separate file. The names in this research study did not reflect the names of the interviewees, although the gender is consistent.

Face-to-face interviews were conducted at a mutually agreed location, with each interviewee. Online interviews using appropriate video-conferencing software were conducted if distance or other issues arose that prevented face-to-face interviews.

Audio was digitally captured in each of the interviews and the data held securely. Video files were not recorded for any of the interviews, including those who engaged in video-conferencing.

Interviews were hence recorded electronically for accuracy and then manually transcribed into word-processing software. Interview digital data will be permanently deleted after the publication of this manuscript.

Description of Interviewees

The following descriptions outline the interviewees, their schools and skills. All names are pseudonyms. The number of enrolled students at interviewee schools was not included here, in order to preserve the anonymity of the schools.

Adrian was an experienced e-learning leader and educator who worked at a Catholic female secondary school in a suburb north of Melbourne. He was appointed ICT Curriculum Coordinator and taught

Information Technology in the school's computer labs. There was no specialist e-learning coordinator in the school and there was little focus on professional development in e-learning. Digital technology decisions rested with the ICT Systems manager who appeared to resist change and there was little curriculum influence on these decisions.

Samantha was an experienced digital learning educator who worked at a Catholic male secondary school in northern Tasmania. She was appointed as the school's first e-learning coordinator and she taught Media and Design. The school had several labs of outdated computers that she was updating. Samantha was implementing a professional development environment for teachers to learn about digital technologies. Digital technology decisions appeared to be made on an ad-hoc basis by the Principal and ICT Systems Manager. Samantha had recently instigated an ICT team to manage decisions.

Michelle was an experienced information technology teacher who worked at an Independent coeducational secondary school in southern Melbourne. She taught senior Information Technology classes and assisted with e-learning and professional development for teachers in uses of digital technologies. There were a small number of computer labs at the time of the interview and some student use of tablet computers. Digital technology decisions were made by e-learning coordinators and the Principal and implemented through an outsourced ICT systems team.

Terry was a well-known e-learning leader and regular presenter at digital technology conferences. He worked at an Independent female single-sex secondary school in Melbourne's eastern suburbs. Terry was a curriculum leader in his school, managed much of the digital technology system and taught classes in Media. Students used tablet computers at the time of the interview. Terry's school had set-up two committees that made decisions relating to digital technology access.

Rory was an experienced e-learning leader and he had taught a number of Science and Technology subjects. He worked at a Government coeducational secondary school in Melbourne's south-east. His school had allowed students to bring their own devices (BYOD) because Government funding for their laptop program had ceased. Decisions relating to digital technology access were generally made by the school ICT Technicians, who seemed resistant to change.

Lauren was an experienced teacher in using digital technologies who had taught at several school types. She worked at a Catholic female secondary school in Melbourne's Western suburbs. She was also a parent of two girls who went to a different, but similar school, from the one she worked in. There was limited e-learning or professional development for teachers in using digital technologies. Lauren was a teacher of Mathematics. In her school, digital technology decisions were made in an ad-hoc manner by the ICT Technician.

Kellie worked at an Independent coeducational P-12 school in Northern Sydney, New South Wales, and was a conference presenter on uses of digital technologies in new learning spaces. Kellie was an e-learning leader at her school and worked in the year 5-6 team of teachers. Her school Principal was known for his innovative practices and he had been recognised as a “Principal of the Year”. Her school was renowned for its pedagogies and open learning spaces. Curriculum and professional development support for e-learning was a focus for the school. The school had a BYOD digital technology access policy for students. There was a digital technologies decision-making committee at her school.

Ingrid was a leading teacher and Head of Humanities at an Independent coeducational school in inner Melbourne. The school had a strong student laptop program. Ingrid assisted her team of teachers to use digital technologies in their classes and had a strong belief in the value of Social Media use in education. She was also a leader in professional development for the teachers at her school. Decisions about digital technology access and policies stemmed from the ICT manager.

Robert was an experienced Art and Design teacher and former Head of the Art Department at an Independent male single-sex school in outer Melbourne. He was working at an Independent coeducational school in an Eastern Melbourne suburb at the time of interview. He had also worked at an International school and three Independent schools with laptop programs. Decision-making in digital technologies at Robert’s school was undertaken by the ICT Technicians.

Carolyn was an e-learning and curriculum leader with an interest in modern pedagogy. She was a highly qualified English and History teacher, working at an Independent male single-sex school in Melbourne’s southern suburbs. She had previously worked in a University, was excited about the potential for digital technology use in education and was a conference presenter in this area. Decision-making at her school in digital technologies was made by the ICT manager.

Interview Duration

Interviews lasted between 30 and 70 minutes, depending on the detail of the responses from interviewees. Interviews took place over a fifteen-month time-frame in 2012-2013.

Section 3.7 Data Analysis

3.7.1 Stage 1 Survey Data Analysis

Analysis of Digital Literacy Self-Assignment and Self-Efficacy

Self-assignment into the high digital literacy group was made as follows: survey participants self-assigned themselves as having a high level of digital literacy, as shown in Table 4.1, by responding with ‘agree’ or ‘strongly agree’ to the survey statement, “I have a High level of Digital Literacy.” They were then assigned to the ‘high digital literacy’ category, with the remaining participants in this survey item placed into the 'low digital literacy' category. The responses of each of these groups to the remaining survey statements were then filtered accordingly. The self-assignment of survey participants to groups of high or low digital literacy (DL) assisted in grouping respondents for statistical purposes, as discussed below.

A Pearson correlation coefficient and associated *p*-values, was calculated to determine the level of similarity between student and educator response distributions, on the survey items that related to DL and on perceived ability to use digital technologies (DT) in the classroom. For these survey items, the participant responses were graphed into distributions and correlation coefficients and p-values were then calculated and displayed in Section 4.1.

The statement of identifying DL appeared at the end of the survey, it was therefore assured that those that identified themselves on this statement, would have responded to all or most of the voluntary survey questions. The downside of this decision was that there were a number of participants who responded to survey questions but withdrew part way.

It was preferred to determine the level of DL of student and educator participants through self-assignment, rather than by measuring what they could do with specific devices. The latter method was thought to be time-consuming and too technology-specific to be of value. The subjective perception of the DL of a participant, based on self-efficacy, was thought to be of more value, since this was more likely to limit the confidence level and use of DT in a practical sense. It could also be cross-referenced to other items that relate to ability to use DT in the classroom and confidence in using DT. This measure of DL turned out to be a highly accurate reflection of the participants' opinion on their ability to use DT in the classroom. This item is discussed in Section 4.1 and self-assignment is consistent with literature pertaining to the value of self-efficacy in measuring digital skillsets (Prior et al., 2016).

Self-efficacy items were developed in a framework and wording consistent with Bandura's (2006) advice on constructing scales to measure self-efficacy. Five-point Likert scale items was the preferred way to capture data. On self-efficacy items, rather than asking participants about specifics of what they can or cannot do, they were directly asked to estimate their own level of DL and ability to use DT in the classroom situation. Due to the definitions provided, participants were able to estimate their own abilities and self-efficacy on the relevant survey items. Participants were similarly asked to estimate the level of DL of the other group, educator or student. The items and permission instruments did not mention self-efficacy was being measured as Bandura (2006) suggested. Consequently, reactivity from survey participants to this research term was minimised and ethical standards adhered to. The survey results from self-efficacy items could then be used to inform the

Stage 1 survey findings. By dividing educators and students into high and low DL groups, various comparisons could then be made according to each of the survey statements.

Statistical Analysis of Survey Data

Data from each survey item was tabled and graphed in order to view individual responses to the survey items. This method allowed only a cursory view of the survey responses for most survey items and deeper statistical methods were sought to allow analysis of the survey findings.

Where participant responses on nominal and other items were able to be shown in graphical form, that allowed relevant comparisons to be made between students and educators, the graphs are shown in Chapter 4. This was the case for comparisons of DL self-estimates and estimates of others, shown in Section 4.1.

Groups of students and educators were sectioned into those with high and low levels of DL. There were then six groups of survey participants: educators, students, high and low DL educators and high and low DL students. This then allowed comparisons of four domains: acquisition of DL, online risks and security, curriculum and classroom uses of DT and home versus school uses of DT. Each of these focus areas was then used in analysis of agreement in attitudes and disconnects between groups of participants.

The most agreed statements, showing attitude congruence, between the six survey participant groups were tabled and displayed visually in two bubble charts. Figure 3.2 shows one example from these charts.

Table 3.2 Bubble chart sample from Figure 4.2 shows attitude agreements between the groups analysed (from Chapter 4)

Statement	All Educs	All Stud	Educ High DL	Stud High DL	Educ Low DL	Stud Low DL
DL is important in future employment	100	76.5	100	90.9	100	48.9
I would like (students) to obtain more training in DT	74.5	51.8	79.6	60.6	74.4	31.6

In another statistical analysis method used, levels of agreement were calculated, together with Chi square calculations, with two degrees of freedom, for the three groups of responses from each of two comparison groups. The first statistical comparison was made between students and educators without consideration of their DL. The remaining comparisons made were: All participants with Low versus High DL; Educators with Low versus High DL; Students with Low versus High DL; Educators with Low DL versus Students with High DL; Students with Low DL versus Educators with High DL; Students with High DL versus Educators with High DL and Students with Low DL versus Educators with Low DL. This represents eight possible comparisons across four domains, as outlined above.

Tables 4.3 – 4.45 show level of agreement, or level of disconnect between the groups being compared. In order to determine the agreement and disconnect levels, the following method was used, as developed by the researcher. Note that results tables show that these methods were consistent with the Chi Square statistical analysis used for the purpose of comparison and validation of this methodology.

Firstly, the labels on each column in the results tables were abbreviated from the original results so that 'Agr' specifies agreement and 'Dis' specifies disagreement. To derive these groupings of responses from the survey items, responses of 'strongly agree' were combined with 'agree' to obtain one group in the 'agree' category. Similarly, 'strongly disagree' was combined with 'disagree' to obtain a 'disagree' category.

The third category shown in the results tables, which could not be discounted, represented participants who chose to respond with 'neither agree nor disagree' or 'uncertain'. It was not deemed to be relevant whether this was because they selected the middle option on the Likert scale or selected 'uncertain'. Hence, these responses were combined and applied in a Chi square test with two degrees of freedom. Significant differences between the two comparison groups were assumed if the Chi square p-value was < 0.01. This level revealed a high level of significant difference between the comparison groups, that was not due to chance. In the case of Likert scales interpreted in this way, these differences reflected an attitudinal difference between the two comparison groups of respondents in each case.

Therefore, the six results from the survey item in question, three response categories for each of the two comparison groups, allowed for a Chi square analysis, to determine a p-value, which showed the level of significant difference between the 'agree', 'disagree' and 'neither/uncertain' values for the two groups. In the sample shown in Table 3.3, a p-value of 0.048 showed some differences in the responses between the two comparison groups of students but not one of significance, since significant difference was ascribed to p-values of < 0.01.

For each group that was compared in the tables in Chapter 4, a level of agreement was then calculated by subtracting the 'disagree' total from the 'agree' total. This is shown as A-D in the tables. This calculation revealed a group attitudinal agreement level for each survey statement investigated. This allowed discussion of attitudinal agreement between survey groups that related to the first research question on attitudes to DT. For example, Table 3.3 shows similar attitudinal level of agreement (A-D) of 41.0 and 39.0 for the two groups of students.

To investigate the second research question that reflected on disconnects between the groups identified, a calculation was developed to show this attitudinal disconnect. This was defined as the 'Level of Disconnect', or LoD in the tables. The level of disconnect (LoD) was obtained by calculating the difference between the two A-D values.

Table 3.3, (a copy of Table 4.10) is shown to illustrate this calculation and figures for analysis. The survey statement refers to teachers having difficulty using DT in the classroom. There was no significant difference between the responses of the two groups, students with low and high DL, to the survey item, as the Chi square value *p*-value is 0.048. The level of disconnect shown is also very small with only a 2.1 level of disconnect (LoD). This data analysis therefore shows that students with self-assigned high and low DL, had similar views that teachers often had difficulties in using DT in the classroom.

Table 3.3 also reveals that there was only one survey statement that related to 'Digital literacy and training' that showed a high level of agreement between the two comparison groups of students with either a high or low level of DL.

Table 3.3 Illustrating the Level of Disconnect and Chi square calculations (from Chapter 4)

Digital Literacy and Training												
	Students with Low DL				**Students with High DL**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N_High**	**Chi ^{2}**
Teachers often have difficulties in using DT in the classroom	52.6	35.8	11.6	41.1	58.8	21.5	19.8	39.0	2.1	95	177	0.048

LoD data is shown in green cells where the second group has the highest A-D value, where the first group has the highest value the LoD is shown in a white cell, as in Table 3.3.

If the LoD was greater than 20 it was seen as significant, where supported by a significant difference through Chi square *p*-value <0.01. In this case an attitudinal disconnect between the two groups was confirmed. Where the LoD was less than 12, the data showed attitudinal agreement between the two comparison groups, when not supported by a significant difference in the Chi square *p*-values. If the LoD level fell between 12 and 20, the data was seen as offering little information about either a level of attitudinal agreement or attitudinal disconnect. In this last case, the survey responses were not investigated as the data was deemed to be of little relevance.

3.7.2 *Stage 2 Interview Data Analysis*

Schools Types and Roles of Interviewees

As a group, the interviewees had worked in all Australian school sectors, as discussed in Section 3.6.1. Table 3.4 shows school types where interviewees had experience. Each interviewee is also listed under the different roles that are discussed in Chapter 5. Innovators were educators who use the most cutting-edge technology available in their schools in terms of hardware or software and who wished to explore new uses of DT. All of the interviewees were classroom teachers, five were e-learning or ICT specialists with a high level of knowledge about DT and its uses in education and two were curriculum leaders in their schools. Eight interviewees reported being involved in innovative uses of new DT in their schools. This research was limited to the attitudes of classroom educators, and school administrators (Principals and Assistant Principals) and ICT managers were not interviewed. These latter groups could represent different groups for future research studies.

Table 3.4 School Types, Roles of Interviewees and Device Types Available

School Type	Classroom Teacher	Innovator	ICT or e-learning Specialist	Curriculum Leader	Device Type
Independent Coeducational School	Ingrid Robert Michelle Kellie Samantha	Ingrid Kellie Samantha Michelle	Michelle		School Laptop, BYOD, Tablets, Computer Labs
Catholic male School	Samantha Lauren	Samantha	Samantha		Tablets, Computer Labs
Catholic female School	Adrian Lauren	Adrian	Adrian		Tablets, Computer Labs
Independent female school	Terry	Terry	Terry	Terry	Tablets, BYOD, Computer Labs

Independent Male school	Carolyn Robert	Carolyn		Carolyn	School Laptop, Tablets, BYOD
Coeducational Government School	Rory Robert	Rory	Rory		BYOD, Computer Labs

Method of Interview Data Analysis

The full text of the interviews was firstly transcribed into a word processing package manually from the digital recordings of each interview. This resulted in more than sixty pages of text from the ten interviews.

This textual data from interviews then underwent the following analysis:

- Interview data was mapped into themes or coded areas, based on the areas identified in the mind-map shown in Figure 3.1. These mind-mapped topic areas were then coded into NVivo software;
- The interview data was then extracted into meaningful quotes and these were added to NVivo to allow comments from each interviewee to be combined into the mapped codes;
- Interview comments were mapped into the coded areas and then incorporated into sections that were relevant to the four research questions. This was then extracted from the NVivo software to allow qualitative analysis;
- Qualitative data and interviewee quotes were tabled into sections, where mention was made of similar areas and problems in the schools of interviewees. These tables, where appropriate, are shown in this chapter and in Chapter 5 Stage 2 findings;
- Thematic analysis was conducted on the interview data and this is discussed in detail in Chapter 5;
- Interview data and relevant points pertaining to the research questions are sectioned and discussed at length in Chapter 5;
- The tabulated data includes Table 3.4, showing school types and device type used in interviewee schools;
- The Venn Diagram, in Figure 3.2 shows home versus school tensions with DT;

- Opportunity maps, for example Figure 3.3, were used in Chapter 5 to illustrate a variety of qualitative findings;
- A Spectrum chart, shown in Figure 3.4 was used in Chapter 5 to evaluate decision-making strategies in interviewee schools.

Venn Diagram

A Venn-Diagram was created to show elements of DT decision-making inside the home and at school, and the overlap of these elements. Training may occur either at home or at school and occur through viewing videos, in lectures, or having a peer or family member offer advice, in which case this may be divorced from uses of hardware and software.

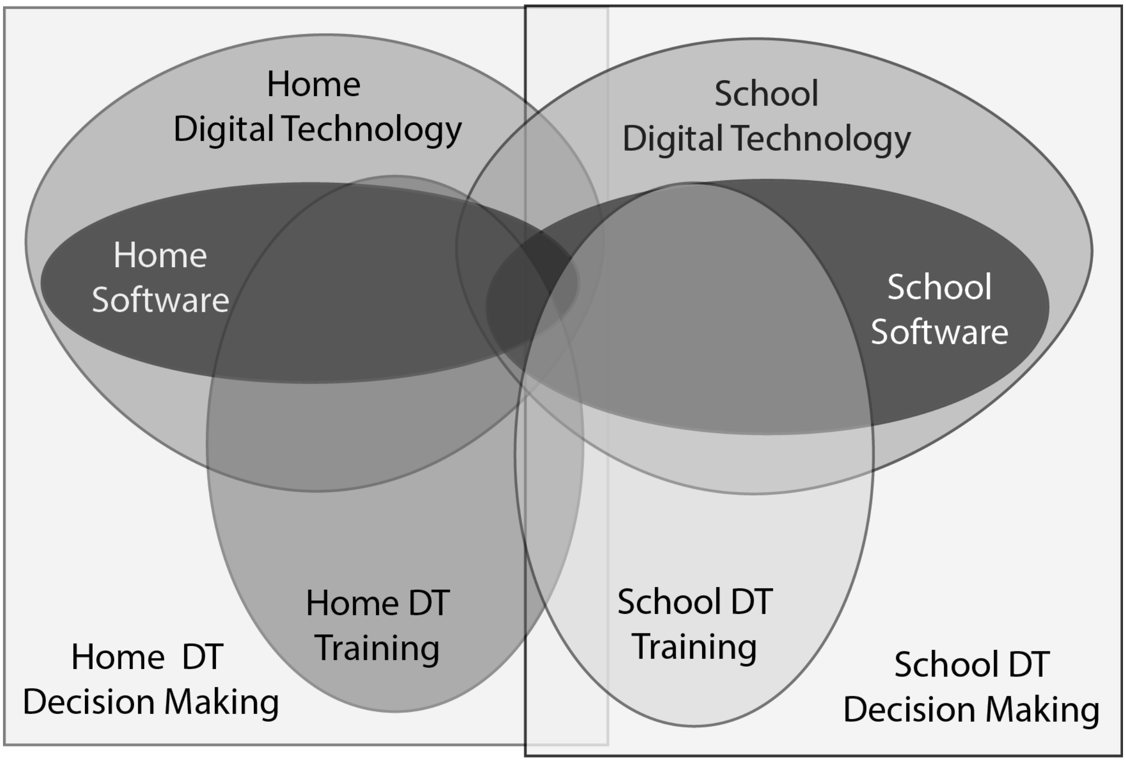

Figure 3.2 Home and school tensions. Venn-Diagram showing overlap between decision-making elements. (from Chapter 5)

Opportunity Map for Qualitative Analysis

Disconnect Area	Focus	Ror	Kel	Ing	Sam	Mic	Rob	Ter	Adr	Lau	Car
Student Training	Embedded DT Curriculum										
	Senior IT Specialist Subject										
	Middle Years DT Program										
	Digital Safety Program										

High Availability/Opportunity

Medium Availability/Opportunity

Minimal Availability/Opportunity

Figure 3.3 Opportunity Map of Student Opportunities to Access Digital Technology Training (from Chapter 5)

Spectrum Chart to Evaluate Decision-making Strategies

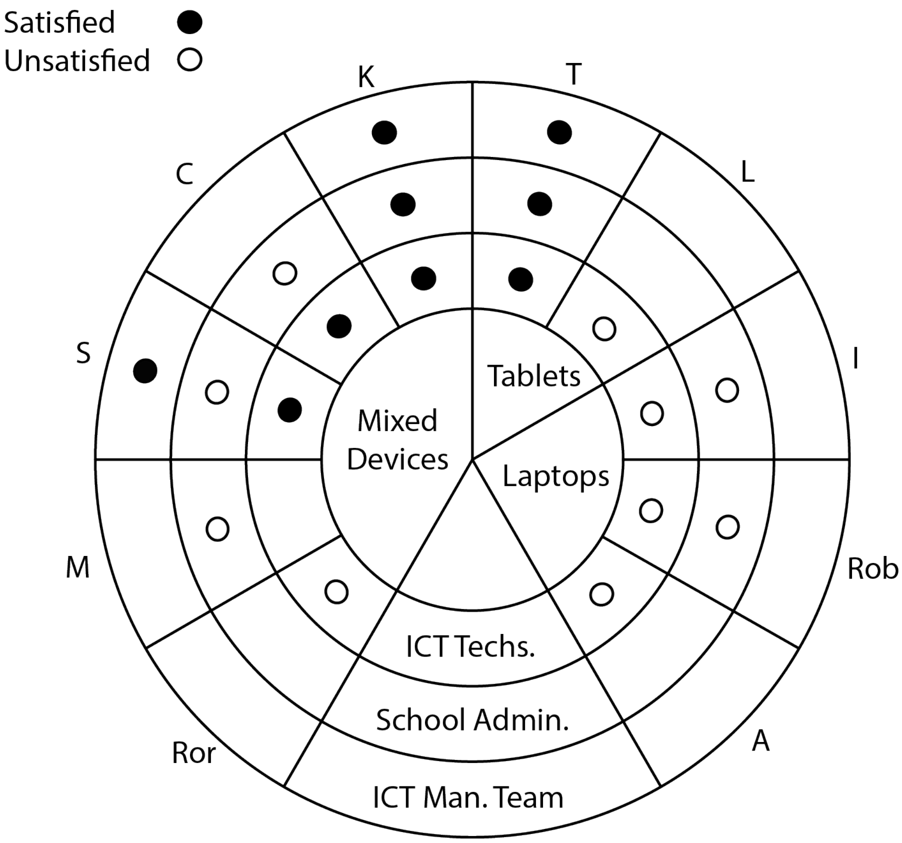

Figure 3.4 Decision-making strategies employed in interviewee schools (from Chapter 5)

3.7.3 Mixed-methods Analysis of Stage 1 Quantitative and Stage 2 Qualitative Findings

The results of the quantitative and qualitative analyses are discussed in Chapter 6, and these findings are assessed for similarities and differences. Summaries of relevant findings from Stage 1 and Stage 2 were combined and associated and related to the four research questions.

Findings relevant to each of the four research questions were appraised and synthesised. Finally, conclusions were drawn from the mixed-methods approach.

A Use-Case diagram was created to show decision-making processes that impact on DT in schools. This is shown in Figure 6.1.

Conclusions were then made to determine best practice decision-making for schools utilising or integrating new digital technologies. A recommended decision-making approach was determined from the best-practice schools and this approach was elucidated and described in detail.

Limitations and critique of this study including the methodology, is found at the end of Chapter 6.

In the following chapter, Chapter 4, Stage 1 survey quantitative data is displayed and analysed. Chapter 5 contains the Stage 2 interview qualitative data analysis and in Chapter 6 conclusions are drawn that reflect on the entire mixed-methods study.

4 Stage 1 Survey Results and Analysis

This chapter investigates aspects of two research questions through analysis of the Stage 1 quantitative survey data:

- What are the attitudes of the various stakeholders towards digital literacy and use of digital technologies in education?
- What are the disconnects between stakeholders that impact upon the use of digital technologies in the classroom?

The third research question: 'How do schools train stakeholders in the acquisition of digital literacy and in using digital technologies and how effective are these methods?' bears a close relationship to the survey data found in participant responses to items reflecting on digital literacy and the use of digital technologies in the classroom. This question will be discussed in more detail when Stage 1 data is combined with Stage 2 interview data in Chapters 5 and 6, along with discussion on the final research question: 'How are decisions made in providing training in digital literacy and in implementing digital technologies in digital education? Are there decision-making and change management practices that allow for more effective provision of digital literacy and implementation of digital technologies?'

In Stage 1, 59 survey items were provided to participants in several formats. The majority of survey items follow a five-point Likert ordinal scale, whilst others required participants to make nominal and interval selections, as outlined in Chapter 3, with the full survey text found in Appendix 1.

Notes on Analysis of Group Comparison Data in Sections 4.1 and 4.2

As explained in the Methodology, Chapter 3, in each of the Tables in Sections 4.1 and 4.2, the labels on each column are abbreviated from the original results. In these Tables 'strongly agree' and 'agree' were combined into a broad agree category, 'Agr', 'strongly disagree' and 'disagree' were also combined into a disagree category, 'Dis'. For each group a Level of Agreement (LoA) was calculated by subtracting 'Agr' from 'Dis', seen as 'A-D', and finally a 'Level of Disconnect' between the groups (LoD) was obtained by calculating the difference between the two LoA (A-D) values. Hence, the LoA reveals how the two groups show attitudinal agreement or disconnect on each of the survey items.

The Chi Square calculation in the data tables in Sections 4.1 and 4.2, using two degrees of freedom and six data sets, reveals the *p*-value, which shows the probability that the results were caused by chance and may reveal a significant difference between the attitudes of the two groups. Significance was assumed in cases where the *p*-value was <0.01.

Level of Disconnect, (LoD) data, shown in green cells in the tables, shows cases where the second group had the highest A-D value of the two groups, rather than the first (white cells). Where the LoD was greater than 20% it was seen as a significant disconnect in attitude between the groups, particularly where supported by significant difference in the Chi Square test. On the other hand, where the LoD was below 12% it was seen as a high level of agreement between the two comparison groups, particularly where supported by no significant difference in the Chi square values. If the LoD level fell between 12 and 20, the data was seen as offering little information about the level of attitudinal agreement. While these figures of 12 and 20% are arbitrary, the Chi Square significant differences were utilised to verify differences in attitudes of the two groups and both numerical representations were shown in the results tables.

In Section 4.1, there were several methods used in this study to draw comparison between attitudes that showed agreement on a survey item, as opposed to the disconnects which are shown in Section 4.2. Tables 4.6 and 4.18 display comparative agreement, or congruence, between the groupings, by numerically and visually displaying survey results where 'agreed' and 'strongly agreed' responses were greater than 50% when combined (LoA). However, few survey statements showed this high LoA, so similar tables cannot be shown in Sections 4.1.4 and 4.1.6. Tables 4.7 – 4.16, and 4.19 – 4.34 showed strong congruence between comparison groups on survey statements. The low LoD in these comparisons was used to show agreement level and the Chi Square *p*-value in these cases is >0.01, so that there was not a significant difference between the opinions of the two groups. In Section 4.2 Tables 4.35 – 4.63 show high LoD values and significant differences in the Chi Square *p*-value of <0.01, illustrating the attitudinal differences, or disconnects between the two groups being compared.

In the sections that follow, Section 4.1.1 reveals the self-estimates of digital literacy of educator and student participants of the surveys, and attitude agreements between educator and student groups on survey items; while Section 4.2 reveals disconnects between these groups on statements. The participant groups and survey domains are further elucidated at the commencement of Section 4.1.

Section 4.1 Attitudes to Digital Literacy and Use of Digital Technologies

The following Section 4.1, shows similarities in the attitudes of participants to survey statements in comparison groups. In Section 4.2 attitudinal differences were investigated through disconnects in responses to the survey items.

The comparisons were made for survey statements grouped into the following four domains:

- Attitudes to the acquisition of digital literacy (DL)

- Attitudes to online risks and security
- Attitudes to classroom use of digital technology (DT)
- Attitudes to home vs school uses of digital technology

For each of these domains, responses have been grouped into the comparisons as shown in Figure 4.1. There were eight comparisons according to individual self-assignment into student and educator groups of high and low DL.

Self-assignment into the high DL group was made as follows: survey participants self-assigned themselves as having a high level of DL by responding with 'agree' or 'strongly agree' to the survey statement, 'I have a high level of digital literacy'. They were then assigned to the High DL category, with the remaining participants to this survey item placed into the Low DL category. The responses of each of these groups to the remaining survey statements were filtered accordingly.

Groupings of students and educators, with high and low DL, allowed several filtered result comparisons to be made, as shown in Figure 4.1. These comparisons then allowed analysis of attitudinal similarities and differences of each of these groups, in their comparable survey responses. These are discussed in Sections 4.1 and 4.2.

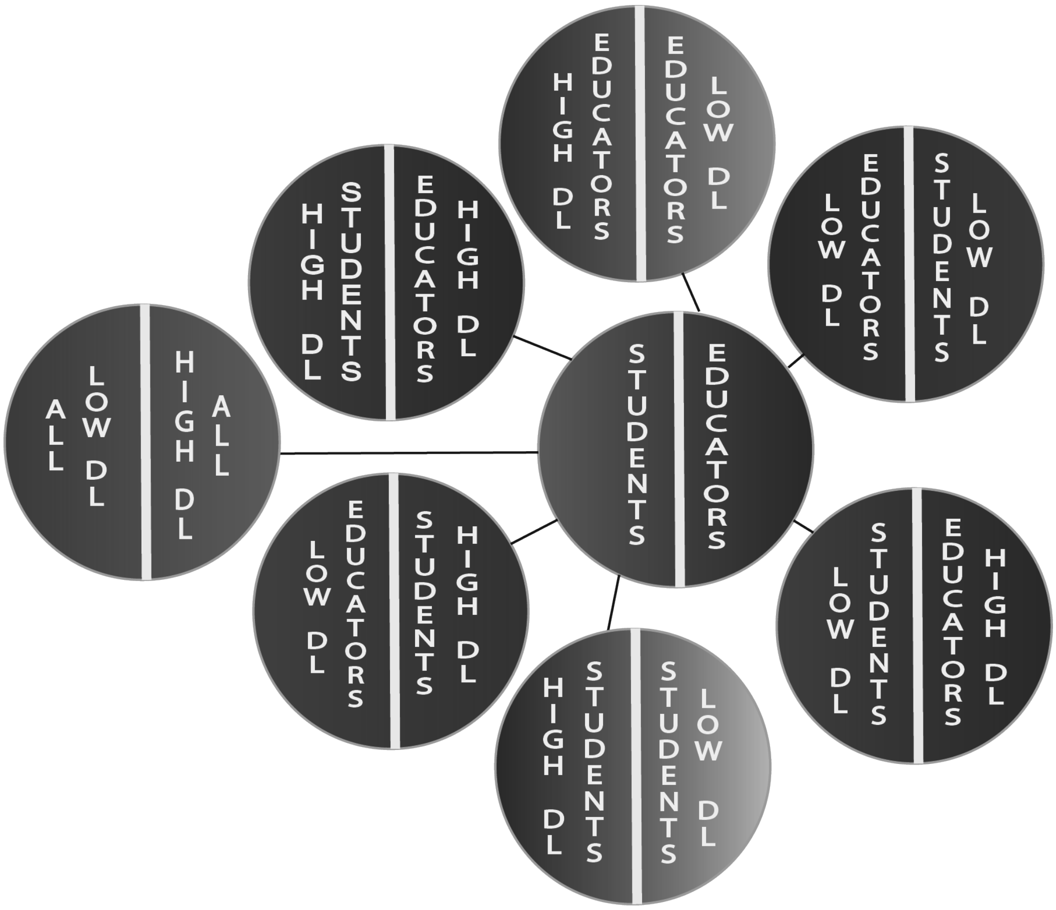

Figure 4.1 Digital Literacy (DL) comparison groups used in this research.

Figure 4.1 shows the comparisons made between: ‘Students and Educators’ without consideration of their DL; ‘all participants with Low vs High DL’; ‘Educators with a Low DL vs Educators with High DL’; ‘Students with Low vs Students with High DL’; ‘Students with High DL vs Educators with Low DL’; ‘Students with Low DL vs Educators with High DL’; ‘Students with High DL vs Educators with High DL’ and ‘Students with Low DL vs Educators with Low DL’. This represents the eight possible comparison combinations.

In the following section, the DL of survey participants was investigated through their own self-estimates, as provided from their survey responses, prior to being used as a filter for further in-depth analysis.

4.1.1 Estimates of Digital Literacy and Ability to Use Digital Technologies

Survey Participant Self Estimates of Digital Literacy

Students and educators were asked to provide self-estimates of their own digital literacy in the surveys, recalling that the definition provided for survey participants was that ‘digital literacy is the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers' (Gilster, 1997). The statement on the survey item was 'I have a high level of digital literacy' and participants were asked whether they 'agree' or 'disagree' on the five-point Likert scale described in Chapter 3.

Table 4.1 shows the ordinal responses of educators and students to this statement. A most significant finding from this data was the degree of similarity in the responses of the two groups of participants. There was little variation between the self-estimates of the two groups' DL. When this data, in terms of the distributions of participant responses, was applied statistically to calculate the Pearson's Correlation Coefficient (r), a very high r value of 0.948 was obtained. This represented a very high positive correlation between the two distribution sets of responses and the Pearson critical values table shows this to have a significance of $p < 0.01$. The responses of these groups were hence marked by their similarities, as illustrated in Figure 4.2. Any assumptions that students and educators were at opposite ends of a digital divide and that students were part of a 'digital native' generation, were challenged by this finding as the differences were minimal and not significant between these groups.

Table 4.1 Student and Educator Self-Estimates of Digital Literacy via response to the survey item: 'I have a High level of Digital Literacy', response data is shown as percentages.

	Str Dis	**Disagree**	**Neither**	**Agree**	**Str Agree**	**Uncert**	**Total N**
Students	1.10	3.68	23.16	43.01	22.06	6.99	272.00
Educators	1.08	13.98	25.81	39.78	18.28	1.08	93.00

Pearson Correlation Coefficient: r 0.948

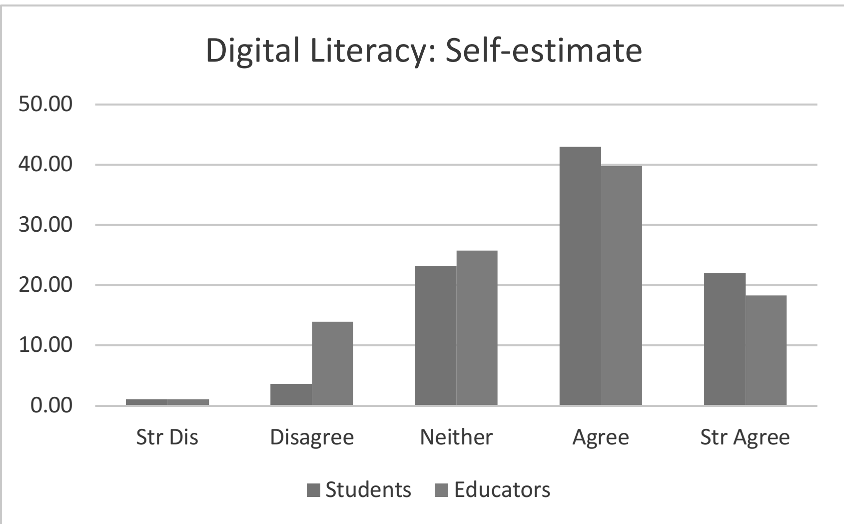

Figure 4.2 Overlapping distributions for student and educator self-estimates of digital literacy. Pearson's Correlation Coefficient r value, is very high: 0.948, significance p <0.01

Figure 4.2 shows results graphed from Table 4.1. The responses of students and educators followed overlapping distributions with a skewed trend towards higher self-estimated DL for the majority of participants. This data showed marginally greater DL self-estimates in the student group. Table 4.1 revealed a larger minority of educators who disagreed with the statement.

While there was no direct evidence that this self-estimate reflected actual DL, as this was a subjective response reflecting a belief about one's DL, it would logically follow that this belief would impact on an individual's self-efficacy and confidence in use of DT, which may be more relevant, as discussed in Chapter 2. The findings on this item both challenges the concept of the 'digital native' and indicates that there were groups of students and educators who had a similar self-perceived lack of having high DL and a likelihood of having less confidence and low self-efficacy in using DT. This also implies that there was a need in these groups for more training in the acquisition of DL, which was confirmed in responses to other survey statements. Table 4.2 shows high and low DL self-estimates from Table 4.1, grouped together.

Table 4.2 Student and Educator Self-Estimates of DL: Agree (Strongly agree and agree) and Not-Agree Groupings

	Not-Agree	Agree	Uncert	Total N
Students	27.94	65.07	6.99	272.00
Educators	40.87	58.06	1.08	93.00

Table 4.2 shows significant numbers of educators (40.87 + 1.08 = 41.97%) and students (27.94 + 6.99 = 34.93%) did not believe they had a high level of DL, when 'neither agree nor disagree' and 'uncertain' responses were grouped with 'disagree' to show 'not high' self-estimates. These last three responses on this Likert scale item were not reflective of strong self-belief in high DL. 'Agree' or 'strongly agree' responses, showing high self-estimates of DL, were shown for approximately 58% of educators and 65% of students respectively.

It is worth emphasising that the self-assignment of the survey participants into these two groups showed no universal student belief they were digitally literate and that the corollary was also true, that there were large numbers of educators who believed they had a high level of DL.

It is also pertinent to mention that within the educator group, participants may have been in the age range of 23 to 70. There was insufficient data in this study to separate age group responses amongst educators. The educators who participated, like their students, had a majority group that self-estimated themselves to have a high DL as well as a group that did not self-estimate high levels of DL. Hence, in analysing this data, self-assigned DL did not appear to be strongly related to age.

Survey Participant Self-Estimates of Ability to Use Digital Technologies

The above survey item on DL, bears close resemblance to the following item, showing the ordinal self-estimate of participants' abilities to use DT in the classroom. This item directly reflected student and educator self-efficacy in using DT, although this term was not used in the surveys. The two items each had a similarly high Pearson Correlation Coefficient *r* value, 0.935 in this case, revealing a high correlation in the beliefs of both students and educators on these items and the Pearson critical values table shows these distributions to have a significance of $p < 0.01$. Table 4.3 shows percentage data from the survey item that requested participants to 'rate your self-perceived ability to use digital technologies in education/classroom situation'. On this item a moderate response was assumed to reflect a less than high self-estimate of capacity to use DT in the classroom situation, since this response suggested doubt in one's ability. Therefore, in Table 4.4 the moderate response on this item was grouped with poor and poor to moderate self-estimate of ability.

Table 4.3 Student and Educator Self-Estimates of Ability to Use Digital Technologies in the Classroom (percentages)

	Poor	Poor-Mod	Mod	Mod-High	High	Uncert	Total N
Students	0.34	1.03	27.49	44.33	23.37	3.44	291.00
Educators	0.00	8.70	34.78	40.22	16.30	0.00	92.00

Pearson Correlation Coefficient r value: 0.935

Figure 4.3 shows a graph of the data from Table 4.3, to reveal a similarly skewed distribution, as Figure 4.2. Table 4.4 shows the raw data grouped together into two self-rating categories in terms of ability to use digital technology in education, or self-efficacy and is comparable to Table 4.2.

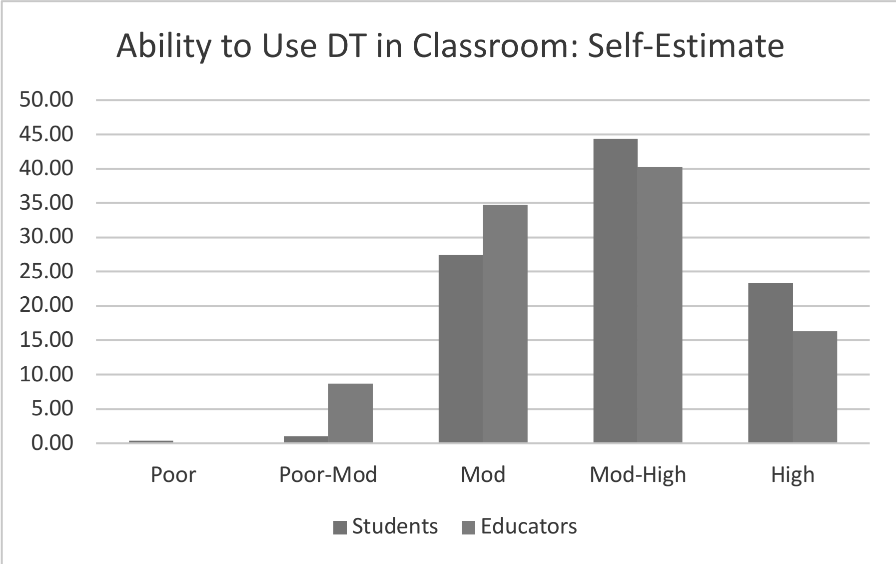

Figure 4.3 Self-Estimate of Ability to Use Digital Technology in the Classroom. Pearson Correlation Coefficient r = 0.935, significance <0.01

Table 4.4 Student and Educator Self-Estimates of Ability to Use Digital Technologies in the Classroom re-grouped into two categories

	Poor – Mod	**Mod-High/High**	**Uncert**	**Total N**
Students	28.86	67.70	3.44	291.00
Educators	43.48	56.52	0.00	92.00

Table 4.3 and Figure 4.3 show a close resemblance between self-efficacy in ability to use DT in the classroom, to self-estimates of DL in Table 4.1 and Figure 4.2 above. For the uncertain students above, it was implied by this response that they did not have a high self-perceived ability to use DT. Hence, approximately 43% of educators and 32% of students indicated that they had a moderate to poor self-efficacy to use DT in the classroom, corresponding to the 42% and 35% above, not agreeing that they have a high DL. Hence, the DL self-estimate was highly similar to DT self-efficacy of the participant groups in this study. The ordinal data-set in Table 4.3 validates the data from the Likert item shown in Table 4.1, suggesting that these two findings, when taken together, have a high reliability. While these two items are subjective, independent measures of DL and DT self-efficacy, they show highly important similarities in pattern and results that reflect cognitive and affective attitudinal components that relate to DL and use of DT in the classroom. These attitudes are therefore likely to affect behaviour where DT was employed in the classroom. Those with a high-level of DT self-efficacy and high self-estimate of DL, would be more likely to use it with confidence.

Throughout this thesis in Stage 1, self-estimates of DL shown in Table 4.2, were applied to filter the responses of groups of students and educators, into those with a self-assigned high level of DL and those without a high level, in order to investigate attitude agreements and disconnects. These attitude similarities and differences are discussed in Sections 4.1.2 to 4.2.4.

The two sets of data on the two items above had markedly similar correlation coefficients, revealed similar groupings and similar skew towards higher levels of DT self-efficacy, in both groups of participants in this study. These attitudes towards DL and DT self-efficacy were explored further, through the Stage 2 interviews that provide qualitative reflections from educators and e-learning leaders, in Chapters 5 and in Chapter 6, where both qualitative and quantitative data findings were conjoined, synthesised and further analysed.

Survey Participant Estimate of Digital Literacy in Other Group

For further comparison a third survey item provided interval data of the estimates of each group to the other's DL. The two groups of students and educators were asked to identify the approximate percentage of the other group who were highly digitally literate, through the survey item that asked participants 'What percentage of your students/educators do you estimate have a high-level of digital literacy?' The responses to this item showed a marked difference to the two subjective items discussed above and reveal contrasting differences in beliefs between student and educator groups.

Table 4.5 Student and Educator Percentage Estimates of High Digital Literates in Other Group

	0-20	***21-40***	***41-60***	***61-80***	***81-100***	***Uncert***	***Total N***
Students	6.90	16.30	26.96	31.97	4.39	13.48	319
Educators	3.00	10.00	15.00	37.00	32.00	3.00	100

Pearson CC r value: 0.332

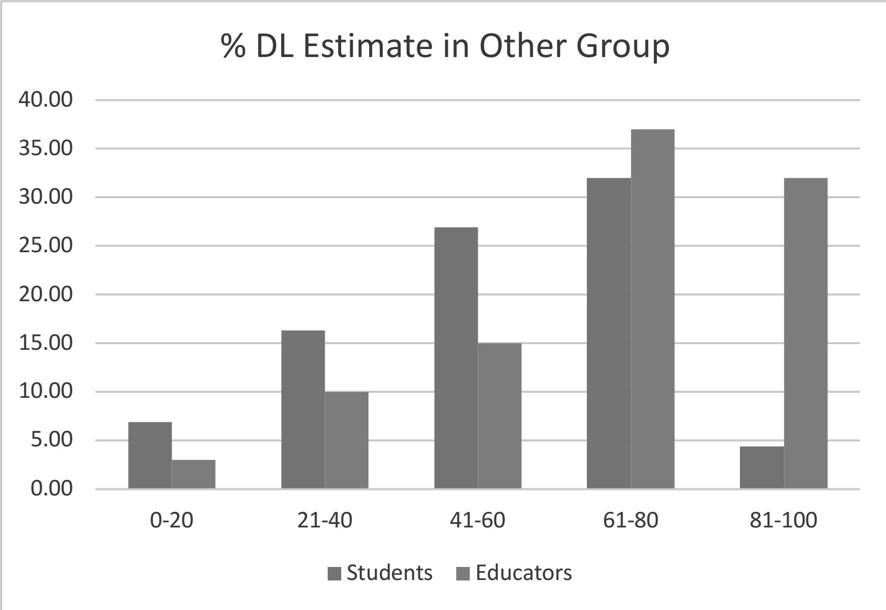

Figure 4.4 Estimate of High Digital Literates in Other Group (students' estimates of educators' DL and educators' estimates of students' DL). Pearson Correlation Coefficient r = 0.332

Table 4.5 and Figure 4.4 reveal estimates that each group made about the DL of the other group in terms of percentages. When the educator results were compared with the self-estimates of students on DL, there appeared to be a high likelihood that educators over-estimated the DL of students. This data strongly suggested that many educators had an exaggerated expectation of the ability of their students to use DT in the classroom situation. The Pearson Correlation Coefficient *r* value, was 0.332 in the case of these distributions, revealing a poor correlation in the beliefs of both students and educators on this item and the Pearson critical values table shows this relationship to have little significance with $p > 0.01$.

It was possible that educators were influenced by articles and discussions in the contemporary media about the 'digital natives', being persuaded that students were naturally skilled in using DT. Yet it was quite extraordinary that more than 32% of teachers would believe that between 80 and 100% of their students had a high-level of DL. It is conceivable that this third of educators corresponded to those participants with low levels of DT self-efficacy and perhaps, with low levels of DL; however, when the data was investigated for this trend, it was not evident. This may have given rise to over-estimates, due to poor understanding of student abilities. There was not sufficient data in this research study to resolve this issue. If over-estimates of student abilities were common amongst educators, it may have given rise to teacher assumptions about student abilities in the classroom and change teaching behaviour in using DT with students. This in turn may impact on student learning about how to effectively use DT, particularly in the student group that does not have a high level of DL. Further research into this question may lead to better understanding of the issues at play in educator understanding and predictions of student abilities in using DT.

Student estimates of educator DL were closer to the self-estimates of educators and appeared to be more realistic, since they were consistent with the two items discussed above and shown in Figures 4.2 and 4.3. The data shown in Figure 4.4 and Table 4.5, also indicated that students believed there was a significant group of educators who were not effective in using DT in the classroom. It is reasonable to assume that this related to the group of educators with low DL. Student comments on the survey reinforced this view, for example, one student suggested that educators 'can't even connect to data projectors', reflecting a belief that some educators were indeed challenged when it comes to using DT.

These findings reflected student and educator subjective views towards DL and uses of DT. Nevertheless, these findings identified attitudes that were likely to impact on the behaviours of stakeholders in using DT generally. These issues were investigated in further depth in the sections and chapters that follow.

4.1.2 Attitudes to the Acquisition of Digital Literacy

This section provides a discussion on shared attitudes amongst the stakeholders in this research. This research analysis was undertaken in two main ways. Firstly, shared attitudes were displayed where there was a majority of agreement with statements presented to the survey participants; secondly, similar attitudes were uncovered in instances where comparative groups had a very low 'Level of Disconnect' (LoD), of less than 12.

The attitude comparisons outlined in Figure 4.1 are shown in the tables that follow, revealing beliefs and thoughts about survey items that related to the acquisition of DL and may reveal considerations that related to training in the use of DT in survey schools.

In the first of the comparisons in the agreement level tables, Table 4.6 shows responses where the agreed and strongly agreed responses together, for both educator and student groups, totalled more than 50% on items that related to DL. It shows these agreements visually, with coloured circle areas representing agreement levels, in this way similarities and differences are apparent.

Table 4.6 Comparison in Agreement Level – Digital Literacy Acquisition – the most agreed statements (with students and educators agreed and strongly agreed over 50%) 100 sq. mm = 100%

Statement	All Educs	All Stud	Educ High DL	Stud High DL	Educ Low DL	Stud Low DL
DL is important in future employment	100	76.5	100	90.9	100	48.9
I would like (students/teachers) to obtain more training in DT	74.5	51.8	79.6	60.6	74.4	31.6
I have a high DL	58.1	65.3	100	100	0	0
Social Media offer new ways of developing DL	54.8	59.9	63.0	67.2	43.6	42.1
Students/teachers with a low level of DL waste time using DT in class	53.8	54.8	56.6	61.6	52.6	37.0
Use of Social Media sites, online email, forums, wikis etc. helped me develop DL	49.5	58.1	59.3	69.8	35.9	35.8
I would like to find out more about DT for entertainment	49.5	52.1	59.3	60.6	41.0	38.7

In Table 4.6, aside from the defining statement relating to the self-assignment of participants' DL, there were six statements that illustrated shared attitudes between the groups outlined above. The most profound disparity on the above statements was shown on 'Digital Literacy is important in future employment opportunities for students', where students with low levels of DL were the only group that did not show a very high Level of Agreement (LoA) of >90%. Educators of both groups and students with high levels of DL all had a high majority in agreement. That students with low levels of DL did not recognise the importance of DL in employment was an important finding of this study. It is conceivable that schools were not informing students of the essential nature of DL. It was also pertinent that educators, even those with low levels of DL themselves, universally acknowledged its importance. The importance of DL in future employment was reflected upon in the literature (Facer, 2011).

Table 4.6 also shows that students with low levels of DL were only 32% in agreement with the necessity to professionally develop teachers in DT. This thereby confirmed their lack of recognition of the importance of DT training and their failure to see acquisition of DL as important for teachers, as opposed to the views of their high DL counterparts. It seems likely that schools were either not informing students accurately of the need for DL, nor indicating the importance of DT in their future. In either case low DL students did not share the more positive views of the other groups. This brought into question school DT training programs for low DL students. The focus that schools placed on DT training is explored further in Chapters 5 and 6.

Students and educators with low levels of DL shared the view that they did not agree that Social Media assisted with the growth of DL, or that it offered new ways of developing DL. They also did not show a great deal of interest in finding out more about the use of DT in terms of entertainment. This finding was unexpected since it was predicted that these areas would be of interest to the majority.

One other finding of interest in Table 4.6 was that the majority of all groups (>50%), other than the student low DL group, agreed with the survey statement that the other group with a low level of DL, 'waste time when using DT in the classroom'. This illustrated a disconnect between students with high and low levels of DL, on their perceptions of others using DT, that is explored further in Section 4.2.

Agreements Between Groups on Survey Responses to Digital Literacy and Training

In terms of training in DT for entertainment use, participants were asked to respond to the statement that they 'would like to find out more about digital technology for entertainment'. There were shared agreement ranges by students and educators (see Table 4.7) and those with high levels of DL, >59% in Table 4.12, and a lower agreement distribution between those with low levels of DL, 39-41% in Table 4.13. In the case of the latter group it can be seen that a large majority of those with low DL did not agree that they would like to find out more about DT, 59 – 61%. This dichotomy and difference in opinion is discussed further in Section 4.2 although the data shown here, taken on face value, suggested that there was a lack of enthusiasm for more training in the acquisition of DL by those with low levels of DL, even where this would result in the ability to better exploit DT for personal entertainment purposes.

The tables in this section show the survey items related to the issue, only where attitude agreement was revealed by similar participant responses, with an LoD of < 12.

Table 4.7 All Educators vs All Students, agreed attitudes to Digital Literacy and Training

Digital Literacy and Training												
	All Educators				All Students							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi 2
I would like to find out more about DT for entertainment.	49.5	36.4	14.1	35.4	52.1	35.4	12.5	39.7	4.3	99	305	0.915
Students with a low level of DL are more likely to waste time in using DT in the classroom.	53.8	30.1	16.1	37.6	54.8	32.2	13.1	41.7	4.1	93	283	0.824
Video Games offer new ways of developing DL	45.2	32.3	22.6	22.6	42.6	34.2	23.2	19.4	3.2	93	284	0.933

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

In general terms, most students and educators agreed with the statements shown in Table 4.7 that related to DL and training in DT. Hence most students and educators would have liked more training in DT for entertainment; believed students with low DL 'waste time using DT in the classroom' and that 'video games offer new ways of developing DL'. Schools may therefore benefit from using entertainment technologies in their school DT programs by exploring the use of video games as a curriculum tool.

Table 4.8 All Participants with Low Digital Literacy vs All with High Digital Literacy, agreed attitudes to Digital Literacy and Training

Digital Literacy and Training Issues												
	All Low				All High							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi 2
DL helps to protect students when on the Internet.	52.7	41.8	5.5	47.2	66.4	25.0	8.5	57.9	10.7	134	230	0.040
I would like to obtain more professional development/training in DT	58.3	28.9	12.9	45.4	60.2	19.1	20.7	39.4	6.0	134	230	0.146

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.8 shows that both high and low DL groups had attitudes skewed towards agreement that they would like more training in using DT and that greater DL helped to protect students when they are on the Internet, which was a view also shared by both groups of educators, illustrated in Table 4.9. This table shows that both groups of educators also shared high levels of optimism about the value of DL including its importance in future employment. It was an interesting finding that educators with high levels of DL themselves, were equally as likely to find students that had high levels of DL helpful when they were using DT.

Table 4.9 Educators with Low vs High Digital Literacy, agreed attitudes to Digital Literacy and Training

Digital Literacy and Training												
	Educators with Low DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N_High	Chi ^{2}
I find students with a high level of digital literacy helpful when I am using DT in education/classroom	91.9	8.1	0.0	91.9	87.0	11.1	1.9	85.2	6.7	37	54	0.286
I would like students to obtain more training in DT	74.4	17.9	7.7	66.7	79.6	11.1	9.3	70.4	3.7	39	53	0.383
Students with a low level of DL are more likely to waste time in using DT in the classroom	52.6	31.6	15.8	36.8	56.6	26.4	17.0	39.6	2.8	38	54	0.720
I am enthusiastic about students obtaining a high-level of DL	84.6	12.8	2.6	82.1	87.0	9.3	3.7	83.3	1.3	39	54	0.677
DL helps to protect students when on the Internet	71.8	25.6	2.6	69.2	77.8	14.8	7.4	70.4	1.1	39	54	0.660
DL is important in future employment opportunities for students	100.0	0.0	0.0	100.0	100.0	0.0	0.0	100.0	0.0	37	54	1.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Students with low DL vs high levels of DL, in Table 4.10, had two items relating to DL that they shared agreement on, that 'teachers often had difficulties in using DT in the classroom', indicating that they thought many educators lacked the confidence or professional development in using the DT that schools had invested in. This pointed to a shortcoming in teacher professional development that schools could improve upon. The need for improvement in school professional development of educators in using DT is further discussed in Stage 2, in Chapters 5 and 6. Students were also divided on whether they would like more training in DT.

Table 4.10 Students with Low vs High Digital Literacy, agreed attitudes to Digital Literacy and Training.

Digital Literacy and Training												
	Students with Low DL				Students with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N_High	Chi ^{2}
Teachers often have difficulties in using DT in the classroom	52.6	35.8	11.6	41.1	58.8	21.5	19.8	39.0	2.1	95	177	0.048
I would like to obtain more training in DT	24.2	52.6	23.2	1.1	37.3	28.8	33.9	3.4	2.3	95	177	0.003

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.11 Students with High Digital Literacy vs Educators with Low Digital Literacy, agreed attitudes to Digital Literacy and Training.

Digital Literacy and Training Issues												
	Educators with Low DL				Students with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
Students with a low level of DL are more likely to waste time in using DT in the classroom	52.6	31.6	15.8	36.8	61.6	22.7	15.7	45.9	9.1	38	172	>0.05

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

As expected, educators with low DL and students with high DL had little agreement except on the item 'students with low levels of DL were more likely to waste time when using DT in the classroom', which was a view also shared by all students and educators, shown in Tables 4.6 and 4.9. This finding was reinforced by educator agreement, that they 'would like students to obtain more training in DT' (Table 4.9) and that a majority of high and low DL groups in Table 4.8, wanted to obtain more professional development and training in DT. Extrapolating from this, it seems likely that schools were not meeting their student or educator needs in providing suitable or effective training in DT or adequately enhancing their DL. Further to this finding, Table 4.10 shows that teachers had difficulties in using DT, according to their students, suggesting this to be a reason why teachers wasted time in using DT. It should be noted that there were technical and administrative limitations in DT provisioning that limited teacher use of DT, as discussed in Stage 2 interviews.

Table 4.12 Students with High Digital Literacy vs Educators with High Digital Literacy, agreed attitudes to Digital Literacy and Training.

Digital Literacy and Training Issues												
	Students with High DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ^{2}
DL is important in future employment opportunities for students.	90.9	8.0	1.1	89.8	100.0	0.0	0.0	100.0	10.2	176	54	0.009
Social Networking sites (like Facebook or MySpace) offer new ways of developing DL	67.2	19.2	13.6	53.7	63.0	20.4	16.7	46.3	7.4	177	54	0.783
Students with a low level of DL are more likely to waste time in using DT in the classroom.	61.6	22.7	15.7	45.9	56.6	26.4	17.0	39.6	6.3	172	53	0.763
Video Games offer new ways of developing DL	50.9	22.9	26.3	24.6	48.1	33.3	18.5	29.6	5.1	175	54	0.186
I would like to find out more about DT for entertainment.	60.6	26.9	12.6	48.0	59.3	29.6	11.1	48.1	0.1	175	54	0.888

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.13 Students with low vs Educators with Low Digital Literacy, agreed attitudes to Digital Literacy and Training.

Digital Literacy and Training												
	Students with Low DL				Educators with Low DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi^2
Social Networking sites (like Facebook or MySpace) offer new ways of developing digital literacy.	42.1	46.3	11.6	30.5	43.6	33.3	23.1	20.5	10.0	95	39	0.052
Students with a low level of DL are more likely to waste time in using DT in the classroom.	37.0	53.3	9.8	27.2	52.6	31.6	15.8	36.8	9.7	92	38	0.008
Video Games offer new ways of developing DL	23.2	58.9	17.9	5.3	41.0	30.8	28.2	12.8	7.6	95	39	0.000
I would like to find out more about digital technology for entertainment.	38.7	50.5	10.8	28.0	41.0	43.6	15.4	25.6	2.3	93	39	0.502

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

4.1.3 Attitudes to Online Risks

There were several survey items that related to perceived online risks and security measures employed by schools. The associated issues included fears that educators had about the need for student behavioural control, while others specified psychological aspects, such as Internet or computer dependency. The tables in this section show the survey items related to this issue, only where attitude agreement was revealed by participant responses to be similar, with an LoD of < 12.

Schools employed firewalls that were designed to prevent students from accessing sites that were not approved by school administrators. It was therefore put to survey participants that students often by-passed the school's Internet filter. However, the results amongst the groups below, were not universally skewed towards agreement. Tables 4.14, 4.15 and 4.16 show that all participants with low vs high DL, educators with low vs high DL and students with low vs high DL, showed a range of attitudes. Given that a significant number of all groups agreed that bypassing school filters occurred, it seems likely that it happened, although students showed a lower level of agreement than their educators. The reason for this was not clear, although it is possible that it was not occurring as much as the educators thought.

Table 4.14 All Participants with Low vs All with High Digital Literacy, agreed attitudes to Online Risks.

Online Risks and Security												
	All Low				All High							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi 2
I think students often by-pass my school's Internet filter	20.9	47.4	31.7	-10.9	32.7	28.1	39.2	-6.6	4.3	131	230	0.016
Students/teachers can become dependent on using DT	56.7	27.8	15.6	41.1	61.4	21.0	17.6	43.7	2.7	134	231	0.536

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.15 Educators with Low vs Educators with High Digital Literacy, agreed attitudes to Online Risks.

Online Risks and Security												
	Educators with Low DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi 2
Many students waste time when using the Internet at school	64.1	17.9	17.9	46.2	73.6	9.4	17.0	56.6	10.4	39	54	0.190
There are many risks involved with using Web 2.0 technologies in education	66.7	20.5	12.8	53.8	54.7	34.0	11.3	43.4	10.4	39	53	0.099
I think students often by-pass my school's Internet filter	34.2	42.1	23.7	10.5	42.6	27.8	29.6	13.0	2.4	38	54	0.106

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.16 Students with Low vs Students with High Digital Literacy, agreed attitudes to Online Risks.

Online Risks and Security												
	Students with Low DL				Students with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi 2
Teachers can become dependent on using DT	38.9	45.3	15.8	23.2	41.2	32.8	26.0	15.3	7.9	95	177	0.103
Many students waste time when using the Internet	36.8	46.3	16.8	20.0	42.9	26.9	30.3	12.6	7.4	95	175	0.009
I would like teachers to publish their writing on the Internet	18.9	51.6	29.5	-10.5	34.3	28.0	37.7	-3.4	7.1	95	175	0.002
I think students often bypass my school's Internet filter	7.5	52.7	39.8	-32.3	22.7	28.4	48.9	-26.1	6.1	93	176	0.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Three items in Table 4.16 show variation between *p*-values, showing significance and LoD levels showing little. Concordance was required between the two methods. In this case the variation in the indecisive responses has caused the variation, whilst other responses show similar tendencies.

Dependency and Associated Risks in using Digital Technologies

There was concern in the literature about computer and Internet dependency. One survey item requested direct feedback about participant dependency on DT. Participants were asked to respond to the suggestion that the other group, teachers or students, could become dependent on using DT. While there were some shared attitudes on this item, it also gave rise to disconnect, particularly between students and educators. When student and educator groups were combined into low or high DL, a surprising correlation was obtained with both groups in majority agreement (>55%) that others could become dependent on DT (Table 4.14). Students, on the other hand, were less certain, with between 39 – 41% of both low and high DL student groups agreeing that their teachers could become dependent on using DT. It seems surprising that more students did not believe this. Predictably, as Table 4.43 shows in Section 4.2.2, a clear majority of educators (76%) agreed students could become dependent. This issue was discussed in 4.2 as a disconnect and also in Chapters 5 and 6.

Further to the issue of dependency, Tables 4.15 and 4.16 suggest that many participants believed it true that 'students wasted time when using the Internet', given that students and educators of low and high DL were more likely to agree, including a significant majority of educators. This belief may have caused educators to restrict student use of their laptops in class. This was one factor that may have limited the success of DT programs. This also has implications that schools should implement strategies to lessen time-wasting activities. One survey school had installed mirrors at the back of the room and suggested that educators position themselves behind students, in order to view student laptop screens. Another school was investigating the use of software so that teachers could remotely view student screens in their classes. Both of these were intended to limit student time-wasting and distraction.

Keeping in mind that Web 2.0 and Social Media/Networking were viewed interchangeably, both high and low DL groups of educators in Table 4.15 were in agreement on the 'risks of using Web 2.0 in education'. This may underpin the reason why schools made attempts to block Social Media in the classroom and reflect opinions on the dangers of Social Media found in contemporary media. Yet educators appeared divided on the issue of Social Media, with more than 45% of educators with high levels of DL not agreeing that there were many risks using Web 2.0 (Table 4.15), when those who do not agree were combined. Furthermore, a disconnect in opinions on this issue between students and educators was revealed in Section 4.2.2.

Agreed Attitudes Towards Internet Risks as an Educational Resource

Survey participants attitudes towards the educational value and risk of using the Internet as an educational resource was investigated. Survey participants were able to indicate risks associated with Internet use. Table 4.17 shows the breakdown of responses to a nominal survey item, where participants selected from eight possible responses, about the Internet as an educational resource. The most striking thing about the data was the similarity between the attitudes of students and educators about the effectiveness of the Internet. Students and educators shared very similar responses to all but one of the items. They did not show majority agreement the Internet was 'of great risk to students' or was 'unreliable'. The Internet was also seen as being 'of poor quality' as an educational resource by fewer than 7% of students and educators, while more than 20% believed it was 'of average quality' and more than 26% believed it was 'of excellent quality' as an educational resource.

Furthermore, Table 4.17 reveals that more than 48% of both groups agreed the Internet was 'very effective for research' and more than 49% thought it was 'essential in schools'. These figures demonstrated that large numbers of students and educators, believed in the effectiveness of the Internet as an educational resource and in its value as a research tool in the classroom.

Table 4.17 Student and Educator Attitudes to the Internet as an Educational Resource.

As an educational resource the Internet is:									
	Too unreliable	very effective for reseach	Essential in schools	of great risk to students	needing guidance by teachers	of poor quality	of excellent quality	of average quality	Total responses
Students	18	153	142	30	26	13	83	60	286
Student %	6.29	53.50	49.65	10.49	9.09	4.55	29.02	20.98	
Educators	6	45	53	11	57	6	24	24	92
Educator %	6.52	48.91	57.61	11.96	61.96	6.52	26.09	26.09	

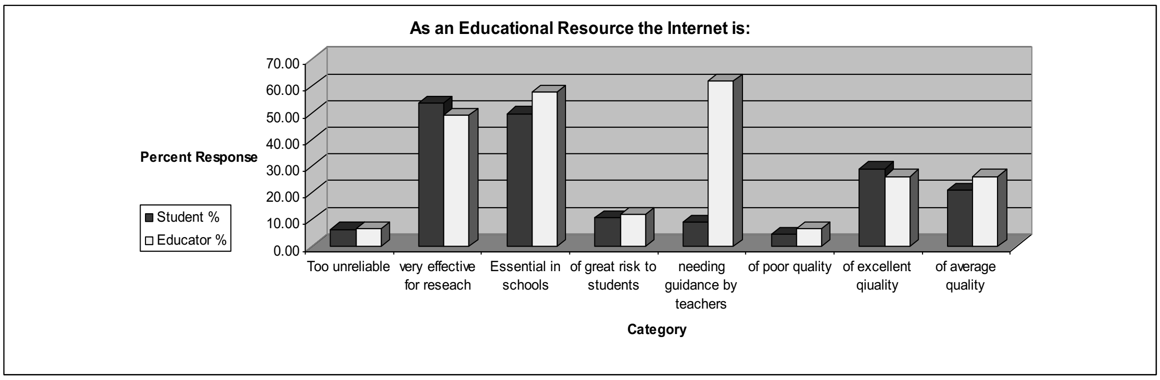

Figure 4.5 Views on the value of the Internet as an educational resource.

The only significant difference between the views of educators and students on the value of the Internet as an educational resource, was a 50% difference between educators and students, in agreeing that ‘the Internet is needing guidance by teachers’, representing a considerable disconnect and discussed further in Section 4.2.2. This suggested both that educators may have viewed the use of the Internet as a considerable risk and that students desired independence and trust in their own decision-making in using the Internet.

4.1.4 Attitudes to Curriculum and Classroom Use of Digital Technologies

In this section attitudinal agreement, or congruence, between groups towards the curriculum and classroom uses of DT is discussed. Table 4.18 uses circle areas with a ratio of 100 sq. mm to 100%, to visually represent strong agreement levels on the survey items shown. This table reveals general optimism felt by educator and student survey participants towards their school laptop programs. There was strong agreement amongst the groups about their enjoyment in having a school-provided laptop, as well as the opportunities it provided for creativity, innovation, self-expression and learning by discovery. Participants also shared high levels of confidence in using DT in the classroom and beliefs that the quality of homework and presentations was of a higher standard and that students tended to write more. There was also support for constructivist pedagogy, since DT was seen to be well-suited to group projects. The survey results supported other research findings in classroom use of DT. The tables in this section show the survey items related to the issue, only where attitude agreement was revealed by participant responses to be similar, with an LoD of < 12.

Table 4.18 shows a compilation of the most agreed survey items by students and educators, that related to classroom and curriculum uses of DT. The majority of all groups in this study agreed that they enjoyed having a school laptop, showing strong support for school laptop programs. They also thought the quality of homework was better when using DT. Taken together, these responses gave strong indications that laptop programs were seen as valuable in assisting presentation and homework quality by all survey participants.

Students with low levels of DL were the group who generally showed least agreement with survey statements and a minority agreed that DT provided students with the opportunity to be highly creative, that the Internet allowed them to be innovative, that they were encouraged to use new technologies in the classroom and they were encouraged to learn by discovery. On the other hand, all other stakeholder groups had majority agreement on the survey items in Table 4.18. These findings offer a stark comparison to the perception of students with high levels of DL, who were more than twice as likely to agree that they were encouraged in these ways and that the Internet allowed them to be more innovative, than their low DL peers. This data analysis suggests those with high levels of DL were skilled in using DT and pleased with the opportunities it offered. Also, students with low levels of DL were not being led to understand that DT offered them new and better learning opportunities and they were not feeling encouraged by their teachers. This leads to thinking that there was more at play here and that schools may not be doing all they could to develop DL in students that were lacking. This pointed to the need to investigate training and decision-making in schools, that was undertaken in Stage 2 of this study.

Both educators and students with low levels of DL had similar minority agreement with the statements that 'some students get bored when not using DT' and that 'DT are well suited to group projects'. These similarities would be expected since these groups were unlikely to show great enthusiasm for using DT due to their low levels of DL and DT self-efficacy. Once again, this finding reiterated the finding of schools not positively impacting on the attitudes of those with low levels of DL.

On the other hand, clear similarities and majority agreement between student and educator groups with high levels of DL was shown on all the survey statements examined in Table 4.18, showing an optimistic view point towards DT use in schools for those with high DT self-efficacy, as expected. This leads us to question where these attitudes derived from; did this stem from positive beliefs surrounding technology use that was based on feedback from successful use of DT in the past, that related to experiential self-efficacy, or was it derived from effective school training programs in learning about DT? If it was the latter, why haven't those with low levels of DL been positively impacted on by the same school training programs? This suggests that the school programs were not effective in reaching all stakeholders, as discussed in Chapter 5, Stage 2 interview findings.

Table 4.18 Comparison in Agreement Level – Classroom Use – the most agreed statements (with students and educators agreed and strongly agreed over 50% approx.)

Statement	All Educs	All Stud	Educ High DL	Stud High DL	Educ Low DL	Stud Low DL
I enjoy having my own school laptop	94.6	82.6	94.3	89.3	94.9	68.4
DT provides students with the opportunity to be highly creative	84.9	65.7	88.9	77.8	79.5	42.1
Students should be encouraged to use new technologies in the classroom	87.9	72.4	87.0	84.2	89.2	48.4
DT and the Internet allows me to be more innovative	77.8	64.9	80.3	80.9	69.4	33.3
I am confident using DT in the classroom	76.1	77.5	94.4	93.1	50.0	47.4
Encourage/d to learn by discovery	69.1	56.8	70.4	68.6	69.2	30.9
I think it is important for schools to explore student self-expression using DT	67.0	58.2	71.7	69.7	60.5	32.6
The quality of homework and presentations is better when using DT	61.7	71.2	56.6	79.9	71.8	54.7
DT well-suited to group projects	61.7	60.5	72.2	68.9	48.7	44.2
Some students get bored in class if they are not using DT	54.3	63.4	60.4	71.6	48.7	42.4
Student tend to write more when asked to complete an assignment using DT	49.0	65.7	51.9	76.3	53.9	44.2

Student and Educator Attitudes towards Digital Technologies use in the Classroom

In the following tables one of the most significant findings was that DT use in the classroom was seen to enhance cooperation by the student vs educator group (Table 4.19), low vs high DL educators (Table 4.21), as well as by high DL students vs low DL educators (Table 4.23). This finding supports the view that DT was seen to assist constructivist learning. There was a majority view, reiterating the general finding shown in Table 4.18, shared by the low vs high DL educator group (Table 4.21), and the low DL student vs high DL educator group (Table 4.24), that students tended to write more when asked to complete an assignment using DT. Table 4.20 also reveals a similar finding that the low vs high DL participants showed high levels of agreement that students worked more efficiently when using DT. This view was also shared by all educators of either low or high DL (Table 4.21). These latter two groups were also more likely to disagree that DT detracted from more important educational activities. These positive findings, support the use of DT in the classroom, suggesting it allowed more efficient production of schoolwork, suggesting many benefits for classroom inclusion of DT.

Students were not thought to be less productive when using DT in the classroom, rather than with pen and paper, by the student vs educator group (Table 4.19), the low vs high DL group (Table 4.20) and the high DL student vs low DL educators group (Table 4.23). Fewer than 23% of educators and students thought students were less productive when they used DT in the classroom, in comparison to pen and paper, while more than 37% disagreed. While this finding gives further guarded cause for optimism about DT classroom use, it also shows that there was a minority group of both students and educators (>18%) in the survey schools, who could be termed Luddites, who apparently believed pen and paper provided greater productivity. The fact that both student and educator responses were in similar proportions on this survey item, contributes to the argument that there was not a digital native divide per se and that the student and educator groups were more similar in the distribution of their views, on the effectiveness of technology use, as per Section 4.1.1, than digital native theory would indicate. This was reinforced by the 'neither agree nor disagree' and 'uncertain' group, as more than 37% of both students and educators were unwilling to state an opinion on this issue. The extent of anti-technology viewpoints was not resolved by these surveys and is discussed in the Stage 2 interviews in Chapters 5 and 6.

Educators and students are shown in Table 4.19 to have had similar majority views that they were confident when using DT (>76%), thought that schools should explore self-expression when using DT (>61%) and that DT was well suited to group projects (>53%). These results were reflected by other groups in this study, as revealed in Table 4.18. It was also true that while those with high levels of DL were highly likely to express optimistic viewpoints that were supportive of classroom DT use, those with lower levels of DL, particularly students, were far less likely to have high levels of support for self-expression in use of DT, or optimism about its impact on creativity or innovation. Once again this reflects poorly on DT training programs that were implemented in survey schools, since the low DL student group was less capable of using DT, less confident and less supportive of its inclusion in schools, reflecting their low DT self-efficacy.

While these results need to be viewed through a lens of uncertainty that DT is fundamentally superior to pen and paper in education, these results strongly indicate that the survey schools and survey participants were tentatively moving towards classroom and curriculum acceptance of DT. Confidence in using DT and agreement that it was a useful tool to use in classroom research and for creative endeavours, seemed to grow according to familiarity with DT and greater DL. The fact that survey schools had a continuity of laptop use over a number of years, suggests that the survey students would have been more likely than most to be supportive of DT classroom use and more optimistic about how beneficial it could be in educational settings.

Table 4.19 All Students vs All Educators, agreed attitudes towards Classroom and Curriculum Use of Digital Technology.

Classroom and Curriculum Uses of Digital Technologies												
	All Educators				All Students							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
Students are less productive when they use DT in the classroom rather than pen/paper	18.1	37.2	44.7	-26.6	22.6	37.5	39.9	-17.4	9.2	94	288	0.680
I think it is important for schools to explore student self-expression using DT	67.0	27.5	5.5	61.5	58.2	36.8	4.9	53.3	8.2	91	285	0.368
I feel confident in using DT in my classes	76.1	15.2	8.7	67.4	77.5	19.6	2.9	74.6	7.2	92	276	0.176
DT enhance cooperation in the classroom between students	46.7	39.1	14.1	32.6	38.1	50.7	11.2	26.9	5.7	92	286	0.259
DT are well-suited to group projects	61.7	29.8	8.5	53.2	60.5	28.7	10.8	49.7	3.5	94	286	0.858
I would rather students work with pen and paper in the classroom than with DT	16.5	40.7	42.9	-26.4	19.6	35.4	44.9	-25.3	1.1	91	285	0.711

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Digital Literacy Attitudes to Classroom and Curriculum use of Digital Technologies

There was majority agreement amongst low vs high DL users in Table 4.20, that many students wasted time using the Internet at school. Students themselves, were much less likely to agree with this, as discussed as a disconnect in Section 4.2.

Table 4.20 All Participants with Low vs All with High Digital Literacy, agreed attitudes towards Classroom and Curriculum Use of Digital Technology.

Classroom and Curriculum Uses of Digital Technologies												
	All Low				All High							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi 2
I find that students work more efficiently when using DT	41.6	41.9	16.6	25.0	54.0	27.0	18.9	35.1	10.1	134	230	0.083
DT detracts from more important educational activities.	19.5	49.3	31.2	-11.7	20.9	36.8	42.3	-21.4	9.7	134	230	0.169
The quality of homework assignments and presentations is better when students use DT	63.3	27.4	9.3	53.9	68.2	22.0	9.8	58.5	4.6	134	227	0.674
Students are less productive when they use DT in the classroom rather than pen/paper.	17.7	43.7	38.6	-20.9	21.5	32.8	45.7	-24.2	3.3	134	228	0.280
Many students waste time when using the Internet at school	50.5	32.1	17.4	33.1	58.2	18.1	23.6	34.6	1.5	134	228	0.068

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Amongst low vs high DL educators, in Table 4.21, fewer than 19% agreed that 'DT detracts from more important educational activities' whilst more than 48% disagreed that it was a distraction. In terms of proportions, this finding mirrored the educator split on the pen and paper survey item and also contained an allusion to traditional classroom learnings, as 'more important educational activities'. The detailed opinions of this minority (agree) group on the issue of distraction when using DT, were unknown. However, it is conceivable that the amount of resistance to DT in the classroom amongst teachers was understated in this survey. This seems likely since, when the neither and uncertain groups were combined with those who actively agreed that DT 'detracts', there was a minority that disagreed, that 'digital technologies detracts from more important educational activities' for both groups of educators. Similar interpretations can be made on the pen and paper item, with a large number of educators not choosing a viewpoint. These items may therefore reveal some resistance or disquiet about the use of DT in survey schools amongst educators. This issue is discussed further in the Stage 2 interviews.

Further to the above issues, suggesting educator resistance to DT, was the fact that it was not known if there was any reluctance on the part of educators to respond to survey items in a way that challenged their school policies, to go against leadership expectations of staff. School leaders were likely to expect school staff to be supportive of laptop programs, or employed supportive staff, so it is conceivable that educator survey responses undertaken in these Independent schools with laptop programs, represented a distorted view, and under-reported staff resistance to DT programs. Even though survey participants were assured their survey responses were anonymous, it is conceivable that participants may not have wanted to undermine school efforts to introduce DT programs.

Table 4.21 Educators with High vs Educators with Low Digital Literacy, agreed attitudes towards Classroom and Curriculum Use of Digital Technology.

Classroom and Curriculum Use of Digital Technologies												
	Educators with Low DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
I find that students work more efficiently when using DT	41.0	38.5	20.5	20.5	37.0	37.0	25.9	11.1	9.4	39	54	0.650
Some students get bored in class if they are not using DT	48.7	30.8	20.5	28.2	60.4	15.1	24.5	35.8	7.6	39	53	0.031
I enjoy having my own school laptop	94.9	2.6	2.6	92.3	94.3	5.7	0.0	94.3	2.0	39	54	0.153
Students tend to write more when asked to complete an assignment using DT	53.8	25.6	20.5	33.3	51.9	31.5	16.7	35.2	1.9	39	54	0.597
I encourage students to learn by discovery, using DT	69.2	25.6	5.1	64.1	70.4	22.2	7.4	63.0	1.1	39	54	0.714
DT detracts from more important educational activities	17.9	33.3	48.7	-30.8	18.5	31.5	50.0	-31.5	0.7	39	53	0.962
DT enhance cooperation in the classroom between students	46.2	41.0	12.8	33.3	48.1	36.5	15.4	32.7	0.6	39	53	0.764
Students should be encouraged to use new technologies in schools	89.2	8.1	2.7	86.5	87.0	13.0	0.0	87.0	0.6	37	54	0.145

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

The issue of student boredom in class if they were not using DT, was at the forefront of survey findings. Table 4.18 revealed that large numbers of all groups investigated in the analysis of survey responses, believed that students did appear to suffer from boredom in the class when they were not using DT. It might also indicate some disaffection with traditional classroom learning amongst students that could be explored in future research. Several of the comparison groups shared a high level of agreement on the boredom issue: high vs low DL educators (Table 4.21); low DL students vs high DL educators (Table 4.24) and low DL students and educators (Table 4.26). In addition, many more survey participants with high levels of DL agreed, on the boredom issue, causing disconnect with low DL participants, further discussed in Section 4.2. The overriding finding, however, was that there was a majority view that students did suffer from boredom in classrooms without using DT.

The above finding suggests that students became acclimatised to using DT, enjoyed having their school laptops with them and suffered from boredom when disengaged from DT. This may lead to some frustration for students when they were limited in using the one-to-one devices in classroom situations. It should also be noted that there was a not similar survey item on the boredom experienced by educators, which may in retrospect, be an oversight in this research.

Table 4.22 Students with High vs Students with Low Digital Literacy, agreed attitudes towards Classroom and Curriculum Use of Digital Technology.

Classroom and Curriculum Use of Digial Technologies												
	Students with Low DL				Students with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
Most of my teachers Encourage me to use DT in the classroom	32.3	54.8	12.9	19.4	42.0	33.5	24.4	17.6	1.7	93	176	0.007

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.23 Educators with Low vs Students with High Digital Literacy, agreed attitudes towards Classroom and Curriculum Use of Digital Technology.

Classroom and Curriculum Use of Digital Technologies												
	Educators with Low DL				Students with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
Students are less productive when they use DT in the classroom, rather than pen/paper	15.4	35.9	48.7	-33.3	22.3	29.7	48.0	-25.7	7.6	39	175	>0.05
DT enhance cooperation in the classroom between students	46.2	41.0	12.8	33.3	47.4	44.0	8.6	38.9	5.5	39	175	>0.05
I enjoy having a school laptop	94.9	2.6	2.6	92.3	89.3	9.0	1.7	87.6	4.7	39	177	>0.05
Students should be encouraged to use new technologies in schools	89.2	8.1	2.7	86.5	84.2	14.0	1.8	82.5	4.0	37	171	>0.05
DT provide students with an opportunity to be highly creative	79.5	15.4	5.1	74.4	77.8	16.5	5.7	72.2	2.2	39	176	>0.05

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.24 Students with Low vs Educators with High Digital Literacy, agreed attitudes towards Classroom and Curriculum Use of Digital Technology.

Classroom and Curriculum Use of Digital Technologies												
	Students with Low DL				**Educators with High DL**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi 2**
Some students get bored in class if they are not using DT	42.4	45.7	12.0	30.4	60.4	15.1	24.5	35.8	5.4	92	53	0.000
The quality of homework assignments and presentations is better when students use DT	54.7	36.8	8.4	46.3	56.6	30.2	13.2	43.4	2.9	95	53	0.042
Students tend to write more when asked to complete an assignment using DT	44.2	47.4	8.4	35.8	51.9	31.5	16.7	35.2	0.6	95	54	0.038

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.25 Students with High vs Educators with High Digital Literacy, agreed attitudes towards Classroom and Curriculum Use of Digital Technology.

Classroom and Curriculum Uses of Digital Technologies												
	Students with High DL				**Educators with High DL**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Stud**	**N Edu**	**Chi 2**
Students often use digital technologies inappropriately in the classroom.	58.8	21.5	19.8	39.0	57.4	16.7	25.9	31.5	7.5	177	54	0.488
I would rather students work with pen and paper in the classroom than with digital technologies.	16.6	28.0	55.4	-38.9	15.1	37.7	47.2	-32.1	6.8	175	53	0.340
I enjoy having my own school laptop.	89.3	9.0	1.7	87.6	94.3	5.7	0.0	94.3	6.8	177	53	0.276
Digital technologies enhance cooperation in the classroom between students.	47.4	44.0	8.6	38.9	48.1	36.5	15.4	32.7	6.2	175	52	0.268
Students generally follow instructions when they use digital technologies in the classroom.	61.8	27.7	10.4	51.4	62.3	20.8	17.0	45.3	6.2	173	53	0.276
Students should be encouraged to use new technologies in schools.	84.2	14.0	1.8	82.5	87.0	13.0	0.0	87.0	4.6	171	54	0.390
I feel confident in using digital technologies in my classes.	93.1	4.6	2.3	90.9	94.4	5.6	0.0	94.4	3.6	175	54	0.300
Digital technologies and the Internet allow me to be more innovative when developing ideas or plans for classes.	80.9	16.2	2.9	78.0	83.3	14.8	1.9	81.5	3.4	173	54	0.858
Students are less productive when they use DT in the classroom rather than pen/paper.	22.3	29.7	48.0	-25.7	20.8	35.8	43.4	-22.6	3.1	175	53	0.653
I think it is important for schools to explore student self-expression using digital technologies.	69.7	27.4	2.9	66.9	71.7	24.5	3.8	67.9	1.1	175	53	0.856

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.26 Students with Low vs Educators with Low Digital Literacy, agreed attitudes towards Classroom and Curriculum Use of Digital Technology.

Classroom and Curriculum Uses of Digital Technologies												
	Students with Low DL				Educators with Low DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ^{2}
I find that students work more efficiently when using digital technologies	42.1	45.3	12.6	29.5	41.0	38.5	20.5	20.5	9.0	95	39	0.294
Students tend to write more when asked to complete an assignment using digital technologies.	44.2	47.4	8.4	35.8	53.8	25.6	20.5	33.3	2.5	95	39	0.002
Some students get bored in class if they are not using digital technologies.	42.4	45.7	12.0	30.4	48.7	30.8	20.5	28.2	2.2	92	39	0.062
Digital technologies are well-suited to group projects.	44.2	49.5	6.3	37.9	48.7	38.5	12.8	35.9	2.0	95	39	0.149

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

One other finding on student behaviour was the issue of encouragement. Educators were asked if they encouraged students to 'learn by discovery' and students were asked if they were encouraged to learn by discovery in using DT. Table 4.18 shows that of the six groups studied, a majority in five of the groups thought teachers were encouraging students to learn by discovery. Only students with low levels of DL did not think that this was the case, or perhaps were uncertain of what the statement was asking of them. Once again, this response may have reflected their poor DL and capacity to use their laptop effectively. This finding showed survey schools were generally using DT to enhance student research and investigation. This theme will be revisited in the chapters and sections that follow.

In Section 4.1.5 survey item responses that represented interactions between school and home use of DT are discussed.

4.1.5 Attitudes to Home vs School Use of Digital Technologies

A small number of items on the surveys related to uses of DT both at home and at school. The responses to these items where groups were in agreement, are explored in this section. The tables in this section show the survey items related to the issue, only where attitude agreement was revealed by participant responses to be similar, with an LoD of < 12.

The most agreed attitudes towards any of the survey items, was to the statement that 'DT at home can be a major distraction'. While all group comparisons on this item shared similar variations in views, shown in Tables 4.27 – 4.34, with larger numbers (approx. 38 to 49%) of all participant groups agreeing that DT could be a distraction, there was also a significant but smaller number of all groupings, (approx. 19 - 33%) that disagreed. Hence, there was a similar range of views on this item across all groups studied. This indicates that the variety of individual opinions on this item was independent of a participant's DL. Therefore, a participant at home was distracted by DT or not, regardless of their DT self-efficacy or DL. This led to a possibility that DT related distractions may have related more to personality than to self-efficacy or DL and perhaps, to the capacity to become dependent on technology use, as is discussed in 4.1.3.

Table 4.27 All Educators vs All Students, agreed attitudes to Home vs School Uses of Digital Technology.

Home vs School Use of Digital Technologies												
	All Educators				All Students							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
Digital technologies at home can be a major distraction.	44.4	26.3	29.3	15.2	44.9	30.4	24.7	20.2	5.0	99	312	0.708
I enjoy using the Internet at home.	90.7	5.2	4.1	86.6	89.4	9.3	1.3	88.1	1.5	97	312	0.270

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.28 All Participants with Low vs All with High Digital Literacy, agreed attitudes to Home vs School Use of Digital Technology.

Home vs School Use of Digital Technologies												
	All Low				All High							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
DT at home can be a major distraction.	42.0	31.8	26.1	15.9	46.5	25.1	28.4	18.1	2.3	134	231	0.573

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.29 Educators with Low vs Educators with High Digital Literacy, agreed attitudes to Home vs School Use of Digital Technology.

Home vs School Use of Digital Technologies												
	Educators with Low DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
DT at home can be a major distraction	46.2	20.5	33.3	12.8	44.4	25.9	29.6	14.8	2.0	39	54	0.643

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.30 Students with Low vs Students with High Digital Literacy, agreed attitudes to Home vs School Use of Digital Technology.

Home vs School Use of Digital Technologies Attitudes												
	Students with Low DL				Students with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N_High	Chi 2
DL is best developed at home rather than at school	25.8	61.3	12.9	12.9	37.3	49.7	13.0	24.3	11.4	93	177	0.191
Friends and/or relatives often assist me in improving my DL	27.4	49.5	23.2	4.2	33.0	27.3	39.8	-6.8	11.0	95	176	0.004
DT at home can be a major distraction	37.9	43.2	18.9	18.9	48.6	24.3	27.1	21.5	2.5	95	177	0.018

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.31 Educators with Low vs Students with High Digital Literacy, agreed attitudes Home vs School Use of Digital Technology.

Home vs School Use of Digital Technologies												
	Educators with Low DL				Students with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N_High	Chi 2
DT at home can be a major distraction	46.2	20.5	33.3	12.8	48.6	24.3	27.1	21.5	8.6	39	177	>0.05

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.32 Students with Low vs Educators with High Digital Literacy, agreed attitudes to Home vs School Use of Digital Technology.

Home vs School Use of Digital Technologies												
	Students with Low DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N_High	Chi 2
Most of my DL has developed through my use at home	46.3	45.3	8.4	37.9	53.7	20.4	25.9	27.8	10.1	95	54	0.015
Friends and/or relatives often assist me in improving my DL	27.4	49.5	23.2	4.2	46.3	14.8	38.9	7.4	3.2	95	54	0.000
DT at home can be a major distraction	37.9	43.2	18.9	18.9	44.4	25.9	29.6	14.8	4.1	95	54	0.027

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.33 Students with High vs Educators with High Digital Literacy, agreed attitudes to Home vs School Use of Digital Technology.

Home vs School Use of Digital Technologies												
	Students with High DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ²
DT at home can be a major distraction.	48.6	24.3	27.1	21.5	44.4	25.9	29.6	14.8	6.7	177	54	0.839
I enjoy using the Internet at home.	95.5	4.0	0.6	94.9	98.1	1.9	0.0	98.1	3.2	177	53	0.501

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.34 Students with Low vs Educators with Low Digital Literacy, agreed attitudes to Home vs School Use of Digital Technology.

Home vs School Use of Digital Technologies												
	Students with Low DL				Educators with Low DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ²
DT at home can be a major distraction.	37.9	43.2	18.9	18.9	46.2	20.5	33.3	12.8	6.1	95	39	0.002
I enjoy using the Internet at home.	78.7	18.1	3.2	75.5	84.6	7.7	7.7	76.9	1.4	94	39	0.044

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

The data displayed in the tables above, showing group agreements to the relevant survey items, reveal that there was a high level of agreement amongst all groups, that participants enjoyed using the Internet at home, that was most pronounced (>95%) amongst users with high levels of DL (Table 4.33). All students and educators also agreed (Table 4.27). Low DL groups of students and educators had somewhat lower levels of agreement, 79 – 85% (Table 4.34). These differences are discussed further in Section 4.2. It was unsurprising that stakeholders enjoyed using the Internet at home, which is often for entertainment purposes. It is less clear why those with low levels of DL would not agree with this sentiment, although online access was possibly limited for some students, or that effective use of Internet connected devices was limited by poor DL and DT self-efficacy. Some parents may also have controlled student access to the Internet.

Digital Literacy is more Acquired in the Home

There was an implicit issue of the location where an individual developed their DL, hence survey participants were asked to respond to the statement that their DL 'developed through my own use at home'. While this statement received differing responses for high and low DL participants, that gave rise to a disconnect discussed in Section 4.2, the responses also showed strong levels of agreement between educators with high DL (54%) and students with low DL (46%) shown in Table 4.32. It was relevant that a large majority of students with high DL (84%) also claimed to have acquired most of their DL at home (Table 4.62 in Section 4.24), although this represented a disconnect with other groups.

Furthermore, 26% of low and 37% high DL students (Table 4.30), agreed that DL was 'best developed' at home. These findings would be cause for concern by school leaders in e-learning. It is clear from this finding that many participants did not believe schools were responsible for the development of DL, nor effective in assisting in its development, since many students would prefer to learn about DT at home. This was consistent with the literature as students may not have seen their schools as being able to creatively allow student skill development in using DT.

At home a large number of students of low and high DL (27 & 33% in Table 4.30) and educators with high DL (46% in Table 4.32) and low DL (59% in Table 4.58), agreed that 'friends and/or relatives often assist me in improving my DL'. These were sources of in-home training assistance and represented a challenge for schools, wishing to gauge the needs of their students and teachers in developing more DL. There is a competitive element to this finding, since the homes of many educators and students in this study were seen as greater sources of DL and skills in using DT, than their schools. There was no way of determining the specific skillsets that this type of home learning affects and no way of schools ensuring consistent skill development for stakeholders.

Home and school use of DT, as this pertained to the acquisition of DL, also overlapped with survey items discussed in Section 4.1.2 on attitudes to DL. Social Media and video games were both perceived by many survey participants to contribute to the development of DL, together with uses for entertainment purposes. These would be likely to act as driving forces in the home to enhance the development of DL and DT self-efficacy. Survey findings indicated that much of the DL that students and educators acquired in the home, related to gaming, Social Media and entertainment and it is questionable how much these contributed to better learning in schools. Yet those with low DL may have been hampered in the home environment to improve their DL, as much by an incapacity to self-learn, as by the availability of friends and relatives with high DL.

The fact large numbers of survey participants acquired most of their DL at home, through independent learning or through the assistance of friends and relatives, may be a concern to some school leaders, since it was unknown what skills were acquired or how this learning could be complemented by school programs. The range of skills and abilities at home was bound to vary significantly for students and educators and produce a large range of indeterminate skills. How schools could better address the needs of their educators and students in DL acquisition is revisited in Chapters 5 and 6.

Section 4.2 Disconnects Impacting on the Use of Digital Technologies in the Classroom

This section will focus on the second research question: What are the disconnects between stakeholders that impact upon the use of digital technologies in the classroom?

The comparisons are shown for survey items grouped into the following four domains:

i) Attitudes to the Acquisition of Digital literacy

ii) Attitudes to Online Risks and Security

iii) Attitudes to Classroom Use of Digital Technology

iv) Attitudes to Home vs School Uses of Digital Technology

The disconnects shown in this section gives rise to concerns about school provision of digital literacy (DL), digital technologies (DT) programs and decision-making that relates to these elements in digital education.

4.2.1 Disconnects on Acquisition of Digital Literacy

Attitudinal Disconnects in Acquisition of Digital Literacy

Several survey statements related directly to the acquisition of DL. This issue gave rise to some of the most profound attitudinal disconnects in this study. The tables in this section show the survey items related to this issue, only where disconnects were revealed by participant responses, with an LoD >20.

Firstly, students had a low level of agreement (33%) that they would like more training in DT, shown in Table 4.35; while educators had a very high level of agreement in wanting more professional development (86%) revealing the largest level of disconnect between these groups. Paradoxically, students with high DL were slightly more likely to want training (37%) than their low DL peers, while low DL educators were more far more likely (92%) to want professional development, as shown in Table 4.39. Students with low levels of DL were the least enthusiastic group in wanting more training (24% in Table 4.40). This vast disconnect between students and educators on training and professional development, was also reflected in several other survey responses, discussed below. It should be noted here that training or professional development in DT here implied formal training programs.

When individual desire to obtain a high level of DL was investigated, through the survey statement relating to enthusiasm about obtaining a high-level of DL, further significant disconnects were observed in the agreed survey responses of students (47%) and educators (85%), in Table 4.35. In similar results to the above item on training, low DL (31%) and high DL students (54%) had less agreement than educators that they were enthusiastic about obtaining high DL, although these student differences show a significant disconnect between these student groups, seen in Table 4.38. On the other hand, there were high levels of agreement between the groups of educators and no significant differences. Low DL educators, 92% in Table 4.42, showed the highest level of agreement of any group on training/professional development. The high level of disconnect shown in this table, between the attitudes of low DL educators and low DL students (24%), requires closer examination. The vast majority of educators with low DL desired more training and more DL, whereas the opposite was the case for low DL students. One possible reason is that schools were offering uninspiring DT and DL programs for students that should be improved. This issue will be discussed further in Stage 2, Chapter 5.

Students (37%) and educators (83%) were similarly divided on the issue of whether they were enthusiastic about the other group obtaining a high level of DL (Table 4.35) and low DL students seem particularly disinterested, with 16% in agreement (Table 4.38), compared to their high DL peers (45%). Hence, although there was a minority of both student groups in expressing enthusiasm about educator DL, there was, nevertheless, a significant disconnect between student groups on this DL issue. With even low DL educators (85% in Table 4.42) showing a high degree of enthusiasm about students obtaining high levels of DL, the difference between students and educators on this issue was profound. It should be noted here that DL may have reflected on learning at home or at school, with no specific mention of training, as it was used as a general term on this item.

The survey item that allowed reflection on the issue of whether participants would like the other group to obtain more training in DT, revealed that educators (75% in Table 4.35) were significantly more likely to agree that they wanted students to obtain more training in DT, than students (52%) wanting the same for their teachers. There was also a significant disconnect on this item between the two student groups, with high DL students much more likely to agree (61%) than students with low DL (32% in Table 4.38). Hence low DL students had a resistance to any acquisition of DL, whether this related to their teachers or themselves. They lacked enthusiasm for both obtaining a high level of DL and for desire for training in using DT.

In summary, the above four survey items, that related to acquisition to DL and training in DT, show that there were significant disconnects between educators and groups of students, and between low DL and high DL students, on most or all of these survey items. The two groups of educators, on the other hand, had similar positive attitudes to DL and desired more training in DT, with the implication that schools may not have been effectively providing this for educators. High DL students had intermediate, but much less positive views on these items, than their educators. Very few low DL students had positive attitudes to acquiring more DL or to learning about DT. There were significant disconnects between low DL students and the other three groups.

The low DL student group had a high level of uncertainty in their responses, since, on all four statements a large majority of low DL students responded with either ‘neither agree nor disagree’ or ‘uncertain’. This could be interpreted in a number of ways. Firstly, these responses could be viewed through the prism of this group’s general uncertainty about responding to any of the survey items, as many of their survey responses showed similar uncertainty. Apart from showing a lack of agreement or disagreement, these responses may also be due to a failure of individual participants to grasp the meaning of the survey items, possibly through poor language or intellectual ability, an apathetic attitude to digital education generally, or a general disaffection with school and schooling. However, given that there was an option for survey participants to not respond to any or all survey items, these students were amongst the group that chose to click a response to all or most questions, including the last one on their own DL. It should also be noted that definitions of DL and DT were provided on every survey page. Tables 4.6 and 4.18 show that this group had a general low level of responses even to the most agreed survey items.

One student thought that the use of the word ‘enthusiastic’ in survey items was not appropriate, commenting that: “It is hard to specify whether or not we are enthusiastic about digital learning. I for one think that it is beneficial but I an not enthusiastic about it.” (sic.). While it is understandable that students may have avoided responding to survey items with emotive terms, this seems unlikely to be the reason that so many students with low levels of DL responded with little certainty to the survey items generally.

Table 4.35 All Educator vs All Students, Disconnects on Digital Literacy and Training.

Digital Literacy and Training												
	All Educators				All Students							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi²
I would like to obtain more professional development/training in DT	85.7	9.2	5.1	80.6	33.0	35.9	31.1	1.9	78.7	98	309	0.000
I am enthusiastic about students/teachers obtaining a high-level of DL	82.8	13.1	4.0	78.8	37.0	54.2	8.8	28.2	50.5	99	308	0.000
I am enthusiastic about obtaining a high-level of DL	84.8	9.1	6.1	78.8	46.8	36.7	16.6	30.2	48.6	99	308	0.000
I find the use of DT challenging	23.9	25.0	51.1	-27.2	5.1	30.4	64.5	-59.4	32.2	92	276	0.001
DL helps to protect students when on the Internet.	70.7	23.2	6.1	64.6	46.8	44.8	8.4	38.3	26.3	99	308	0.002
DL is important in future employment opportunities for students	100	0	0	100	76.5	21.8	1.8	74.7	25.3	91	285	0.000
My use of Social Networking sites, online email, forums, wikis etc. has helped me develop DL	49.5	25.8	24.7	24.7	58.1	31.6	10.3	47.8	23.1	93	272	0.027
I would like students/teachers to obtain more training in DT	74.5	16.3	9.2	65.3	51.8	40.1	8.1	43.6	21.7	98	307	0.001

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.36 All Participants with Low vs All with High Digital Literacy, Disconnects on Digital Literacy and Training.

Digital Literacy and Training Issues												
	All Low				All High							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ²
I find the use of DT challenging	19.1	46.5	34.4	-15.3	11.4	17.1	71.5	-60.1	44.7	133	229	0.000
I would like to find out more about DT for entertainment.	39.9	47.1	13.1	26.8	59.9	28.2	11.8	48.1	21.3	132	229	0.012
Social Networking sites (like Facebook or MySpace) offer new ways of developing DL	42.8	39.8	17.3	25.5	65.1	19.8	15.1	50.0	24.5	134	230	0.003
DL is important in future employment opportunities for students.	74.5	24.5	1.1	73.4	95.5	4.0	0.6	94.9	21.5	134	229	0.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.37 Educators with Low vs Educators with High Digital Literacy, Disconnects on Digital Literacy and Training.

Digital Literacy and Training												
	Educators with Low DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi [2]
I find students with low levels of DL need more support than I can provide, when they use DT in the classroom	56.4	23.1	20.5	35.9	34.0	24.5	41.5	-7.5	43.4	39	54	0.002
I find the use of DT challenging	30.8	33.3	35.9	-5.1	18.9	18.9	62.3	-43.4	38.3	39	53	0.001
Social Networking sites offer new ways of developing DL	43.6	33.3	23.1	20.5	63.0	20.4	16.7	46.3	25.8	39	54	0.022
I would like to find out more about DT for entertainment	41.0	43.6	15.4	25.6	59.3	29.6	11.1	48.1	22.5	39	54	0.035

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.38 Students with Low vs Students with High Digital Literacy, Disconnects on Digital Literacy and Training.

Digital Literacy and Training												
	Students with Low DL				Students with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi [2]
I find the use of DT challenging	7.4	59.6	33.0	-25.5	4.0	15.3	80.7	-76.7	51.2	94	176	0.000
DL is important in future employment opportunities for students	48.9	48.9	2.1	46.8	90.9	8.0	1.1	89.8	43.0	94	176	0.000
Like teachers to get more training in DT	31.6	56.8	11.6	20.0	60.6	33.7	5.7	54.9	34.9	95	175	0.000
Use of Social Networking sites, online email, forums, wikis etc has helped me develop DL	35.8	53.7	10.5	25.3	69.8	19.8	10.5	59.3	34.0	95	172	0.000
I am enthususatic about teachers obtaining a high-level of DL	16.0	73.4	10.6	5.3	45.2	46.9	7.9	37.3	32.0	94	177	0.000
I find teachers with low levels of DL need support when they use DT in the classroom	48.9	46.7	4.3	44.6	77.3	18.0	4.7	72.7	28.1	92	172	0.000
I am enthusiastic about obtaining a high-level of DL	30.5	52.6	16.8	13.7	54.0	29.5	16.5	37.5	23.8	95	176	0.002
Social Networking sites offer new ways of developing DL	42.1	46.3	11.6	30.5	67.2	19.2	13.6	53.7	23.1	95	177	0.000
DL protects students when online	33.7	57.9	8.4	25.3	55.1	35.2	9.7	45.5	20.2	95	176	0.005
I would like to find out more about DT for entertainment	38.7	50.5	10.8	28.0	60.6	26.9	12.6	48.0	20.0	93	175	0.002
Video Games offer new ways of developing DL	23.2	58.9	17.9	5.3	50.9	22.9	26.3	24.6	19.3	95	175	0.000
Teachers with a low level of DL are more likely to waste time on using DT in the classroom	37.0	53.3	9.8	27.2	61.6	22.7	15.7	45.9	18.8	92	172	0.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Attitudinal Disconnects in the Perceived Value of Digital Literacy

There were pronounced attitudinal disconnects towards the perceived importance of DL in terms of future employment opportunities. Educators agreed unanimously (100%) with its importance in future employment, whilst students were significantly less likely to agree (77% in Table 4.35). Participants with high DL were more likely to agree to DL's importance in employment (96%), than those with low DL (75%), with a significant difference between them, revealing disconnect on the issue (Table 4.36). The most profound significant differences were again found between students with low DL (49%) and the other DL groups, students with high DL (91%) and educators with high or low DL (100%). The fact that these students were much less likely to see the importance of DL in future employment was likely be one reason they lacked enthusiasm for training in DT, or acquisition of more DL. This reinforces the suggestion that surveyed schools failed to inform students of the importance of DL.

On the issue of whether DL protected students when they were online, there was a significant disconnect between agreement of educators (71%) and students (47%), although fewer than 9% of either group disagreed (Table 4.35). A majority of students with high DL (55%) were significantly more likely to agree than students with low DL (34%). Further attitudinal disconnect on this survey item was also observed between these student groups and the groups of educators with high DL (78%) and low DL (72%). It is also of interest that students with high DL were not more strongly inclined to agree it protected them, with a large proportion choosing not to have an opinion (35%). A majority of educators (both high and low DL) and high DL students therefore agreed that DL assisted in online protection, indicating that an enhancement to DL, should be a priority for schools wishing to improve student safety online.

Difficulties using Digital Technologies and Challenges for schools

Several survey items related to challenges that teachers and educational leaders face when one-to-one DT programs are adopted by their schools. These were: how challenging each group found using DT; the support needed by students and teachers in the classroom; time wasting that was likely to occur when using DT in the classroom and the contributions that Social Media and video games made towards the acquisition of DL. While Social Media and video games were likely to be used at home, the issue here was whether they were perceived as contributing to student and educator DL. These results are discussed in the following section.

There were a variety of disconnects that related to whether survey participants found the use of DT challenging. Educators were significantly more likely to find DT challenging than their students, with a majority of students (64.5% in Table 4.35) disagreeing that it was challenging. Predictably, all three participant groups with high DL, in Tables 4.36 – 4.38, had a significant disconnect with their corresponding low DL counterparts, in disagreeing that the use of DT was challenging. Table 4.39 also shows a predictable disconnect between educators with low DL and high DL students on this issue. Since there were differences in the ways educators and students used DT in classrooms, the challenges that each group faced were dissimilar, with educators arguably under more social pressure to perform, with students acting as a critical audience, who educators perceived to be more talented in using DT (see Section 4.1.1).

Time Wasting in the classroom by students with low levels of DL was discussed briefly in Section 4.1.3 with both low DL groups agreeing. Table 4.38 reveals a disconnect between students of high and low DL, on the issue of low DL teachers wasting time when using DT in the classroom, with high DL students (62%) significantly more likely to agree that low DL teachers did waste time. This group of students would be likely to be more perceptive about teacher behaviour when using DT, since they were skilled in DT and this finding is consistent with these teachers feeling challenged.

Teachers with low levels of DL needed classroom support with DT, according to high DL students (77% in Table 4.38). Although there was disconnect between the high DL and low DL student (49%) groups, it would be expected for high DL students to be more perceptive of teachers than their low DL peers, and these results confirmed this. In further reiteration of expected disconnects between high and low DL groups, students with low levels of DL 'need more support than I can provide' according to the majority of low DL Educators (56%), with a lower level of agreement amongst high DL educators (34% in Table 4.37). This confirmed that high DL educators felt more able to act to help students in the classroom with DT, while low DL teachers felt less so. These findings, taken together, suggest that students who were using DT in the classrooms of low DL teachers, were not receiving a level of support that would have allowed them to extend their knowhow, in using the DT at their disposal. It was also apparent that teachers with low levels of DL who were using DT were similarly not receiving the support that they needed to effectively master the tools they were provided with. These findings have serious ramifications in that a lack of skill in mastering DT by students and educators would be likely to undermine DT programs. Since the schools in this study had established laptop programs, it may seem surprising that such pronounced student and staff difficulties have been revealed here.

Students were also marginally disconnected with their educators on the view that their use of Social Media had 'helped' them to 'develop DL', as seen in Table 4.35, although the *p*-value was >0.01. A further significant disconnect on this survey item was illustrated in Table 4.36 between all participants with low (43%) vs high DL (65%). Low DL educators also had a significant disconnect on this issue with low DL students, shown in Table 4.42, being much more likely to disagree that it 'contributes to DL'. Amongst students themselves, in Table 4.38, there was again a significant disconnect between those with high DL (70%) that Social Media had helped them develop DL, in comparison to their low DL peers

(36%). In confirmation of this disconnect, high DL students were significantly more likely to agree (67%) that Social Media offered new ways of developing DL, than low DL students (23%). Video Games were similarly seen to be more likely to have made a contribution to developing DL, according to high DL students (51% in Table 4.38) and high DL educators (48% in Table 4.40), in comparison to students with low DL (23%).

DL has many elements, as discussed in the literature review. The survey findings show that participants were sensitive to the various aspects of DL and the contributions that entertainment and communication could make to the process of acquiring greater DL. While exposure in an individual's life to Social Media and video gaming will vary enormously from one person to the next, schools might be able to benefit from the widespread use of these types of DT in order to enhance the DL of their staff and students.

Table 4.39 Educators with Low vs Students with High Digital Literacy, Disconnects on Digital Literacy and Training.

Digital Literacy and Training Issues												
	Educators with Low DL				**Students with High DL**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi ^{2}**
I would like to obtain more professional development/training in DT	92.3	5.1	2.6	89.7	37.3	28.8	33.9	3.4	86.4	39	177	0.000
I find the use of DT challenging	30.8	33.3	35.9	-5.1	4.0	15.3	80.7	-76.7	71.6	39	176	0.000
I am enthusiastic about teachers/students obtaining a high-level of DL	84.6	12.8	2.6	82.1	45.2	46.9	7.9	37.3	44.8	39	177	0.000
I am enthusiastic about obtaining a high-level of DL	82.1	10.3	7.7	74.4	54.0	29.5	16.5	37.5	36.9	39	176	0.000
Social Networking sites offer new ways of developing DL	43.6	33.3	23.1	20.5	67.2	19.2	13.6	53.7	33.2	39	177	0.004
DL helps to protect students when on the Internet	71.8	25.6	2.6	69.2	55.1	35.2	9.7	45.5	23.8	39	176	0.020
I would like to find out more about DT for entertainment	41.0	43.6	15.4	25.6	60.6	26.9	12.6	48.0	22.4	39	175	0.018

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.40 Students with Low vs Educators with High Digital Literacy, Disconnects on Digital Literacy and Training.

Digital Literacy and Training												
	Students with Low DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
I am enthusiastic about teachers/students obtaining a high-level of DL	16.0	73.4	10.6	5.3	87.0	9.3	3.7	83.3	78.0	94	54	0.000
I am enthusiastic about obtaining a high-level of DL	30.5	52.6	16.8	13.7	92.6	3.7	3.7	88.9	75.2	95	54	0.000
I would like to obtain more professional development/training in DT	24.2	52.6	23.2	1.1	83.0	9.4	7.5	75.5	74.4	95	53	0.000
DL is important in future employment opportunities for students	48.9	48.9	2.1	46.8	100.0	0.0	0.0	100.0	53.2	94	54	0.000
I would like students/teachers to obtain more training in DT	31.6	56.8	11.6	20.0	79.6	11.1	9.3	70.4	50.4	95	54	0.000
DL helps to protect students when on the Internet	33.7	57.9	8.4	25.3	77.8	14.8	7.4	70.4	45.1	95	54	0.000
Video games offer new ways of developing DL	23.2	58.9	17.9	5.3	48.1	33.3	18.5	29.6	24.4	95	54	0.000
I would like to find out more about DT for entertainment	38.7	50.5	10.8	28.0	59.3	29.6	11.1	48.1	20.2	93	54	0.007

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.41 Students with High vs Educators with High Digital Literacy, Disconnects on Digital Literacy and Training.

Digital Literacy and Training Issues												
	Students with High DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ^{2}
I would like to obtain more professional development in digital technologies.	37.3	28.8	33.9	3.4	83.0	9.4	7.5	75.5	72.1	177	53	0.000
I am enthusiastic about obtaining a high-level of digital literacy.	54.0	29.5	16.5	37.5	92.6	3.7	3.7	88.9	51.4	176	54	0.000
I am enthusiastic about students obtaining a high-level of digital literacy.	45.2	46.9	7.9	37.3	87.0	9.3	3.7	83.3	46.0	177	54	0.000
I find the use of digital technologies challenging.	4.0	15.3	80.7	-76.7	18.9	18.9	62.3	-43.4	33.3	176	53	0.002
Digital literacy helps to protect students when on the Internet.	55.1	35.2	9.7	45.5	77.8	14.8	7.4	70.4	24.9	176	54	0.002

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.42 Students with Low vs Educators with Low Digital Literacy, Disconnects on Digital Literacy and Training.

Digital Literacy and Training												
	Students with Low DL				Educators with Low DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ^{2}
I would like to obtain more training/professional development in digital technologies.	24.2	52.6	23.2	1.1	92.3	5.1	2.6	89.7	88.7	95	39	0.000
I am enthusiastic about students obtaining a high-level of digital literacy.	16.0	73.4	10.6	5.3	84.6	12.8	2.6	82.1	76.7	94	39	0.000
I am enthusiastic about obtaining a high-level of digital literacy.	30.5	52.6	16.8	13.7	82.1	10.3	7.7	74.4	60.7	95	39	0.000
Digital Literacy is important in future employment opportunities for students.	48.9	48.9	2.1	46.8	100.0	0.0	0.0	100.0	53.2	94	37	0.000
I would like students to obtain more training in digital technologies.	31.6	56.8	11.6	20.0	74.4	17.9	7.7	66.7	46.7	95	39	0.000
Digital literacy helps to protect students when on the Internet.	33.7	57.9	8.4	25.3	71.8	25.6	2.6	69.2	44.0	95	39	0.000
My use of Social Networking sites, online email, forums, wikis etc. has helped me develop digital literacy	35.8	53.7	10.5	25.3	35.9	28.2	35.9	0.0	25.3	95	39	0.000
I find the use of digital technologies challenging.	7.4	59.6	33.0	-25.5	30.8	33.3	35.9	-5.1	20.4	94	39	0.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

4.2.2 Disconnects on Online Risks

In the following section further significant differences are investigated relating to online risks that pertained to surveyed student use of online resources. Several group comparisons did not show significant differences for the survey items related to this issue and the tables show only items where disconnects were revealed with an LoD>20.

The first disconnect related to the Internet as an educational resource, shown in Figure 4.5 and Table 4.17 in Section 4.1.3, that there was more than 50% difference between educator and student views, that 'the Internet [was] needing guidance by teachers' when used as an educational resource. This was a telling result that suggested students desired independence and trust in their own decision-making. This view presumably stemmed from student use at home, where they generally used the Internet without guidance. Educators, on the other hand, desired more control over student Internet use and this further confirmed their fears that students would misuse their access rights. Educators evidently saw access to the Internet, without teacher guidance, to be a significant risk in the classroom. However, it was highly likely that students used unfiltered Internet, outside of the classroom on mobile devices or at home. Yet schools had a responsibility to ensure 'duty of care' and this may have been interpreted by educators as meaning that there was an implicit expectation that they show guidance. In a practical sense this may mean limitation or restriction of student time for Internet use, or that students were expected to use only specified sites.

In further reinforcement of the findings on the above survey item, Tables 4.43 – 4.47 show that educators (60%) were significantly more likely to agree that there are risks in using 'Web 2.0 technologies' in the classroom, than students (26%). A majority of educators of high DL (55%) and low DL (67%) also show disconnect with the opinions of high (27%) and low (19%) DL student groups, on this item. It should be emphasised here that this survey item specified that 'Facebook, YouTube and Flickr' represented examples of Web 2.0, commonly known as Social Media. Social Media would very likely have been frequently used in the homes of educators and students, yet educators saw them as increasing classroom risk. Educator anxieties about Web 2.0 and Social Media, limited school access to the latest online DT tools and these were often blocked by the schools in this study. There was little evidence in these findings that the educators in this study saw Web 2.0 or Social Media to offer worthwhile innovative online tools for collaboration.

Table 4.43 All Educator vs All Students Disconnects on Online Risks and Security of Digital Technologies.

Online Risks and Security												
	All Educators				**All Students**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi ^{2}**
There are many risks involved with using Web 2.0 technologies in education.	59.8	28.3	12.0	47.8	25.8	38.3	35.9	-10.1	57.9	92	287	0.000
Students/teachers can become dependent on using DT	76.0	12.0	12.0	64.0	39.3	38.3	22.4	16.8	47.2	100	321	0.000
I think students often by-pass my school's Internet filter.	39.4	34.3	26.3	13.1	18.2	36.8	45.0	-26.7	39.9	99	318	0.002

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.44 Educators with Low vs Students with High Digital Literacy Disconnects on Online Risks and Security of Digital Technologies

Online Risks and Security												
	Educators with Low DL				**Students with High DL**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi ^{2}**
There are many risks involved with using Web 2.0 technologies in education	66.7	20.5	12.8	53.8	26.6	28.8	44.6	-18.1	71.9	39	177	0.000
Others can become dependent on using DT	74.4	10.3	15.4	59.0	41.2	32.8	26.0	15.3	43.7	39	177	0.000
I think students often by-pass my school's Internet filter	34.2	42.1	23.7	10.5	22.7	28.4	48.9	-26.1	36.7	38	176	0.212

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.45 Students with Low vs Educators with High Digital Literacy Disconnects on Online Risks and Security of Digital Technologies.

Online Risks and Security												
	Students with Low DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N_High	Chi ²
Others can become dependent on using DT	38.9	45.3	15.8	23.2	81.5	9.3	9.3	72.2	49.1	95	54	0.000
There are many risks involved with using Web 2.0 technologies (e.g.: Facebook, Youtube, Flickr) in education	18.9	60.0	21.1	-2.1	54.7	34.0	11.3	43.4	45.5	95	53	0.000
I think students often by-pass my school's Internet filter	7.5	52.7	39.8	-32.3	42.6	27.8	29.6	13.0	45.2	93	54	0.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.46 Students with High vs Educators with High Digital Literacy Disconnects on Online Risks and Security of Digital Technologies.

Online Risks and Security												
	Students with High DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N_Edu	Chi ²
There are many risks involved with using Web 2.0 technologies (e.g. Facebook, Youtube, Flickr) in education.	26.6	28.8	44.6	-18.1	54.7	34.0	11.3	43.4	61.5	177	53	0.000
Students/teachers can become dependent on using DT	41.2	32.8	26.0	15.3	81.5	9.3	9.3	72.2	57.0	177	54	0.000
I think students often by-pass my school's Internet filter	22.7	28.4	48.9	-26.1	42.6	27.8	29.6	13.0	39.1	176	54	0.005

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.47 Students with Low vs Educators with Low Digital Literacy Disconnects on Online Risks and Security of Digital Technologies.

Online Risks and Security												
	Students with Low DL				Educators with Low DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ²
There are many risks involved with using Web 2.0 technologies (e.g.: Facebook, Youtube, Flickr) in education.	18.9	60.0	21.1	-2.1	66.7	20.5	12.8	53.8	56.0	95	39	0.000
I think students often by-pass my school's Internet filter.	7.5	52.7	39.8	-32.3	34.2	42.1	23.7	10.5	42.8	93	38	0.000
Students/teachers can become dependent on using digital technologies.	38.9	45.3	15.8	23.2	74.4	10.3	15.4	59.0	35.8	95	39	0.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

There was significant disconnect between students and educators (Tables 4.43) and between low DL students and educators (Table 4.47), on whether the other group of students or teachers could become 'dependent' on DT, with educators (76%) much more likely to agree that students could become dependent than students (39%) were to agree teachers could become dependent. There was widespread concern in contemporary media about student addiction to, or dependency on DT and the Internet and this may have had an effect on educator perceptions. Students seemed less concerned about the dependency of their teachers.

There appear to be complex and uncertain findings from the survey responses that related to students bypassing their school's Internet filter. Educators (39%) had a significant disconnect with students (18%) in agreeing on this issue and both educators with high DL (43%) and high DL students (23%) were more likely to agree than their low DL counterparts, although these high DL groups displayed a significant disconnect. The very low agreement level of low DL students (8% in Table 4.47) is also of interest, since it may suggest that only students with high DL bypassed the firewall, or were aware of others doing it. Large numbers of students also disagreed with the survey statement on bypassing and the possibility exists that students were either being intentionally misleading or disagreeing with the use of the word 'often' in the statement. In either case, there was a strong indication that a proportion of students did bypass their school's filters and that those with high DL were more likely to be aware of those that did this. If this was the case in large numbers of classrooms, what do educators do to prevent or uncover inappropriate use? Low DL educators would seem to be at a distinct disadvantage, since they would not be as aware of student misuse of the Internet, since only 34% agreed with the statement.

4.2.3 Disconnects in Classroom and Curriculum uses of Digital Technologies

Many disconnects have been uncovered in the analysis of the participant survey responses in the following section, each of these findings related to classroom and curriculum uses of DT. The tables in this section show the survey items related to this issue, only where disconnects were revealed by participant responses and these are discussed and compared. The greatest disconnects were observed between those of high and low levels of DL. Tables 4.48 – 4.55 outline the disconnects for all comparison groups that are discussed in this section.

Disconnects in School Digital Technologies Programs

In terms of positive agreements about school DT programs where participants 'enjoy[ed] having a school laptop', Table 4.18 shows that five of the six groups had a high level of agreement, with the only disconnected group being the low DL student group. However, even low DL students (68%) had a majority of participants agreeing that they enjoyed having a school laptop. The remaining groups in Tables 4.51, 4.53 and 4.55 all had higher levels of majority agreement: high DL students 89%, high DL educators 94% and low DL educators 95%. Given that low DL students were much more likely than the other comparison groups to be non-committal in their survey responses, giving rise to the disconnect observed here, the results for this survey item strongly supported school one-to-one DT provisioning. If schools also boosted the DL of those groups with lower levels, then the support for these programs would be likely to be higher, since positive attitudes towards school laptops increased with DL.

Similar responses from survey participants were found on the survey statement that 'students should be encouraged to use new technologies in the classroom', in that students low levels of DL (48%) faced an even greater disconnect with all other comparison groups, in Tables 4.51, 4.53 and 4.55, suggesting that they had more resistance to the idea of using DT in their schools, possibly because DT threatened many of them, since they lacked skill using it. Their response also showed a high degree of ambivalence ('uncertain' and 'neither agree nor disagree' 48%). On the other hand, students with high levels of DL (84%); educators with high levels of DL (87%) and educators with low levels of DL (89%) all had a great majority in agreement with this statement. Educators with low DL were evidently able to see the benefits of allowing students to use DT in the classroom, although they may not be required to use new technology in their own subject area.

To compound the resistance of low DL students to using DT in the classroom, low DL students (35%) were much less likely to agree than their high DL counterparts (68% in Table 4.51), that they 'would like to encourage teachers to use DT in the classroom'. This finding provides an opportunity for future researchers to obtain the opinions of this group of students, who do not profess to have a high level of DL. This could be undertaken in future focus groups and follow up surveys that aim to gauge the opinions of this group, so that schools could better meet their needs.

There were further disconnects between many of the comparison groups on the issue of being 'satisfied with my laptop and the way it is set up by my school', particularly between educators (55%) and students (27%) in Table 4.48. Tables 4.52 – 4.55 show further disconnect on laptop setup satisfaction between educators of low DL (59%) and students of high DL (28%); students of low DL (23%) and educators high DL (52%); students of high DL (28%) with educators of high DL (52%) and students of low DL (23%) with educators of low DL (59%). The high level of disagreement with this statement by students of high DL (57%) should also be noted, in Table 4.54. Several student comments reinforced the negative views that students had about their school provided laptops, suggesting they were setup in a way that was "extremely restrictive" and caused "frustration" and that they were "unreliable", "clogged up by [school's] stupid programs and junk" and had "issues that impair[ed]" student use. Hence students were aware that their schools installed network security software on school provided laptops and employed firewalls that restricted student and teacher access to the Internet at school.

Disconnects on Affective Responses to Digital Technologies

Two survey items had affective content relating to participant feelings about DT, these items related to confidence and passion surrounding DT use, revealing significant disconnects between all high versus low DL comparison groups.

On the statement 'I feel confident in using DT in my classes', there was a significant disconnect in agreement, shown in Table 4.49, between all participants with low DL (49%) and those with high DL (94%). This was reiterated in Tables 4.50 – 4.53, showing educators with low DL (50%) and students with low DL (47%) were significantly less likely to agree than educators with high DL (94%) and high DL students (93%). These profound disconnects, while expected for participants with differing DL, suggest that a lack of confidence in using DT was associated with low DL and was likely to impact on programs involving the use of DT in the classroom. This difference in attitude was also mirrored by the item discussed below, on passion for using DT.

For the survey statement 'I would say I am passionate about using DT in education' there were similar significant disconnects with the groups shown above, as seen in Tables 4.49 – 4.53. The all participant low DL group (29%) compared with the all participant high DL group (67%) had an enormous disconnect. As expected, this finding was again reflected in the low DL students (22%) and high DL educators (77%) comparison; the educators low DL (36%) vs high DL educators; students with low DL compared to students with high DL (56%); educator low DL with student high DL and student low DL with educators of high DL, with significant disconnects for all comparisons. One result that was less expected on this item, is shown in Table 4.54, with a level of disconnect of 26% shown between the responses of students high DL with educators of high DL. Given the focus of this question was 'education', this reference used in this survey item may have inadvertently discouraged students from agreeing. It is conceivable that students were less likely to show positive responses regarding schooling.

Disconnects on Creativity, Self-expression and Innovation using Digital Technologies

Where self-expression was concerned, Tables 4.49, 4.51, 4.53 and 4.55 show that, while all comparison groups with high levels of DL were in majority agreement of more than 70%, that 'it is important for schools to explore student self-expression using DT', educators of low DL (61%) were somewhat less inclined to agree. There were again significant disconnects between high DL groups and low DL groups, all high DL participants (71%) with all low (47%); students of high DL (70%) with students of low DL (33%) and both educators with high DL (72%) and low DL, with students of low DL.

This finding again fits the pattern of low DL participants being less inclined to hold optimistic and supportive viewpoints about the use of DT in schools.

Responses relating to creativity also reflected disconnects between the groups listed above. On the statement 'DT provides students with an opportunity to be highly creative', high DL students (78%), high DL educators (89%) and educators with low DL (80%) had high agreement scores in comparison to students with low DL (42%). In addition, all high DL participants (83%) had a significant disconnect on this item, with all low DL participants (61%). There was an additional disconnect in Table 4.48 on the creativity item, between all educators (85%) and all students (66%). In similar vein, group responses and significant disconnects were found on the survey item that suggested 'I have found that I have become more creative using DT' between all participants with low DL (36%), low DL students (24%) and low DL educators (49%) with all high DL participants (69%), high DL students (63%) and high DL educators (76%). The fact that those with high DL believed that they were assisted in their creative endeavours by use of DT, whereas those with low DL did not, is an important disconnect in perception of DT use and appeared related to the higher self-reported self-efficacy of these participants (Section 4.4.1). It should be noted that these two survey items did not necessarily relate to creativity in classroom use and may have reflected perceptions of use at home. These findings indicate that schools generally need to ensure that their DT programs take advantage of this feeling, by stimulating creative use of DT, in order to generate student enthusiasm and involvement with classroom DT activities.

Again, for the survey statement that 'DT and the Internet allows me to be more Innovative when developing ideas or plans for assignments', there was general agreement amongst all participants with high DL (82%), educators with high DL (83%) and students with high DL (81%) while these groups had disconnects with all low DL participants (51%) and students of low DL (33%). The difference on this item compared to the creativity items above, was that a majority of low DL educators (69%) agreed with this statement which showed a significant disconnect with the views of their low DL students; although, it is not clear why this group of educators felt more positive about 'innovative when developing ideas' than they did with creativity. It may be due to the more concrete nature of this statement in engagement with DT to access new ideas, perhaps online.

One disconnect between the two groups of students that related to self-expression using DT, was on the survey statement: 'I like to learn by discovery using DT', that had a minority of students of low DL (31%) agreeing in comparison to those with high DL (69%). This suggests that students of low DL may either have had a general disaffection with the learning process, or that they preferred a teacher led educational program. The reluctance of low DL student participants to engage in learning with DT, was conceivably linked to a low level of DL and low self-efficacy. However, it seems unlikely that these students would want less control over their own learning. Alternatively, their reluctance may have been linked to disaffection with educational programs. Yet, as seen in the literature, even disaffected youth can engage with DT programs, when these are not associated with school or with teachers. Therefore, disaffected students may not engage with school programs in which they are capable, simply because they reject schooling generally. This finding suggests that schooling problems for these students may be linked to authoritarian control in schools. Once again, more in-depth research into the views of low DL and more disaffected students could provide greater depth of understanding on this complex issue.

Further to the issue of student engagement and control, educators were particularly unlikely to 'encourage students to publish their writing on the Internet', suggesting that control over student self-expression was of high importance to teachers. Educators with a low DL were extremely unlikely (5%) to suggest that they would allow self-publishing. While those with high DL (28%) were more likely to agree, although still in a minority. These figures appear to support the premise that educators in this study, at least, were reluctant to support independent student publishing for one reason or another. One limitation of this survey item was that the voice of students was absent and it is easy to assume that we know what students want to do with Internet access, self-publishing, because it is what they do at home when posting on Social Media. However, it is not known whether students wish to publish their writing on the Internet or use Social Media in the classroom. This represents another suitable topic for further research.

Disconnects on Behavioural Items

Several Likert scale survey statements related to student behaviour when using DT. Firstly there were interesting disconnects shown in Tables 4.48, 4.53 and 4.55, on whether 'DT detracts from more important educational activities', particularly on disagreement levels. These tables show educators were far more likely to disagree (>49%) with this statement, than groups of all or low DL students (<27%), illustrating general educator support for the use of DT in their classrooms. Similar disagreement differences, leading to disconnects in Tables 4.49, 4.51 and 4.53, were shown for the survey statement that: 'I would rather [students] work with pen and paper ... rather than DT'. In this case there was disconnect in disagreement of those with high DL in comparison to those with low DL self-ratings. High DL participants (51%) were therefore more likely to be in disagreement that pen and paper were preferable than low DL (32%). It is also pertinent that between 15 – 23% of all groups agreed that pen and paper was preferable, with low DL students showing the highest level of agreement. Individuals in agreement evidently had views that challenged the importance of one-to-one DT access in schools. Once again, it is important that the opinions of this minority group be collected in future research, in order to analyse their objections to DT use.

The use of DT in schools was often assumed in the literature to be consistent with constructivist learning, the 4Cs and the SAMR models. Typical of constructivist learning and the other two pedagogies, were group projects, where the student was at the centre of the learning process and communication was encouraged. To gauge opinions on this issue, participants were provided with the statement that 'DT [was] well suited to group projects'. Once again it was the high DL participants who had significantly higher levels of agreement (>65%), as shown in Tables 4.49, 4.50 and 4.53. Here it would seem apparent that these individuals would be more likely to be able to gainfully employ DT in group projects or instruct students in online research than those with low levels of DL. In similar constructivist vein, students (47%) and educators (48%) with high DL were significantly more likely than students of low DL (17%) to agree that 'DT enhances cooperation'. DT were therefore seen by the high DL participants in this study to be consistent with constructivist pedagogies and those associated with the 4Cs and the SAMR models.

One particularly significant difference was that very few students (8%) disagreed with the survey statement that 'some students get bored in class if not using DT', with 54% of educators and 64% of students agreeing that students did, while 66% of all participants with high DL and 46% of low DL also agreed. Interestingly, there was a disconnect on this item between low DL educators (49%) and students (42%), with high DL students (72%) and educators of high DL (60%). The high vs low DL disconnect on the issue of boredom suggests that it was the high DL users of DT that were more likely to be bored if not using DT in the classroom.

In conclusion on behavioural items, the findings can be summarised as follows: a minority of participants preferred traditional use of pen and paper; high DL participants were more likely to be in support of DT provision in schools, more supportive of pedagogies consistent with DT and more likely to agree that school may be boring without using one-to-one DT in the classroom.

Table 4.48 All Educator vs All Students Disconnects on Classroom and Curriculum Use of Digital Technologies.

Classroom and Curriculum Uses of Digital Technologies												
	All Educators				All Students							2 DoF
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi ^{2}**
I am satisfied with my laptop and the way it is set up by my school.	54.8	16.1	29.0	25.8	27.4	24.6	48.1	-20.7	46.5	93	285	0.000
I find that students work more efficiently when using DT	38.0	37.0	25.0	13.0	60.8	27.3	11.9	48.9	35.9	100	319	0.003
DT detracts from more important educational activities.	18.3	32.3	49.5	-31.2	23.1	50.0	26.9	-3.8	27.3	93	286	0.004
Students tend to write more when asked to complete an assignment using DT	49.0	33.0	18.0	31.0	65.7	25.9	8.4	57.3	26.3	100	321	0.034
Some students get bored in class if they are not using DT	54.3	22.3	23.4	30.9	63.6	28.3	8.0	55.6	24.7	94	286	0.011
DT provide students with an opportunity to be highly creative.	84.9	10.8	4.3	80.6	65.7	27.3	7.0	58.7	21.9	93	286	0.006

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.49 All High vs All Low Digital Literacy Disconnects on Classroom and Curriculum Use of Digital Technologies.

Classroom and Curriculum Uses of Digital Technologies												
	All Low				All High							2 DoF
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi ^{2}**
I feel confident in using DT in my classes.	48.7	38.7	12.6	36.1	93.8	5.1	1.1	92.7	56.6	133	229	0.000
I would say I am passionate about using DT in education.	29.0	53.6	17.4	11.6	66.6	27.5	5.8	60.8	49.2	134	230	0.000
I have found that I have become more creative in using DT	36.3	45.6	18.1	18.3	69.4	20.6	10.0	59.4	41.1	131	229	0.000
DT and the Internet allow me to be more innovative when developing ideas or plans	51.4	39.3	9.3	42.1	82.1	15.5	2.4	79.8	37.7	129	227	0.000
I think it is important for schools to explore student self-expression using DT	46.6	44.7	8.7	37.9	70.7	26.0	3.3	67.4	29.5	133	228	0.002
DT provide students with an opportunity to be highly creative.	60.8	31.4	7.8	53.0	83.4	11.9	4.7	78.7	25.7	134	230	0.001
I encourage students to use DT in the classroom.	52.7	40.1	7.2	45.5	77.3	15.6	7.0	70.3	24.8	131	230	0.000
I would rather students work with pen and paper in the classroom than with DT	20.9	47.2	32.0	-11.1	15.8	32.9	51.3	-35.5	24.4	129	228	0.020
DT are well-suited to group projects.	46.5	44.0	9.6	36.9	69.5	20.4	10.0	59.5	22.6	134	226	0.001
Some students get bored in class if they are not using DT	45.6	38.2	16.2	29.3	66.0	18.3	15.7	50.3	21.0	131	229	0.005

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.50 Educators with High vs Low Digital Literacy Disconnects on Classroom and Curriculum Use of Digital Technologies.

Classroom and Curriculum Use of Digital Technologies												
	Educators with Low DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
I feel confident in using DT in my classes.	50.0	28.9	21.1	28.9	94.4	5.6	0.0	94.4	65.5	38	53	0.000
I would say I am passionate about using DT in education	35.9	46.2	17.9	17.9	77.4	18.9	3.8	73.6	55.6	39	54	0.000
Students generally follow instructions when they use DT in the classroom	34.2	28.9	36.8	-2.6	62.3	20.8	17.0	45.3	47.9	38	54	0.000
I have found that I have become more creative in using DT	48.7	28.2	23.1	25.6	75.9	16.7	7.4	68.5	42.9	39	54	0.000
I encourage students to publish their writing on the Internet	5.3	34.2	60.5	-55.3	27.8	20.4	51.9	-24.1	31.2	38	53	0.000
DT are well-suited to group projects	48.7	38.5	12.8	35.9	72.2	22.2	5.6	66.7	30.8	39	53	0.003
Students with a low level of DL are generally able to use computers efficiently in class	35.9	48.7	15.4	20.5	31.5	29.6	38.9	-7.4	27.9	39	54	0.001
DT and the Internet allow me to be more innovative when developing ideas or plans	69.4	19.4	11.1	58.3	83.3	14.8	1.9	81.5	23.1	36	52	0.015

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.51 Students with High vs Low Digital Literacy Disconnects on Classroom and Curriculum Use of Digital Technologies.

Classroom and Curriculum Use of Digital Technologies												
	Students with Low DL				Students with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi^2
DT and the Internet allow me more innovative when developing ideas or plans for assignments	33.3	59.1	7.5	25.8	80.9	16.2	2.9	78.0	52.2	93	173	0.000
I am confident in using DT in my classes	47.4	48.4	4.2	43.2	93.1	4.6	2.3	90.9	47.7	95	175	0.000
I think it is important for schools to explore student self expression using DT	32.6	57.9	9.5	23.2	69.7	27.4	2.9	66.9	43.7	95	175	0.000
I would say I am passionate about using DT in education	22.1	61.1	16.8	5.3	55.9	36.2	7.9	48.0	42.8	95	177	0.000
DT provide students with an opportunity to be highly creative	42.1	47.4	10.5	31.6	77.8	16.5	5.7	72.2	40.6	95	176	0.000
I like to learn by discovery, using DT	30.9	62.8	6.4	24.5	68.6	26.9	4.6	64.0	39.5	94	175	0.000
I have found that I have become more creative in using DT	23.9	63.0	13.0	10.9	62.9	24.6	12.6	50.3	39.4	92	175	0.000
DT enhances cooperation in the classroom between students	17.4	66.3	16.3	1.1	47.4	44.0	8.6	38.9	37.8	92	175	0.000
Students should be encouraged to use new technologies in schools	48.4	48.4	3.2	45.2	84.2	14.0	1.8	82.5	37.3	93	171	0.000
I would like to encourage teachers to use DT in the classroom	35.1	53.2	11.7	23.4	67.6	23.9	8.5	59.1	35.7	94	176	0.000
I would rather work with pen and paper in the classroom rather than with DT	22.8	51.1	26.1	-3.3	16.6	28.0	55.4	-38.9	35.6	92	175	0.000
Some students get bored in class if they are not using DT	42.4	45.7	12.0	30.4	71.6	21.6	6.8	64.8	34.3	92	176	0.000
I tend to write more when asked to complete an assignment using DT	44.2	47.4	8.4	35.8	76.3	16.9	6.8	69.5	33.7	95	177	0.000
I work more efficiently when using DT	42.1	45.3	12.6	29.5	71.0	17.0	11.9	59.1	29.6	95	176	0.000
The quality of my homework assignments and presentations is better when I use DT	54.7	36.8	8.4	46.3	79.9	13.8	6.3	73.6	27.2	95	174	0.000
I generally focus on school work when I use DT in the classroom	36.8	52.6	10.5	26.3	61.8	27.7	10.4	51.4	25.1	95	173	0.001
I enjoy having my own school laptop	68.4	28.4	3.2	65.3	89.3	9.0	1.7	87.6	22.3	95	177	0.001

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.52 Educators with Low vs Students with High Digital Literacy Disconnects on Classroom and Curriculum Use of Digital Technologies.

Classroom and Curriculum Use of Digital Technologies												
	Educators with Low DL				Students with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
I am satisfied with the way my laptop and the way it is set up by my school	59.0	17.9	23.1	35.9	28.4	14.8	56.8	-28.4	64.3	39	176	0.000
I feel confident in using DT in my classes	50.0	28.9	21.1	28.9	93.1	4.6	2.3	90.9	61.9	38	175	0.000
Students work more efficiently when using DT	41.0	38.5	20.5	20.5	71.0	17.0	11.9	59.1	38.6	39	176	0.000
Some students get bored in class if they are not using DT	48.7	30.8	20.5	28.2	71.6	21.6	6.8	64.8	36.6	39	176	0.002
Students tend to write more when asked to complete an assignment using DT	53.8	25.6	20.5	33.3	76.3	16.9	6.8	69.5	36.2	39	177	0.002
I would say I am passionate about using DT in education	35.9	46.2	17.9	17.9	55.9	36.2	7.9	48.0	30.1	39	177	0.009
I have found that I have become more creative in using DT	48.7	28.2	23.1	25.6	62.9	24.6	12.6	50.3	24.6	39	175	0.077

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Disconnects on Enhancements to Work Quality and Efficiency

Students who had high levels of DL were far more likely to agree on items that related to work quality and efficiency improvements when using DT. These findings were generally expected since students with lower DL and less self-efficacy would be less likely to develop efficiency benefits using DT.

When the suggestion was made to participants that 'students work more efficiently when using DT', Tables 4.48, 4.51, 4.52 and 4.54 show there were significant disconnects between all students (61%) and all educators (38%) in agreement; also, high DL students (71%) with low DL students (42%), low DL educators (41%) and high DL educators (37%). This may point to the fact that it was students with high levels of DL that worked more efficiently with DT, as would be expected. The interesting finding here was that few educators recognised greater student efficiency. Differing views for high DL students were also reiterated, in the above tables, when it was considered whether students 'write more when asked to complete an assignment using DT', with students (66%) showing disconnects on level of agreement with educators (49%) and high DL students (76%) having significantly higher agreement than low DL educators (54%), high DL educators (52%) and low DL students (44%). Another difference in agreement between high DL students (62%) and low DL students (37% in Table 4.51) was found on the survey item that suggested students 'generally focus on schoolwork when using digital technologies in the classroom'. Similarly, students with high DL (80%) were much more likely than students with low DL (55% in Table 4.51) and high DL educators (52% in Table 4.54) to agree that the 'quality of homework assignments and presentations is better when students use DT'. Therefore, these findings show that high DL students reported working more efficiently, writing more content and producing homework of better quality when using DT on their school assignments.

Furthermore, on a survey item for educators, high DL educators (62% in Table 4.50) were more likely to agree that 'students generally follow instructions when they use DT in the classroom' in comparison to low DL educators (34%). This result reflects the attitudinal disconnect of both educator groups towards students, and perhaps, identified differences in student behaviour in the classroom of each teacher group.

Therefore, high DL students appeared more likely to focus on their schoolwork when using a one-to-one device and educators of high DL appeared more likely to be attuned to student responsiveness to instructions relating to DT. The above findings appear directly related to the greater confidence of the high DL participants, shown in Table 4.49, and in turn their greater DL and self-efficacy. Indeed, it is tempting to extrapolate from these results and assume that students with low DL may be somewhat disadvantaged in classrooms with DT. Once again, there are many questions about the low DL student group, indicative of a need for further study. It is conceivable they were generally students who performed poorly, or felt disaffected at school. If so, their poor DL may be reflective of poor school performance in many areas.

Table 4.53 Students with Low vs Educators with High Digital Literacy Disconnects on Classroom and Curriculum Use of Digital Technologies.

Classroom and Curriculum Use of Digital Technologies												
	Students with Low DL				Educators with High DL							2 DoF
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N_High**	**Chi ²**
I would say I am passionate about using DT in education	22.1	61.1	16.8	5.3	77.4	18.9	3.8	73.6	68.3	95	53	0.000
I have found that I have become more creative in using DT	23.9	63.0	13.0	10.9	75.9	16.7	7.4	68.5	57.6	92	54	0.000
DT and the Internet allow me to be more innovative when developing ideas or plans for assignments/classes	33.3	59.1	7.5	25.8	83.3	14.8	1.9	81.5	55.7	93	54	0.000
DT provide students with an opportunity to be highly creative	42.1	47.4	10.5	31.6	88.9	7.4	3.7	85.2	53.6	95	54	0.000
I feel confident in using DT in my classes	47.4	48.4	4.2	43.2	94.4	5.6	0.0	94.4	51.3	95	54	0.000
I think it is important for schools to explore student self-expression using DT	32.6	57.9	9.5	23.2	71.7	24.5	3.8	67.9	44.8	95	53	0.000
Students should be encouraged to use new technologies in schools	48.4	48.4	3.2	45.2	87.0	13.0	0.0	87.0	41.9	93	54	0.000
DT detracts from more important educational activities	21.1	65.3	13.7	7.4	18.5	31.5	50.0	-31.5	38.8	95	54	0.000
DT enhance cooperation in the classroom between students	17.4	66.3	16.3	1.1	48.1	36.5	15.4	32.7	31.6	92	52	0.000
I enjoy having my own school laptop	68.4	28.4	3.2	65.3	94.3	5.7	0.0	94.3	29.1	95	53	0.000
I am satisfied with my laptop and the way it is set up by my school	23.2	43.2	33.7	-10.5	51.9	14.8	33.3	18.5	29.0	95	54	0.000
I would rather work with pen and paper in the classroom than with DT	22.8	51.1	26.1	-3.3	15.1	37.7	47.2	-32.1	28.8	92	53	0.008
DT is well-suited to group projects	44.2	49.5	6.3	37.9	72.2	22.2	5.6	66.7	28.8	95	54	0.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.54 Students with High vs Educators with High Digital Literacy Disconnects on Classroom and Curriculum Use of Digital Technologies.

Classroom and Curriculum Uses of Digital Technologies												
	Students with High DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ²
I find that students work more efficiently when using digital technologies	71.0	17.0	11.9	59.1	37.0	37.0	25.9	11.1	48.0	176	54	0.000
I am satisfied with the way my laptop and the way it is set up by my school.	28.4	14.8	56.8	-28.4	51.9	14.8	33.3	18.5	46.9	176	54	0.002
Many students waste time when using the Internet at school.	42.9	26.9	30.3	12.6	73.6	9.4	17.0	56.6	44.0	175	53	0.000
Students/teachers should be limited/limit (in) their use of digital technologies.	13.6	27.7	58.8	-45.2	37.0	20.4	42.6	-5.6	39.6	177	54	0.001
Students tend to write more when asked to complete an assignment using digital technologies.	76.3	16.9	6.8	69.5	51.9	31.5	16.7	35.2	34.3	177	54	0.001
The quality of homework assignments and presentations is better when students use digital technologies.	79.9	13.8	6.3	73.6	56.6	30.2	13.2	43.4	30.2	174	53	0.002
Some students get bored in class if they are not using DT	71.6	21.6	6.8	64.8	60.4	15.1	24.5	35.8	28.9	176	53	0.002
I would say I am passionate about using DT in education.	55.9	36.2	7.9	48.0	77.4	18.9	3.8	73.6	25.6	177	53	0.006

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for $p < 0.01$.

Table 4.55 Students with Low vs Educators with Low Digital Literacy Disconnects on Classroom and Curriculum Use of Digital Technologies.

Classroom and Curriculum Uses of Digital Technologies												
	Students with Low DL				Educators with Low DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ²
I am satisfied with the way my laptop and the way it is set up by my school.	23.2	43.2	33.7	-10.5	59.0	17.9	23.1	35.9	46.4	95	39	0.000
DT provide students with an opportunity to be highly creative.	42.1	47.4	10.5	31.6	79.5	15.4	5.1	74.4	42.8	95	39	0.000
Students should be encouraged to use new technologies in schools.	48.4	48.4	3.2	45.2	89.2	8.1	2.7	86.5	41.3	93	37	0.000
DT detracts from more important educational activities.	21.1	65.3	13.7	7.4	17.9	33.3	48.7	-30.8	38.1	95	39	0.000
DT and the Internet allow me to be more innovative when developing ideas or plans for classes.	33.3	59.1	7.5	25.8	69.4	19.4	11.1	58.3	32.5	93	36	0.000
DT enhance cooperation in the classroom between students.	17.4	66.3	16.3	1.1	46.2	41.0	12.8	33.3	32.2	92	39	0.000
I think it is important for schools to explore student self-expression using DT	32.6	57.9	9.5	23.2	60.5	31.6	7.9	52.6	29.5	95	38	0.000
I enjoy having my own school laptop.	68.4	28.4	3.2	65.3	94.9	2.6	2.6	92.3	27.0	95	39	0.000
Students are less productive when they use DT in the classroom rather than pen/paper.	20.0	51.6	28.4	-8.4	15.4	35.9	48.7	-33.3	24.9	95	39	0.013

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

In the following Section, 4.2.4, survey items that revealed disconnects and attitudinal differences to the way digital technologies interface between home and school are explored.

4.2.4 Disconnects in Home vs School Use of Digital Technologies

In this section attitudinal disconnects between the various participant groups are discussed in terms of home use of DT, Social Media use and assistance from others. The tables in this section show the survey items related to this issue, only where disconnects were revealed by participant responses with an LoD>20.

While there were ostensibly disconnects in the numbers of participants of the various groups who indicated they enjoyed using the Internet at home, with high DL groups more likely to agree, a vast majority of all participants agreed that they enjoyed using it. Tables 4.57, 4.59 and 4.61 show attitudinal differences on this item between the groups.

Table 4.56 All Educator vs All Students Disconnects on Home and School Use of Digital Technologies.

Home vs School Use of Digital Technologies												
	All Educators				**All Students**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi ²**
DL is best developed at home rather than at school.	9.1	32.3	58.6	-49.5	32.9	52.9	14.2	18.7	68.2	99	310	0.000
Most of my DL has developed through my use at home.	44.9	22.4	32.7	12.2	69.6	25.6	4.8	64.9	52.6	98	313	0.000
Others should limit/be limited in their use of DT	46.0	18.0	36.0	10.0	15.9	33.3	50.8	-34.9	44.9	100	321	0.000
Friends and/or relatives often assist me in improving my DL	51.5	16.2	32.3	19.2	31.1	36.9	32.1	-1.0	20.2	99	312	0.001

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.57 All High vs All Low Digital Literacy Disconnects on Home and School Use of Digital Technologies.

Home vs School Use of Digital Technologies												
	All Low				All High							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Low	N High	Chi ^{2}
Most of my DL has developed through my use at home.	38.9	35.8	25.3	13.7	68.7	17.2	14.1	54.6	40.9	133	231	0.000
My use of Social Networking sites, online email, forums, wikis etc. has helped me develop DL	35.8	40.9	23.2	12.6	64.5	21.9	13.6	50.9	38.3	134	226	0.000
I enjoy using the Internet at home.	81.7	12.9	5.4	76.2	96.8	2.9	0.3	96.5	20.3	133	230	0.002

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Disconnects in Learning about Digital Technologies and Acquiring Digital Literacy at Home

In this section, the greatest disconnect was found on the survey statement 'most of my digital literacy has developed through my use at home'. In schools with one-to-one laptop programs it was anticipated that participants would be more likely to disagree with this statement. However, only in the case of low DL educators did more responses show disagreement, revealing that this was the only group that thought most of their DL had developed at school. Tables 4.56 to 4.60, 4.62 and 4.63 show a large majority of students (70%), all high DL participants (69%), high DL students (84%) and high DL educators (54%) agreed that most of their DL had developed in the home, while all educators (45%), low DL participants (39%), low DL educators (32%) and low DL students (46%) were less likely to agree. Numerous disconnects were found on this item, as shown in the tables. This finding reinforces earlier analysis, suggesting that schools were not meeting the needs of many stakeholders in this study, in training them in using DT or boosting their DL, since many were acquiring most of their DL at home.

Another survey statement where participants were asked to agree if DL was 'best developed at home rather than at school', revealed that educators were much more likely to disagree (59%) than students (14%), representing a huge disconnect (Table 4.56), with 33% of students in agreement. This finding was reiterated in Tables 4.60, 4.62 and 4.63. Students with high DL were the most likely group (37%) to agree that DL was best developed at home, which would have been a major concern for school e-learning leaders, that the most talented students in using DT did not value the contribution that schools made to the development of better DL. In addition, 26% of students with low DL also agreed DL was best developed at home. The finding here is that schools were not meeting the DL and DT training needs of many of their students. Educators, however, were more satisfied with school efforts, or saw value in school professional development. There is a pertinent question here, that if schools with one-to-one laptop programs were not seen by their students to offer support in developing DL, what would they need to change in order to develop effective DT programs and provide better DL training for students?

It would be expected that, if survey participants acquired most of their DL at home, that friends or relatives would have given them assistance. However, only a majority of educators (52% in Table 4.56) agreed they received such assistance, while students were divided, as shown in Table 4.59. Large numbers of educators and students with high DL, shown in Tables 4.58 and 4.60 appeared to be self-learners in DT and did not agree (>38%) that they received this assistance in improving their DL, very likely due to their higher levels of self-efficacy with DT. It was a major concern that the self-learners uncovered by this survey item, ascribed little importance to the role that schools played in educating them in the acquisition of DL and in developing skills in using DT. If schools generally have similarities with those in this study, they may need to rethink how they are approaching their student and educator needs for DL skill acquisition. Self-learning would be an unreliable way of developing skills and DL, since it is ad-hoc and presumably driven in part by an immediate need-to-know, on areas of interest for personal use, or entertainment. Although self-learning and learning to learn is valid, these findings suggest that the schools in this study did not have in-depth DT and DL programs that challenged their more skilled users.

Table 4.58 Educators with High vs Low Digital Literacy Disconnects on Home and School Use of Digital Technologies.

Home vs School Use of Digital Technologies												
	Educators with Low DL				**Educators with High DL**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi ^{2}**
My use of Social Networking sites, online email, forums, wikis etc. has helped me develop DL	35.9	28.2	35.9	0.0	59.3	24.1	16.7	42.6	42.6	39	53	0.001
Most of my DL has developed through my use at home	31.6	26.3	42.1	-10.5	53.7	20.4	25.9	27.8	38.3	38	54	0.006
Students should be limited in their use of DT	53.8	15.4	30.8	23.1	37.0	20.4	42.6	-5.6	28.6	39	54	0.058
Friends and/or relatives often assist me in improving my DL	59.0	15.4	25.6	33.3	46.3	14.8	38.9	7.4	25.9	39	54	0.117

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.59 Students with High vs Low Digital Literacy Disconnects on Home and School Use of Digital Technologies.

Home vs School Use of Digital Technologies												
	Students with Low DL				**Students with High DL**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi ^{2}**
Most of my DL has developed through my use at home	46.3	45.3	8.4	37.9	83.6	14.1	2.3	81.4	43.5	95	177	0.000
Use of Social Networking sites, online email, forums, wikis etc has helped me develop DL	35.8	53.7	10.5	25.3	69.8	19.8	10.5	59.3	34.0	95	172	0.000
Teachers should limit their use of DT	17.9	46.3	35.8	-17.9	13.6	27.7	58.8	-45.2	27.3	95	177	0.004
I enjoy using the Internet at home	78.7	18.1	3.2	75.5	95.5	4.0	0.6	94.9	19.4	94	177	0.002

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.60 Educators with Low vs Students with High Digital Literacy Disconnects on Home and School Use of Digital Technologies.

Home vs School Use of Digital Technologies												
	Educators with Low DL				**Students with High DL**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi ^{2}**
Most of my DL has developed through my use at home	31.6	26.3	42.1	-10.5	83.6	14.1	2.3	81.4	91.9	38	177	0.000
DL is best developed at home rather than at school	2.6	33.3	64.1	-61.5	37.3	49.7	13.0	24.3	85.8	39	177	0.000
Other should limit/be limited in their use of DT	53.8	15.4	30.8	23.1	13.6	27.7	58.8	-45.2	68.3	39	177	0.000
My use of Social Networking sites, online email, forums, wikis etc. has helped me develop DL	35.9	28.2	35.9	0.0	69.8	19.8	10.5	59.3	59.3	39	172	0.000
Friends and/or relatives often assist me in improving my DL	59.0	15.4	25.6	33.3	33.0	27.3	39.8	-6.8	40.2	39	176	0.001

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.61 Students with Low vs Educators with High Digital Literacy Disconnects on Home and School Use of Digital Technologies.

Home vs School Use of Digital Technologies												
	Students with Low DL				**Educators with High DL**							**2 DoF**
Statement	**Agr**	**N/U**	**Dis**	**A-D**	**Agr**	**N/U**	**Dis**	**A-D**	**LoD**	**N Low**	**N High**	**Chi ^{2}**
DL is best developed at home rather than at school	25.8	61.3	12.9	12.9	13.0	27.8	59.3	-46.3	59.2	93	54	0.000
I enjoy using the Internet at home	78.7	18.1	3.2	75.5	98.1	1.9	0.0	98.1	22.6	94	53	0.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.62 Students with High vs Educators with High Digital Literacy Disconnects on Home and School Use of Digital Technologies.

Home vs School Use of Digital Technologies												
	Students with High DL				Educators with High DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ²
DL is best developed at home rather than at school.	37.3	49.7	13.0	24.3	13.0	27.8	59.3	-46.3	70.6	177	54	0.000
Most of my DL has developed through my use at home.	83.6	14.1	2.3	81.4	53.7	20.4	25.9	27.8	53.6	177	54	0.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Table 4.63 Students with Low vs Educators with Low Digital Literacy Disconnects on Home and School Use of Digital Technologies.

Home vs School Uses of Digital Technologies												
	Students with Low DL				Educators with Low DL							2 DoF
Statement	Agr	N/U	Dis	A-D	Agr	N/U	Dis	A-D	LoD	N Stud	N Edu	Chi ²
Digital Literacy is best developed at home rather than at school.	25.8	61.3	12.9	12.9	2.6	33.3	64.1	-61.5	74.4	93	39	0.000
Most of my digital literacy has developed through my use at home.	46.3	45.3	8.4	37.9	31.6	26.3	42.1	-10.5	48.4	95	38	0.000
Friends and/or relatives often assist me in improving my digital literacy.	27.4	49.5	23.2	4.2	59.0	15.4	25.6	33.3	29.1	95	39	0.000

Note: Level of Disconnect (LoD) shows the difference in agreement levels on survey items between the two groups. N/U shows those who neither agree nor disagree together with those who are uncertain. Chi square results show the p-value with significant differences accepted for p <0.01.

Disconnects in Social Media Use

While high DL participant groups in particular shared positive views about the benefits of Social Media use in developing DL (Tables 4.6 and 4.12 in Section 4.1.2), Table 4.57 shows clear attitudinal disconnect on whether 'social networking sites, online email, forums wikis etc. have helped develop digital literacy', with high DL participants (65%) much more likely to agree that these factors had contributed, than participants with low DL (36%). High DL students (70%) and high DL educators (59%) had similarly significant disconnects with their low DL peers, as shown in Tables 4.58 and 4.59. This finding suggests that high DL participants were more likely to use Social Media and more likely to believe that learning about its online applications and tools, assisted in developing DL. Low DL participants were therefore less likely to be avid users of Social Media sites and tools. These findings were also supported by written educator comments on the surveys, that music teachers were 'unable to make online purchases of music from iTunes', due to school firewalls and that teachers wanted a 'more positive and open attitude to Social Media' since 'Twitter and social bookmarking sites have proven educational and pedagogical benefit', indicated that that some teachers wanted to access more Social Media tools. However, Social Media classroom use did not sit easily within traditional school programs in the survey schools, as the most popular Social Media sites were blocked in all cases. One student expressed the opposing view, that 'Facebook and Twitter [were] used excessively by teens' and that over-use of Social Media may have caused us to 'lose our skills to communicate effectively'. These two points underpin the debate that has been occurring in schools and society in general, around the issue of Social Media and online access by students at school and at home, a debate that goes beyond the scope of this study.

Attitudinal Disconnects in Limiting Use of Digital Technologies

Finally, there were curiosities surrounding the related issues of whether students thought teachers should 'limit their use' of DT, or that teachers thought students 'should be limited in their use' of DT. No suggestion was made for the participants as to why this might be the case, whether it could be because of the dangers of over-use or addiction, lifestyle or ergonomic reasons. High DL students, seen in Table 4.59, were far more likely than their peers to disagree that this would be necessary for teachers. Interestingly, this view may have reflected their thoughts of limitations to their own personal use. Only a very small number of students of either group agreed that limiting use would be advisable. However, 46% of all educators thought that students should be limited in their use of DT, representing a large disconnect with only 16% of students thinking the same thing about their teachers, shown in Table 4.56. There was also a disconnect between Low DL (54%) and High DL educators (37% in Table 4.58) who agreed that students should be limited in DT use. This again brings to the fore the issue of teacher control over student use of DT, as educators were far more likely to agree with a student control strategy, when it was suggested in the surveys, than their students thought was appropriate for teachers.

4.2.5 Survey Findings Summary

Chapter 4 has shown an investigation into the research question pertaining to attitudes to digital literacy (DL) and use of digital technologies (DT) in Victorian schools. It has also uncovered disconnects that relate to the second research question that sought information about disconnects between stakeholders that impact on digital education in Victorian schools with one-to-one laptop programs.

Findings that Relate to Digital Literacy

In respect of examination of self-assigned DL, educators and students did not rate their DL to be significantly different, so that digital native theory was not supported in this study. Hence, there were significant groups of students (35%) and educators (42%) that did not ascribe themselves high levels of DL. Similar numbers of students (65%) and educators (58%) also identified as having high levels of

DL and these similarities were confirmed by a highly significant correlation ($r = 0.948$ $p < 0.01$) between the two distributions, suggesting that DL was not age-related for survey participants.

In Table 4.5, educators appeared to over-estimate the DL of their students, in comparison to student self-estimates of DL and ability to use DT in the classroom. These educator opinions appeared to be very likely influenced by media commentary, rather than having any basis in fact. Student ratings of educator DL were more accurate than their teacher's, according to the self-estimates of these groups.

Findings of Disconnects between Stakeholders that Impact on Digital Technologies

There were many disconnects between the various stakeholder groups of high and low DL students and educators uncovered in the survey findings in this chapter.

The findings from the surveys show attitudinal disconnect between educators and students on items that related to educator and school control over student behaviour. Vastly more educators (62%) than students (9%) thought 'the Internet is needing guidance by teachers', revealing teacher belief that control over student Internet use was of high importance in classrooms. A large majority of educators (>74%) would have liked students to obtain more training in DT, in comparison to small numbers of students.

Further to the issue of educator control over students, educators (76%) agreed that students could become dependent on using DT and that they should be limited (46%) in using it in the classroom. Educators also had a high level of agreement with the risks of using Web 2.0, generally known as Social Media, in schools, which was likely to be one reason why survey schools made attempts to block Social Media. Schools locked-down school-provided laptops, in network, Internet and Social Media access; and ICT Technicians installed monitoring software which caused student frustration and disconnect with educators, school policies and decision-makers.

Students believed that educators had difficulties in using DT in the classroom and believed that low DL educators needed more classroom support when using DT. This was one finding that related to training in DT, indicating that decision-making and school leadership in implementing DT programs represented one of the shortcomings in these programs. Many findings similarly point to the likelihood of poor training programs in the use of DT in survey schools and in the acquisition of DL.

There was some educator and student resistance to the use of DT in the classroom that has been revealed by the survey findings, as there was minority agreement that pen and paper was preferable to DT and there was educator division about whether the use of DT detracted from other important educational activities. Low DL students and educators were also less passionate about using DT in education.

Most stakeholder groups in this study, particularly those with high levels of DL, reported acquiring more DL in the home than at school. The type of DT used in the home was likely to relate to gaming, Social Media and DT for entertainment and suggested the development of indeterminate skills in areas that schools did not necessarily explore. A significant proportion of students (33%) also agreed that DL was best developed at home. Yet those with low DL were hampered in their DT use at home by their own incapacity to self-learn, due to poor self-efficacy with DT. There were disconnects here between home and school uses of DT and between high and low DL stakeholders. Survey schools did not appear to be meeting the needs of their students and educators in training them in uses of DT or in the acquisition of DL.

Low DL students were much less optimistic about the value of DT, had the most negative views towards the use of DT in schools and were the most resistant to learning about DT and acquiring more DL. They were also the group least able to recognise the importance of DL in future employment. Students with low DL showed the least agreement with many survey statements. This may have reflected a disaffection with schooling generally and represented a group that requires further study into their attitudes, not only to the research questions here but to learning, schooling and authority.

Positive Attitudes to Uses of Digital Technologies in the Classroom

There were many shared positive attitudes, between students and educators, relating to uses of DT in schools. These included support for laptop programs and use of DT in school classrooms. Most students and educators also valued uses of DT and showed confidence in using it, demonstrating high self-efficacy. They also agreed that it enhanced creativity, innovation, self-expression and learning by discovery. These findings together with agreement that DT was well-suited to group work, supported constructivist pedagogies, the 4Cs and the SAMR model in using DT.

There was a general agreement amongst stakeholders that DT enhanced the quality of presentations and that students write more, showing a boost in efficiency when DT is employed in education.

Conclusion

These findings suggest that schools may not be meeting the needs of their educator and student stakeholders in terms of DL acquisition and in skill development in using DT. There may be avenues for making improvements in group learning and applying constructivist learning practices and modern pedagogies. DT was recognised by stakeholders as being associated with creative and innovative research and discovery. DL was also seen to be enhanced by stakeholders through uses in gaming, Social Media and entertainment. Schools may need to make changes to school decision-making practices, in implementing DT and DL programs, to better inform and train educators and students.

This brings this chapter and the discussion of survey findings that relate to the two research questions that relate to attitudes and attitudinal disconnects on uses of DT and the development of DL, of participant groupings, to a close. In view of the findings in this chapter, a number of interviews were conducted in Stage 2 of this study, with skilled school DT practitioners, that allow further in-depth analysis of the issues at play in DT provisioning, decision-making, training and professional development in schools.

Each of the major findings outline above will be further explored and teased out through the Stage 2 interview findings analysed in Chapter 5 and synthesised in Chapter 6, where findings that pertain to all four research questions are integrated.

5 Stage 2 Interview Analysis and Findings

Attitudinal congruence and disconnects uncovered by the Stage 1 survey findings discussed in Chapter 4, created a need for more in-depth appraisal of some of the issues raised from these findings. Hence, in Stage 2, a series of 10 semi-structured open-ended interviews was undertaken. These allow survey findings to be expanded and elaborated upon. The initial interviewees were derived from skilled ICT and e-learning professionals and presenters at digital learning conventions in Melbourne, Australia. Further interviewees were obtained using a snowball sampling methodology, discussed in Chapter 3, where previous interviewees indicated others who might be of value to this study.

Interviewees occupied a number of relevant leadership positions in schools from all Australian school sectors: Government, Independent and Catholic. These schools had provided a variety of digital technology (DT) access policies and a range of hardware devices that students and educators could use, ranging from one-to-one laptop programs, mixed student tablet/laptop access to BYOD devices where students could bring any device including smartphones.

The intention of undertaking these interviews was to determine if there were any commonly identified issues or problems in schools that use differing access and hardware policies, which may reflect some of the findings exposed by the surveys, particularly in relationship to the four research questions. In this chapter there is an emphasis on how schools train stakeholders and on decision-making. This chapter therefore allows a more in-depth appraisal and fleshing out of the findings from Chapter 4, where issues that relate to training stakeholders in the acquisition of digital literacy (DL) and in using DT, was identified along with indications that informed decision-making may be one cause of shortcomings in implementing DT programs in schools.

In this chapter the following four research questions are discussed in relationship to the interview data, with emphasis placed on the last two:

1. What are the attitudes of the various stakeholders towards digital literacy and use of digital technologies in education?
2. What are the disconnects between stakeholders that impact upon the use of digital technologies in the classroom?
3. How do schools train stakeholders in the acquisition of digital literacy and in using digital technologies and how effective are these methods?
4. How are decisions made in providing training in digital literacy and in implementing digital technologies in digital education? Are there decision-making and change management

practices that allow for more effective provision of digital literacy and implementation of digital technologies?

In this chapter qualitative data from the interviews, pertaining to the research questions, is investigated through thematic analysis. There were several major themes underpinning these interviews, each of which stemmed from findings or implications from the survey results and analysis. These themes include educator interviewee attitudes to hardware and software, to online resources available in the classroom and to curriculum uses of DT. These opinions then flow into an explanation of the disconnects observed by the interviews in their schools. Additional themes explore training for students in DT and in acquiring DL, professional development for educators in DT and associated school decision-making that impacts on professional development in DT and in provisioning and implementing new DT in schools.

Each of these major themes derives from the mind-map that was created and shown in Chapter 3, Section 3.3.2. For convenience this is shown again below. It incorporates coding elements that were derived from the interview data. The interview data was coded using specialist software into sub-sections as derived from the mind-map shown in Figure 5.1.

Section 5.1 Background to the Interview Data

5.1.1 Mind-map of Factors used in Thematic Analysis of Interview Data

The mind-map in Figure 5.1 shows the main areas of interest that are associated with the use, training and professional development of digital technologies (DT) in schools and where acquisition of digital literacy (DL) occurs. These areas are then coded according to the elements or nodes that underpin these areas. This mind-map enabled a coding system that could be applied to the interview responses and allowed comparative thematic analysis.

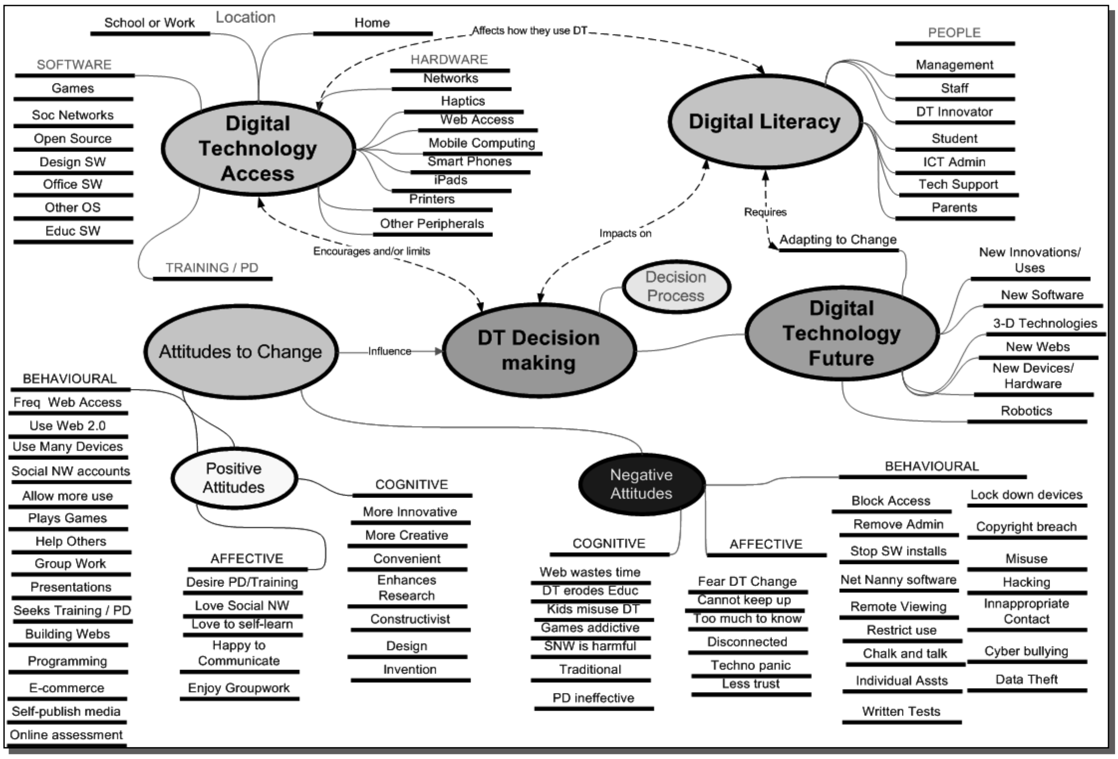

Figure 5.1 Mind-map showing areas of interest and overlapping issues. From this overview interview questions were formulated. (Copy of Figure 3.1)

Coding was undertaken by grouping comments from the interview transcripts into the coded elements in the diagram, shown above, that was developed prior to undertaking the interviews.

Groupings of coded responses were then also made according to the areas of discussion seen in this chapter, which mirrors the structure of Chapter 4, the research questions themselves, and the sub-headings shown: attitudes to digital technologies and digital literacy, disconnects between stakeholder impacting on digital technologies, training in digital technologies and decision-making in digital technologies in schools.

Sampling of Interviewees

Sampling of the interviewees occurred through a snowball sampling methodology. Initially, interviewees were selected due to their leadership roles in training other e-learning specialists at education conferences. Each initial interviewee was also asked to indicate another educator who might make a useful contribution to the research questions and to indicate another educator who may be able to represent the point of view of educators in differing school sectors: Government, Catholic and Independent schools. Finally, teachers representing various curriculum areas and areas relevant to e-learning were selected: specialist ICT teachers, e-learning specialists and teachers of varying subject areas. In this way, all school sectors, many subject areas and all school types could be touched on. There was a total of ten interviewees chosen for the in-depth interviews, each of which lasted from 30 to 70 minutes. Each of the interviews was then fully transcribed and these responses were then coded according to the above areas and research questions. There was significant repetition in the interview findings that eventually gave cause to end the sampling and interview process. Several themes became apparent from the interviews including decision-making processes and methods of leadership in the interviewee schools.

The 10 interviewees chosen, each had significant levels of self-assigned DL, they represented classroom teachers, skilled DT users, e-learning specialists or teacher trainers and senior curriculum leaders. There were no ICT managers or administrators interviewed in this study, although several interviewees worked closely with them and with their curriculum and school leaders. Several were also actively involved in the decision-making processes in their schools in relationship to the acquisition of new DT. There were also no Principal class school leaders who participated in the interview process. Each of the interviewees was therefore able to reflect personally on their views of uses of DT from the coalface of the classroom. Almost every interviewee reflected on several schools that they had taught at previously and they were able to reflect upon the development of DT programs and training in these schools. Interviewee contribution and roles in school provision of DT are shown in Table 5.1.

Table 5.1 Interviewees and their school types and roles (repeated from Chapter 3).

School Type	Classroom Teacher	Skilled DT User	ICT or e-learning Specialist	Senior Curriculum Leader	Device Type Used in School
Independent Coeducational School	Ingrid, Robert, Michelle, Kellie, Samantha	Ingrid, Kellie, Samantha, Michelle	Michelle, Kellie		School Laptop, BYOD, Tablets, Computer Labs
Catholic male School	Samantha Lauren	Samantha,	Samantha,		Tablets, Computer Labs

Catholic female School	Adrian, Lauren	Adrian	Adrian		Tablets, Computer Labs
Independent female school	Terry, Michelle	Terry	Terry	Terry	Tablets, BYOD, Computer Labs
Independent Male school	Carolyn, Robert	Carolyn		Carolyn	School Laptop, Tablets, BYOD
Government Coeducational School	Rory, Robert	Rory	Rory		BYOD, Computer Labs

5.1.2 Research Questions and Themes for Coding

From the survey data analysis, several themes were derived that appeared suitable for the interviews. These were mind-mapped and nodes or sub-themes were derived, as shown in Figure 5.1, for discussion and coding purposes. Each of these elements was then phrased to provide interviewees with stimuli for discussion. The following table reveals these themes for the open-ended interview questions.

Table 5.2 Themes and links to research questions.

Interview Themes	Research Question
Past and present experiences with digital technology and digital literacy.	Research question 1
Access to DT, training, learning and PD.	Research question 3
Disconnects at School vs Home –access difficulties to DT and acquisition of digital literacy.	Research question 2
Best practice: Innovation and best practice in using digital technologies in schools	Research question 3

Disconnects and difficulties in relative access to digital technologies in schools	Research question 2
Disconnects: Mobile Technologies – Security and Online Risks and Dangers filters and fears	Research question 2
DT Decision-making – decision-making processes and digital technology teams.	Research question 4
Change in uses of digital technologies in schools – possible future predictions	Research question 4

Responses to these interview questions were then mapped into areas that related to the original research questions. In each of the sections that follow, selections from the coded responses are used to guide the reader and illustrate the views of the interviewees. These sections are separated into sub-headings that relate to the coded responses. Several tables in this section are provided to show sections of the coded interviewee responses. The full text of the interview questions is shown in Appendix 2.

The sections from 5.2 to 5.5 each relate to one of the four research questions: attitudes to digital literacy and digital technologies; reflections on disconnects with DT provisioning; reflections on training programs in use of DT and reflections on decision-making and leadership.

Section 5.2 Interviewee Attitudes to Digital Literacy and Use of Digital Technologies

5.2.1 Interviewee Attitudes to Acquisition of Digital Literacy

In the following section interview data is analysed to provide information pertaining to the first research question: stakeholder attitudes to digital literacy. Survey data analysis in Chapter 4 shows a high correlation in student and educator distributions of self-reported digital literacy (DL). Each of the interviewees reflected on teacher and student DL, skills in using digital technologies (DT), and the training and professional development that they received.

Educators were almost as likely to have a high DL as their students, according to the survey results. Of the 10 interviewees, 6 believed that educators, such as Design, Media, ICT teachers, and e-learning professionals were highly likely to have a higher level of DL than their students. Interviewees also reported that educators across a variety of subject areas also had high levels of DL. Interviewees believed that many educators had acquired advanced skills in using classroom DT, through experience over a number of years. The interviewees themselves included teachers of Humanities (Ingrid), Art (Robert) and Mathematics (Lauren) who believed they were, in Lauren's words, "quite tech savvy." Lauren felt she was "really lucky because I have been trained since day one on the laptops", and interactive whiteboards. Hence, where teachers had acquired training in using DT and internalised what they had learnt, they had developed a high DL.

All interviewees agreed that the acquisition of DL was related to experience, enthusiasm, training and access to DT both at school and in the home. Interviewees each reported that highly skilled educators in specialist areas had greater DL than their students, particularly in online research skills and in using DT relevant to their curriculum areas. Each of the interviewees had used specialist hardware, software or online resources at an advanced level for several years.

6 out of 10 interviewees in this study, had provided training for other educators, either in their own curriculum areas, or for other educators within schools. Hence, each of these interviewees was a specialist who had acquired advanced skills relative to their colleagues. The majority of interviewees had a self-reported high-level of DL. The specifics of these experiences and uses are expanded on in the following sections. Interviewees also reflected on educators who have low levels of DL.

Attitudes to Educator and Student Digital Literacy

Interviewee opinion supported the premise that low educator DL limited DT use in classrooms. There were numerous educators in interviewee schools that had low levels of DL. Whether this is likely to be the case in each secondary school in Australia, and could be generalised to other countries, at this point in time, is open to question.

Interviewees, other than Kellie, also thought large numbers of students and educators in their schools were likely to have high levels of DL. This interviewee opinion is consistent with survey findings outlined in Section 4.1. It should be noted that Kellie thought her school had an exceptional teaching team who had been selected by their Principal for their high level of DL; in this way, her school may be an exception to the general rule. This finding reinforces the survey findings in Chapter 4, that educators and students had no significant difference in their DL. It also illustrates that schools could select educators with a high DL and impact on the effectiveness of their DT programs.

Interviewees recognised high and low DL student and educator groups that provided further depth to understanding their similarities and differences. Lauren believed that students and educators were similar in DL because "teachers are above average in the community" in terms of DL. She also recalled that educators were not required to use DT in their classrooms in several of the schools she had taught at and that these educators therefore did not develop better skills. These comments supported the notion that educator and student DL may be similar due to the generally high levels of ability of educators to use DT.

Several other interviewees mentioned low DL groups of educators within their schools. Michelle, Ingrid and Robert articulated this observation most clearly and two referenced the term “Luddite” when reflecting on their colleagues. This finding is reflective of implications shown in the literature that DL in schools may be more complex than otherwise assumed (Waycott et al., 2010). Michelle succinctly identified one group of educators in her school who struggled most with using DT. “There will always be that gap,” she explained, between those that were skilled and those that were not. “Women who are 50 to 55 years old ... have the hardest time” with DT. She explained at length that many teachers used age as an excuse, while Michelle, herself, was 67. She opined that a lack of skills was due to a lack of practice. “If you don’t practice you don’t use,” the DT skills learnt. “We are always going to have those people ... the Luddite ones who are not in the slightest bit interested in learning more.” Michelle was astounded that there were teachers at her school “who do not know how to rename a file.” Ingrid reiterated Michelle’s concerns, suggesting “there are about 50% who are Luddite” in her school, who were “almost proud that they are not using it ... they jokingly say well I am not very good with technology.” Ingrid thought that that this group were “getting away without using technology” and that her school should aim for “a shared culture or standard that people are working toward,” with DL. Robert also thought that it was surprising how poor the DL of educators was “it defies belief [how poor they were].” He agreed with Ingrid’s sentiment that DL was “a learning mandate that they should be putting into schools” that “needs to be monitored and reinforced by schools.” He also hoped the Australian Curriculum (ACARA, 2018) in Digital Technologies would eventually be implemented effectively by schools. Hence interviewees were in general agreement that there were limitations to educator DL; although they also recognised that not all teachers have poor skills. “There are teachers who are really good with technology and who love using it,” even if they were in the minority. However, the general interview consensus was that there were a range of skillsets found amongst educators in their schools, reflecting survey findings. Concerns were raised about the impact of low DL educators on the DT program and on how schools have low DL expectations.

Whilst there were varying opinions and attitudes amongst the interviewees towards student DL, all interviewees were aware of student limitations in using DT and reported a variety of scenarios where low student DL was noticeable. This was often attributed by interviewees to a lack of school technology equipment for students in their schools and minimal DT curricula, further discussed later in this chapter. 6 out of 10 interviewees were disparaging of poor DT training programs in schools. Michelle was the most outspoken in stating students had poor DL, while Kellie was the most optimistic.

Michelle saw low student DL as a matter of motivation. "It isn't the teachers, it is the kids," who lacked the motivation to gain good DL. "The kids are so ignorant about I.T., unbelievable! When I teach my Year Nine class, I have to say, 'this is a folder'. They don't get it and they don't understand." She was concerned that "students ... do not explore" with DT, like they did in past years and thought curiosity was diminishing. Michelle thought parents over-rated the abilities of their students to use DT. "Parents say to me 'my kid's good at IT, he is on it all the time'," which she felt was not a gauge of student ability since the student was most likely "on Facebook and Angry Birds! Heck no! That is not a skill in IT." This reflected the views of several interviewees who saw gaming and Social Media, more as distractions than enhancements to DL, contradicting the views of many survey participants. Michelle expressed the view that there was a dumbing-down in general DT use in the wider community, due to ease of use of smartphones, games and Social Media.

Robert was an interviewee who took the middle ground, suggesting that, while students did not have a high level of DL relative to their more skilled educators, they did have an advantage with DT over many parents and teachers since: "what they do have is a consistent interaction with it (hardware) at a level, so it is more of an intuitive device for them." Rory agreed with this perspective since students bringing one-to-one devices to school had "more familiarity with the tool and content," than they would have without a school device.

Within these reports from interviewees, there were implications for schools. Interviewees from schools with committed administrations, like Kellie and Terry, appeared to have more satisfaction with student levels of DL. Other interviewees observed that student DL was not high in comparison to their school's highest skilled educators, but familiarity with technology may have given students an edge over teachers who did not have great familiarity with technology. It is not enough to say that DT abilities were similar between students and teachers, as each would have a different range of skills appropriate to their own uses.

5.2.2 Interviewee Attitudes to Online Risks and Security

Students face risks in school use of DT that schools must manage, as discussed in Chapter 2. A number of issues were discussed by the interviewees that touched upon the risks that students faced when online and the security issues faced by schools. Schools may lockdown access to sites, through Internet filters and software, provide legal protection from unsavoury or criminal online elements and be concerned about student dependency on using DT.

Fears that Limit the Use of Digital Technology

For many educators, fears need to be recognised and surmounted before DT can be utilised effectively in their classrooms. Several interviewees acknowledged the fear factor in their schools. Carolyn recognised that “technology is scary, it is so scary because it changes so fast.“ To utilise DT effectively an educator needs to work with a level of confidence and this takes time. “It might take people five years to overcome their fears and I was one of those people,” Carolyn explained. As a leader in the use of DT in her school, Carolyn was an example of an educator who had surmounted her fears. She thought that it was a matter of being philosophical and accepted that “you can never know everything.” For Robert the fear factor was a problem for educators, because they needed to understand what they were using; “you have people (who) don't understand it (DT), and people are afraid of what they don't understand, I think”. Michelle saw self-pride in the equation too. She thought that if educators did not know how to do something “it freezes them for a long time; they are terribly scared.” If they had to “ask someone a stupid question that little thing impedes their progress and stops them moving on at all and they are not interested in learning.” Studies in self-efficacy in using DT (Prior et al., 2016) indicate that schools needed to focus on training educators in using new DT.

Mobile Smartphone Dependency

In the Literature Review in Chapter 2, there were significant findings that related to dependency on digital technology (Rehbein et al., 2010). Smartphones were most related to addictive behaviour, according to the interviewees. School decision-makers need to be aware of the potential advantages and risks of using smartphones. The connectivity and convenience of these devices made them seem essential to the interviewees. Carolyn said, “I always have my phone in my bag.” Ingrid, who openly admitted to a phone “addiction,” said of her phone, “I use that all the time ... for professional development ... twitter ... curating sites ... information from the Internet. ” In day to day life, she said, “I read newspapers online, on my iPhone all the time” and over the previous few years “smart phones have been the biggest change for me” in terms of DT. Carolyn was also highly phone dependent, saying “if I am not connected, I feel blindsided ... I can’t go a full day without checking it. I don’t know what that means,” suggesting that she needed to feel connected “my mobile phone ... it’s connected everywhere”. Rory expressed frustration his Principal used it to text even during their meetings. There is evidence here that smartphone addiction was a significant issue in interviewee schools and for educators and students.

The lack of an official phone policy was a major shortcoming for Michelle, who was aware that “we (all) have a mobile phone” and “we have no official policy.” The generally accepted rule was “you can’t use your mobile phone in class.” She expressed anxiety that “no one has amended it [the policy] or looked at it”. School leaders had asked teachers to “take the phone away” from the students. “I have never taken a phone off a kid. I won't, and I can't”. She explained that it was a personally owned device and parents expected to contact their children at school, which created a dilemma for decision-makers. Michelle had her students leave their phones at the front of the computer laboratory, but “If something comes up [like] an emergency [they can use it]". Her school faced a serious issue when a parent demanded the return of a phone that a teacher had locked away and forgotten. They then asked to see the non-existent school policy to check its legality, with ensuing conflict. This story carries a strong message that schools need to be aware of individual rights, device ownership and the importance of developing policies that are lawful and accepted by all stakeholders: teachers, students and parents.

Gaming and Internet Addiction

There was a strong awareness amongst all interviewees that Internet and gaming dependency was a major problem for a significant number of students and teachers at home and at school, as shown in Chapter 2 (Block, 2008; Kuss et al., 2013; Young & Nabuco de Abreu, 2011). However, interviewees thought serious gaming addiction, while prevalent for a number of students, was seen both, as an issue for a minority and one that was primarily an issue in the home for parents. Students in laptop schools reportedly flicked from one screen to another so teachers were generally unaware what distracting technology it was that engaged students, whether it be a website, game or Social Media. Teachers with lower levels of DL were least equipped to deal with these distractions and less aware when they are occurring with some frequency. This finding also confirmed and supported survey findings on DT distractions.

Network Connectivity Issues

Interviewee schools often faced network access or software availability issues no matter which device options were chosen by school decision-makers. Kellie indicated the challenge facing schools under a new DT system. "It was kind of like death by fire when we first introduced it [BYOD] into the space, and none of us knew just how much troubleshooting we would have to do". Educators were unprepared for the pressures that student Internet access placed on them in classrooms. In Kellie's case "the very first day they brought them in ... we kind of expected them to know how to access the Wi-Fi, and the Internet [but they didn't]." Training in DT, particularly in network and Internet access for educators in BYOD classrooms was seen as crucially important in her school. According to Kellie, "it was definitely a very steep learning curve for both us and them on how to operate on a range of machinery". In her case, she adapted quickly "if a student has trouble getting access on their Mac, even though I'm more confident on a PC, I know how to navigate the basics on the Mac, to help any student or staff for that matter". These educator needs, to master the systems in place, must be taken into account by school decision-makers, when professional development considerations are made.

5.2.3 *Attitudes to Classroom Use of Digital Technology*

This section investigates interviewee attitudes to the use of DT in schools to provide further findings that relate to the first research question on stakeholder attitudes to the use of DT in education. Following on from Chapter 4 findings, it follows that if high student DL relates to access to DT, then interviewees from schools with better DT access would rate their students with higher DL. However, the data was limited in this regard due to the low number of interviewees. Further quantitative and qualitative research could clarify this question.

An Unremitting Wave of Technological Change

All interviewees felt DT change was an inevitable and irresistible force that was having an impact on private, professional, home and school life. The pace of this change was seen as difficult or impossible for schools to keep abreast of, as they were slow to adapt. Kellie best expressed this belief, that the speed of "change is almost exponential at the moment ... in the last 12 months it has gone off the scale". The impact of this change on classroom use of DT had universally created disconnect and disharmony in all interviewee schools.

This wave of change was reflected in a wide variety of DT tools used in the schools of the interviewees. Social Media, video streaming, classroom display technologies, specialist software, laptops, tablet computers and smart phones were all mentioned by interviewees. The impact of these tools on schools was significant but varied. Robert pointed out that "new technology is becoming obsolete really quickly ... it is imperative that schools keep up with that," while simultaneously musing that none of his schools had been able to keep up with the pace of change. Ingrid brought into focus the magnitude of the problem schools faced in imbedding DT into the curriculum, that education was "a really big system and it is a slow system, it is like turning around the Titanic ... it will take a long time" to change. 8 out of 10 interviewees thought that schools would be unable to keep pace with change unless fundamental changes occur in the way they manage access to DT. Kellie, was an exception, although she concurred that change in traditional schools "was pretty slow," when she started teaching; whereas, "now what we are doing is completely different," in her Internet enabled BYOD classroom. She was one of two interviewees who acknowledged that her school encouraged wholesale change in the classroom dynamic by integrating DT. Herself and Terry both differed from the other interviewees, being highly optimistic and positive about the incorporation of DT. The remaining interviewees each struggled with restrictive school management decisions, that undermined what they were attempting to do with DT.

Attitudes to Digital Technology Devices in Schools

In interviewee schools, there was a range of student DT hardware; including computer laboratories, one-to-one student tablets or laptops. Each device choice brought separate challenges for educators and students. Each student and teacher using a new device faced different learning curves and brought a particular set of attitudes towards the devices used. While more than half of the interviewees had been involved in school laptop programs, they had also worked in schools with other devices. Educator attitudes towards these devices varied significantly amongst the interviewees. For example, Kellie found her schools BYOD system, which was restricted to laptops, to be effective. However, Rory cited significant problems with BYOD, with smartphones being primarily used in his school. In the first instance Kellie believed she had excellent ICT support, while Rory thought the opposite. Hence, it seemed likely that the success of new systems was dependent on the level of ICT support.

Consistency of devices was preferred by the majority of interviewees, as it allowed students to have software consistency. It was also seen to be associated with better ICT support. A large range of devices, often found in BYOD, required more trouble-shooting and professional development for teachers to support their students. BYOD brought the highest degree of device complexity into interviewee classrooms and had challenges in network access, online safety concerns and software consistency.

Educators who had worked in one-to-one laptop or tablet schools, such as Rob and Ingrid, mentioned fewer hardware and software problems. However, in schools that provided laptops on trolleys, as in Adrian's case, a high rate of hardware problems was reported. Teachers who were able to access computer laboratories reported a very low level of hardware error in comparison to others, although both Samantha and Michelle indicated that access to the laboratories was limited to a few classes, such as ICT and Media subjects and the laboratories were gradually being phased out in favour of other solutions.

Table 5.3 shows personal DT device access in the schools of the interviewees and lists the school types that used them.

Table 5.3 Hardware access and device details in interviewee schools.

Devices	Research Comments	Participant	School
BYOD	In BYOD the main device used by students was brought to school by the student, with some limitations e.g.: only tablet or laptop (no smartphone). Smartphones were encouraged in Rory's school. Educators in BYOD schools were provided with laptops. BYOD devices may be locked down by school technicians, as in Rory's school.	Rory, Kellie, Carolyn	Government coeducational school, Independent coeducational school, Independent single-sex male school
Laptop programs	Students were required to lease or purchase a laptop provided to the school by a supplier, this system was used in all the survey schools with laptop programs.	Robert, Ingrid,	Independent coeducational schools
Tablets iPads	In Tablet/iPad cases, these were provided to students by the schools, either as part of student enrolment fees or leased.	Carolyn, Adrian, Terry, Lauren	Independent male School, Catholic coeducational school, Independent female school
Computer labs	Desktop computers were located in specialist computer laboratories. The labs were in short supply and dominated by subjects like ICT.	Samantha, Michelle, Robert	Independent coeducational school, Catholic male school, government coeducational school
School Laptops and trolleys	Classes shared laptops on trolleys, often with fewer than one device per child. The reliability of these devices was questionable in all cases they were mentioned.	Adrian, Lauren, Terry	Catholic female schools, Independent female school
Wireless network	Every school allowed educators to access a wireless network to access the Internet and	All except Robert (one	All

access (Wi-Fi)	network services. Schools with laptops, BYOD or iPads for students also offered this service to students. In the three schools where school computer labs were used there was no student Wi-Fi access.	of his schools), Samantha, and Michelle	

Rory believed that it was more difficult to teach ICT classes with BYOD smartphones than in a computer laboratory that has desktops. Adrian, Rory, Samantha, Robert and Michelle had also used computer labs regularly, with Michelle seeing them as highly advantageous, since, "in a computer lab, I can pretty much monitor what is going on." As an Information Technology teacher, Michelle had used a computer lab for twenty five years. Michelle expressed disquiet because her school had "eliminated two labs," due to the incoming BYOD system at her school. She was concerned that teachers would need to adapt suddenly to the use of one-to-one DT in their classrooms and that the BYOD system would require additional expertise by educators and training of students in using DT. However, she believed that using one-to-one devices would not be effective for the majority, as teachers would not "take time out of their English or Maths or whatever" to use DT. For many educators, the introduction of one-to-one DT meant a significant shift in classroom programs and learning processes. Michelle, Rory and Adrian all agreed that there was better control over student behaviour in a lab. This finding illustrates the importance of student control that educators felt was an important consideration, mirroring the findings that related to student control in Chapter 4.

As Table 5.2 shows, the range of devices in the schools of interviewees was very high, with each school attempting to find a balance between student access and available funding. Aside from one-to-one laptop access there were classroom trolleys of laptops, computer labs, tablets and one-to-one BYOD (bring your own device). BYOD itself may mean students in one class may have a variety of devices from laptops and tablets to smartphones, of differing brands and specifications. Some schools restrict students to either a BYOD laptop or tablet, while others were truly device agnostic, as in the case in Rory's school.

Laptops in schools of interviewees came in three different guises:

- As part of a school controlled one-to-one laptop program, as in the survey schools;
- In a laptop trolley arrangement where a trolley contained enough laptops for half of the class, often used in a 1:2 ratio;

- As part of a BYOD system, where students brought their own laptop of any type, with or without school controls.

Each of these arrangements was noted in interviewee schools with varying degrees of perceived success and limitations.

Laptops on trolleys was one solution thought by interviewees to be an ineffective solution. Laptop trolleys were found in Lauren and Adrian's Catholic female schools where they were booked in advance by teachers. Adrian, as an e-learning specialist, was sharply critical of this setup. He said few teachers could access them because "there are (only) seven laptop trolleys in the school." He listed a litany of problems that he had observed: "15 of the 25 machines ... weren't recharged;" "the kids can't log in [to the network]"; teachers "send a lot of kids over to the IT office ... to get passwords reset" but they "can't hook up to the domain". Adrian said that this process "happens ... most of the time ... it is very frustrating" and it actively discourages teachers from using the trolleys. In Samantha's Catholic male school, they introduced laptop trolleys but they "weren't used that frequently," due similar unreliability. Laptops on trolleys in interviewee schools have more problems, due to maintenance issues, than any other solution. There were observations that communal provisioning resulted in lack of ownership, and no responsibility to look after the devices on the trolleys. Hence, laptops on trolleys produced conflict and disconnect between teachers, decision-makers and ICT Technicians.

Three of the schools of the interviewees had a BYOD system of provisioning classroom devices. These schools included Rory's coeducational Government school, Carolyn's Independent male school and Kellie's Independent coeducational school. Each interviewee was in support of the BYOD policy. The advantages of tablets and phones in BYOD were obvious to Rory because "a laptop takes a few minutes to boot up, and a few minutes to shut down", while phones and tablets didn't. Rory was also aware that BYOD, regardless of device, was "changing the way students engage in the classroom". However, BYOD had little device consistency and brought significant challenges in these schools. At Kellie's school "students have their own devices ... for doing various things ... some have iPads, some bring their own laptops, [some] use their mobile phones". Rory discussed how his teaching has significantly changed. "It is a different kettle of fish ... where every child has one device of a particular sort", although there were some benefits with BYOD, since "it is easier to get the kids to engage with material, outside the classroom". Hence, the range of opinions about BYOD was large, with perceived benefits and problems.

5 out of 10 interviewees, (Samantha, Lauren, Robert, Rory and Ingrid), had recently worked in one-to-one laptop schools. Each of them agreed with Carolyn's reference to the SAMR model that, in their

schools “the laptop was purely used as a replacement – as a writing tool (with) no pedagogy” and teachers were rarely trained in how to use it. Samantha thought that laptop programs were “not very effective” and were used as replacement tools because “all we've done is taken computers and put them in the classroom”. She also referred to school obstructions that limited student capacity to freely explore with their laptops, because “we’ve locked everything down, so we can't even use them [in the classroom] like kids use them at home”. These thoughts mirror some of the findings from both the surveys in Chapter 4 and the Chapter 2 Literature Review that there were issues with DT access, training, implementation and with excess security.

Attitudes to Tablet Computers

While there was some optimism about tablet use in interviewee schools, their introduction as a one-to-one device was reportedly beset with problems stemming from the areas mentioned above: poor implementation decisions, poor training and student misuse. Interviewees reported that students were familiar with tablets since they had used them at home and they became quickly skilled at using them for gaming and bypassing firewalls, at 30% of interviewee schools.

5 out of 10 interviewees referred to the use of tablets in their personal lives. This included Terry, Lauren, Carolyn, Samantha and Adrian who used them for numerous tasks, including: webpage access, video calls, watching movies and game playing. “In my personal life, the introduction of iPads has been quite something,” Adrian said, reflecting the universal view. He was most excited about the tablet as a family communication tool. “We got them for the whole family,” he said. To “show pictures and do recordings,” and for a “shared calendar.” Terry was very supportive of tablet use in his personal life as well as in education, as “there is not much that you can't do now with an iPad [tablet]”, that you need to do with DT either at home or at school.

Terry and his e-learning took teacher training seriously and were actively involved with helping them use tablets. He suggested that “an iPad has all the functionality of an interactive whiteboard,” if it was used effectively, it could be “projected wirelessly through a data projector,” provided a teacher has been trained effectively. Professional development for teachers in using the specific DT available, was seen as critically important for any one-to-one DT device to be effective. Tablets had similarly gained widespread acceptance in 60% of interviewee schools, particularly in more junior years. Terry thought tablets to be the ultimate educational device, which was “what a lot of people have been hanging out for, for years ... it is everything in one device,” with enormous flexibility because “it's the personal, it's yours, it’s your e-mail, it’s your calendar, it’s your textbook, it’s your access to YouTube and Facebook and the Internet”. Carolyn also shared some of Terry’s enthusiasm. “I think tablets are fantastic,” she said. “Tablets are exciting for teaching students and important for quality education”. Lauren also agreed tablets were “wonderful in the classroom if you want instant access for research ... in the science classroom,” and they offered a great new efficiency. “You don't have to go to the library to get the book, you just look something up,” she said. Yet these positive attitudes to classroom use were also tempered by some negative perspectives. Terry mentioned a number of challenges for school IT services, because “you can't block all things on the iPads”. Adrian also found that students could bypass the school firewall and access blocked Internet sites on their tablets. Gaming, pornography and other restricted sites that students occasionally accessed, were specifically mentioned by interviewees, which would alarm many school administrators and parents.

Tablets also came with a variety of problems, distraction, poor motivation for use and a lack of teacher and student training. Carolyn thought tablets might help to change negative attitudes towards DT in the classroom. “Attitudes are changing”, she said. “There are more interactive ways that it [a tablet] is being used in the classroom,” that could improve learning opportunities for students. However, she thought that “for those people who don’t use it [properly] their attitudes are still the same ... they still use ... the tablet for email”, otherwise “it is just a distraction for them”. Terry also believed that it was vital that educators make the effort to use the tablet productively, as this would help to engage students and “get them off the distractions” that were associated with tablets. This reference to distraction reflects similar literature review findings and findings from Chapter 4, that derive from laptop use.

At two interviewee schools there were additional challenges for teachers that were unique to tablets, including device incompatibility and a lack of commitment by school leadership. At Adrian’s Catholic single-sex female school, teachers used school-provided laptops, while students had tablets, which prevented teachers from knowing how to trouble-shoot connection issues, train students effectively or be aware of misuse. “The staff have struggled so much and they get so much hassle with having the students use iPads”, Adrian said. “Too many students spend too much of their time playing games on the iPads”, because of a lack of teacher awareness. Lauren reiterated these concerns through several anecdotes about tablets in her Catholic single-sex female School. “I don't think there (was) a structured reason for introducing them (tablets)” and there was no staff professional development at all. “Most of the teachers do not know how to use them (and) got them at the same time as the students.” Teachers, she said, were unaware of “kids playing a game and the teacher will come past and the kid will just swipe to the next screen”, with the “e-book” on it. It was obvious to her that “kids get away with so much in class,” by being deceptive. The ease of tablet use was seen to be both of benefit and a cause of problems, since students were able to seamlessly shift from a game to a classroom activity without teacher awareness.

These views paint a picture of a rapidly changing classroom environment with needs for professional development and pedagogies that would allow students and educators to utilise the functionality and usefulness of devices, so that they may augment or modify classroom activities, rather than using the devices for substitution. Better usability of devices, like tablets, also came with additional challenges that appeared to limit the control factor that educators have been shown to prefer in survey findings.

Smartphones as Personal Devices in Schools

Personal mobile devices and smartphones were endemic in the Australian schools in this study, according to the interviewees. They were used by educators and students alike and were much-loved devices. Ingrid indicated that most students at her Independent coeducational school carried their phones on them most of the day and at any point in time, she believed that "it would be a very small minority of kids who don't have a smart phone" with them. How schools adapted to this issue depended both on school policies and on teacher attitudes in individual classrooms.

4 out of 10 interviewees mentioned the advantages that smartphones offered. Rory saw a distinct advantage in using smartphones in his BYOD Government coeducational school, because "smart phones ... have got that immediacy," because they were "always on" while other devices took time to boot. In his school, BYOD had allowed one-to-one DT availability and students were suddenly able to undertake research and access online resources at any time, that they were unable to do before. Adrian indicated that when he allowed his students to look up something on their phones via 3G or 4G connections, this resulted in "faster response times and less hassles to actually get on the net", in comparison to the school network, although this meant students were bypassing the school firewall. Ingrid also saw intrinsic benefits in these devices and believed that schools should be able to benefit from professional development and curriculum uses of these devices. "I have a really good professional network on Twitter," that she used on her phone. She also used "a great app that collects all sorts of information from the Internet, according to areas of interest," which generated links she would use in her senior Humanities classes. Although shortcomings were perceived, smartphones were seen by many interviewees as an underused resource in schools.

In terms of student use, Rory and Kellie's schools allowed students to use smartphones as a BYOD device. In Adrian's case the phone was banned for students to use in class, although he sometimes had his senior students use their phones when the network failed. According to Adrian, when students used their phones "they find the stuff, they get back to you; they tell you what they found, they discuss it with you, they are in and out", so quickly. He wished that his school would allow students to use their phones officially because "they can send you an e-mail just like that, there's no problem," unlike when they use the school network. Yet reliability also came with risks. Kellie was equally optimistic about her Independent school's BYOD system and saw one big advantage over other provisioning, in that "students use the same device at home and at school ... this means that any work they do at school they can take home and continue to work on that on the same device". There was also significant evidence that students preferred to use their own devices. However, Kellie reported organisational challenges with BYOD, since students "must bring their device to and from school every day", so the responsibility for DT access and functionality fell onto the student and their family. This had ramifications for schools in terms of one-to-one device availability in classrooms.

During the interview with Rory, there was an exchange which demonstrated the challenges that educators face with student use of smartphones in BYOD schools. Rory looked through the window at a boy who had been ejected from a nearby classroom and suddenly excused himself from the interview. He remonstrated with the student, who was capturing video of his classmates through the glass door on his smartphone. When I queried Rory on the exchange, he said the student had been using his smartphone "irresponsibly," in class and had been removed from the class by the teacher. Rory had then seen the boy recording the classroom in an escalated breach of school rules. Student breaches of teacher and student privacy of this type and irresponsible use of smartphones created many headaches for educators in BYOD schools. Students may not always be connected to the school network and may be using Social Media inappropriately. The problems for teachers in monitoring student online activities became amplified on their personal devices.

Carolyn was more circumspect and philosophical, being aware that a personal device in the classroom inevitably came with unfiltered Internet content, risks and responsibilities. "To use mobile technologies in the classroom you need to think about it deeply," she said. "Build it so kids don't resent it, you might tell them to put their mobile phones away and discuss with them that we are going to use them to learn together". Rory also raised another problem, that personal devices came with inconsistency in software, that otherwise might be provided by the school, for laptops or tablets. Consistent office, word processing, design and programming software was unlikely to be accessible to all students in smartphone and BYOD classrooms, since students provided the software themselves. These were important concerns for school decision-makers, when implementing a BYOD system. The flood of BYOD devices had impacted on Government and Independent schools alike and appeared to be making rapid inroads into many schools, bringing with them a suite of challenges.

In school DT provisioning, the less structure in device choice, the greater the difficulties for schools to exercise access controls. More portable and open DT in interviewee schools, allowed for more open access. Device maintenance and reliability also fell onto the students and their parents in BYOD systems. However, BYOD was still very much in its infancy and little long term analysis was possible in the schools participating in this study. Further research would be required to understand long-term benefits and problems associated with BYOD in schools.

Learning Management Systems (LMS) and Online Video

Each interviewee school had some form of online curriculum content on a website, learning management system (LMS) or portal that was managed either by the school or an external provider. There was variation in the extent to which these tools were accepted by students and educators. In many cases interviewees reported that it was only the most enthusiastic or innovative teachers that placed up-to-date material online. Figure 5. 2 shows that 7 out of 10 interviewees thought that there was a reasonable opportunity for educators and students to use a curriculum focused LMS. There were several viewpoints expressed by the interviewees that a school LMS represents a type of online toolkit with a multiplicity of uses, as an online repository and potential communication medium. However, although several interviewees saw the potential of this type of online storage medium, a minority of teachers in interviewee schools were seen to use them effectively and there was some resistance to using them. Resistance to LMS is discussed under Section 5.3, on disconnects.

Video editing was one of the 'killer applications' that allowed e-learning specialists like Samantha to encourage educators to learn more about DT and incorporate computer use into the classroom. While few teachers at her Catholic male school used DT, "more teachers are interested in using movie maker and there are a few using that to ... upload" videos to YouTube for students to access at home. There was a growing trend to have online video content, either on an online video site or on the school LMS. Several interviewees specifically mentioned video editing as an exciting new recent development for both teachers and students, in terms of the mainstream classroom. Adrian discussed his "students using iPads and sharing movies, using lots of apps" for video editing; while Carolyn was excited that "this year I use the laptop in ways I could not possibly have done before. I use video and I edit it, I bloody put original video in PowerPoint." This capacity for teachers to make educational videos may lead to more flipped learning (Tucker, 2012), which was becoming more popular in interviewee schools. Robert saw greater use of video as part of a wider creative trend towards more multimedia content in art, that was being replicated in schools. "In Art there is a great move towards industry, developing games and sound and video that's becoming an obvious way of communication." This social trend towards more video content was evidently being mirrored in interviewee schools. There were many mentions of video being used in "flipped learning" and "flipped classrooms" by interviewees, with a range of views about this strategy to deliver video content to students at home. However, the relevance of flipped learning to the research questions in this study is minimal, other than a way to engage students in video lessons, which may be seen as a way to modify teaching and learning pedagogy, shown in the SAMR methodologies below.

At Kellie's innovative coeducational Independent school, the teachers and ICT staff were proactive in providing individualised online access, particularly for more junior students so that they had a "website just for Years 5 and 6," which allowed kids to publish their own work on a safe online space. She referred to "a portal where kids can access not only Word document tasks" that reflect what was being done in the classroom, on any given day and it also had safe links so that students could "access a range of multimedia websites such as animate Alice, story bird, various YouTube clips and a whole bunch of things" that students could access at home. Kellie thought that reliably accessing online materials was likely to be related to wealth and socio-economic status "we're in a pretty high socio-economic demographic so pretty much all the parents (and students) have access" to online materials. She said that this type of connectivity was "kind of an expected thing," at her school. "We have wireless access in our space so kids can access digital materials fairly easily" as well as at home. She saw this as being an essential element in providing an innovative DT curriculum. Interviewees universally saw the use of online learning tools as representing the cutting edge of curriculum and pedagogical change in their schools, used by the most innovative teachers and allowed for constructivist practices and of SAMR model elements.

Attitudes to Constructivist Pedagogies and the SAMR Model in Classroom Activities

Amongst interviewees, 8 out of 10 saw DT contributing to a boost in constructivist education, through engaging students in communication with others outside of the school community, through group collaborative activities or through a more student-centred approach to research tasks.

DT have the capacity to enhance teaching methodology and pedagogy (Keane et al., 2016; Puentedura, 2013), where teachers have positive attitudes towards DT, as discussed in the literature. All of the interviewees agreed on the importance of utilising one-to-one devices, which was also universally agreed upon by survey participants. For the most part, interviewee schools showed an engagement with activities that can be associated with substitution, in the SAMR model. Figure 5.2 represents SAMR activities seen to varying degrees in interviewee schools. There was a significant amount of augmentation reported and some modification, mostly through the use of classroom online video, which may be an in-house video system, or the use of an online site, such as YouTube. There was less opportunity provided for students and educators to utilise activities in classrooms that could be identified as forms of redefinition, for example, team teaching, flipped learning and video conferencing with other schools.

SAMR Level	Digital Technology Use	Ror	Kel	Ing	Sam	Mic	Rob	Ter	Adr	Lau	Car
Substitution	e-texts										
	LMS Online Content										
	Word processing										
	Digital Presentations										
Augmentation	Group Work										
	Student Collaboration										
	Online Research										
	Student-lead Projects										
	Teacher Collaboration										
Modification	Teacher Online PD										
	Social Media Use										
	Online Collaboration										
	Video Online Access										
Redefinition	Team Teaching										
	Flipped Learning										
	Interactive Learning										
	Video Conferencing										

	New Spaces										

High Opportunity

Medium Opportunity

Low Opportunity

Figure 5.2 Opportunity Map for Pedagogies in Interviewee Schools, showing likelihood of opportunities for students or educators.

Modification and augmentation were seen in 50% of interviewee schools where students sometimes “work collaboratively” online and then had “deep discussions” at Rory’s Government coeducational school, and they worked together online on integrated “project-based tasks” in Kellie’s Independent school. Carolyn referred to the importance of using “21st Century skills”, “to collaborate with technology”; while Kellie recognised the importance of allowing students to “explore the content of a topic” rather than having everything “teacher delivered”. Each of these interviewees recognised the importance of higher level SAMR pedagogies.

Two interviewees, Kellie and Terry, worked at schools with an active interest in redefinition of the learning process through uses of DT in new pedagogies like flipped learning activities and through the design of new learning spaces, for online video communication, team teaching and group collaboration. These “global communication” spaces, in Terry’s case, had been “physically designed to allow us to communicate with other schools” with support for a range of personal devices. Curiously, in both cases these schools were commencing this exploration with upper junior and early secondary students, that they saw as the most innovative spaces. However, the majority of other interviewees did not report on any implementations that could be described as redefinition.

While Ingrid saw the importance for a “modern school” to have “modern ways of learning” and a pedagogical “mix” including “group work”, she had also asked her senior students about the methods they would prefer her to use and they identified more presentations and teacher-centred work, in delivering senior content. 4 out of 10 interviewees, mentioned that content-based courses predominate in senior subjects, such as History, Maths and Information Technology, and that these do not lend themselves to unconventional pedagogies. It is possible that student familiarity with traditional pedagogy influenced their opinion. There was a shared thematic understanding amongst the interviewees, that content focus drove out innovative pedagogies and that this occurred towards the senior end of schooling, where the focus was on test results.

Interviewees were not supportive of substitution activities, such as an online LMS repository of documents, that were effectively copies of old documents, that Michelle thought was "like a morgue". Rory also thought that most schools with one-to-one DT simply moved their old documents onto a laptop, so that the change was "very superficial" and had no "reflection of deep thinking". These views represent part of the problem with sudden introduction of DT, where the devices offered students and teachers very little opportunity for change, or better engagement, where mere substitution of old tools occurred through using DT and little innovation was encouraged.

The overriding finding from this component of this study suggests that teachers were exploring a number of new teaching devices and pedagogies that they heard were advantageous, with some exploring new pedagogies offered through augmentation and modification of their teaching methods, with little exploration of activities that offered redefinition of the educational process. It would be necessary to conduct further research into the most valid and effective pedagogies that should be used with DT to provide better application of SAMR pedagogies.

5.2.4 Attitudes to Home vs School Use of Digital Technologies

Readings in the literature review revealed that smartphones and multifunctional personal devices had become virtually endemic in developed countries (Waycott et al., 2010). The impact that these devices have had on the stakeholders in this study, teachers and students in Australian Secondary schools, should not be underestimated. All of the interviewees in this study were regular users of smartphones or tablets both at school and at home. Interviewees discussed their own concerns with DT in the home and the relationship of these technologies with those available in their schools. They mentioned the tensions that occurred due to an often greater availability of high-tech equipment in the homes of students and educators. 7 out of 10 interviewees also had their own children at home, many of whom were school aged students. Hence, their comments were wide ranging and they discussed risk-factors at school and home, and decision-making surrounding student access to DT. Much of the discussion also surrounded the ubiquity of personal devices in the homes of the interviewees and their students.

Figure 5.3 shows the complex interplay between the overlapping elements that impacted on student and educator use of DT and acquisition of skills in this study. These elements include: software access, DT hardware, training in acquiring DL and decisions made that enhanced or limited access, both at home and at school. Figure 5.3 also illustrates the two worlds that stakeholders needed to manage in terms of their own access to DT and the training they were likely to receive. There was little apparent overlap between the two domains, home and school.

In terms of software, there were specific software packages purchased for a variety of uses in each location. At home, interviewee and student software often pertained only to specific personal devices, gaming and other entertainment uses. While there was some overlap in software, much remained separate, identifying the different experiences students and educators have at home and at school. In interviewee schools there was a greater likelihood of software that was aimed towards education such as word-processing, mathematical, scientific, computing, design or artistic software, that was used within the school curriculum.

The range of DT hardware was segmented for students and teachers in laptop schools, since they may access their own hardware at home. On the other hand, there was a strong overlap for students in one-to-one BYOD schools, where they used their own device in both locations. It is important to understand that technology access decisions were felt twice by students, at home with parents and relatives responsible for access decisions, and at school with teachers and decision-makers allowing access at various times and to various DT in their school programs. Educators were also similarly limited by these decisions. Training in the acquisition of DT skills and DL were different in each domain, according to the resources that stakeholders used in each place. In the home, this was reportedly online tutorials or assistance from friends and relatives as discussed in Chapter 4. In schools, on the other hand, it was likely to be formal training sessions, through classroom assistance from teachers or assistance from peers, that boosted DL.

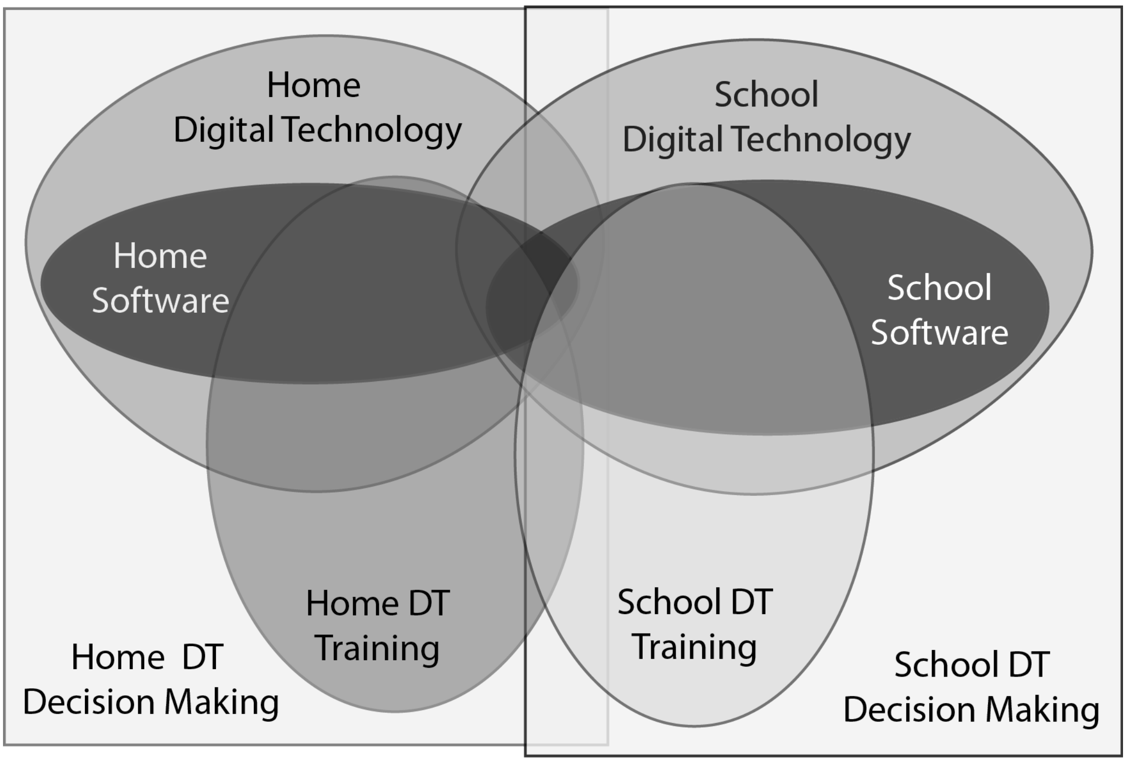

Figure 5.3 Home and school tensions. Venn-Diagram showing overlap between decision-making elements.

Dependencies and Risk factors at Home and at School

Figure 5.4 reveals the concerns raised by interviewees, that related to the development of possible dependencies, the nature of stakeholder uses of home and school DT and the perceived risk factors that may have prevented learning or resulted in personal danger when DT was accessed.

Amongst the interviewees, 7 out of 10 who had children at home suggested that their children had an addictive fascination with their personal devices and the applications that they used on these devices that was of significant concern. 2 out of 10 interviewees also reported that they personally felt that they used their portable devices excessively and that this amounted to a type of "addiction". The addictive nature of DT was previously discussed in Section 5.2.2 and in Chapter 4 and was felt strongly by the educators in this study. They were also aware of the development of dependency in personal devices as a student risk factor. Hence, it is unsurprising that there were similar concerns raised in the home life of the interviewees both for themselves and their own children.

Figure 5.4 reveals that gaming was reported by 7 out of 10 interviewees, as giving rise to concern about the development of possible dependency, and all but one of these expressed a high degree of concern. This strong concern was likely to be one reason that schools were resistant to the introduction of gaming and gamification activities in their classrooms.

The use of Social Media was also identified as a concern by 7 out of 10 interviewees, although they did not view this as serious a concern as gaming. The difficulties that were faced by interviewees who were parents were likely to be similarly faced by other parents of school-aged children. There was significant discussion by the interviewees surrounding the fact that students were not able to learn at school about Social Media security settings or about mitigating the risk factors that they faced in Social Media, since Social Media use was banned in 90% of interviewee schools. This raises the important question of what practical guidance students were receiving at home or at school, in managing their own online use, in risks of meeting strangers online and other online hazards. Students with personal Internet connected devices were likely to be at increased risk, since they may take their devices to their bedrooms and access unfiltered material online. For this reason, each of the interviewees with younger children controlled their access to their devices in the home, while older students must learn to face these hazards themselves.

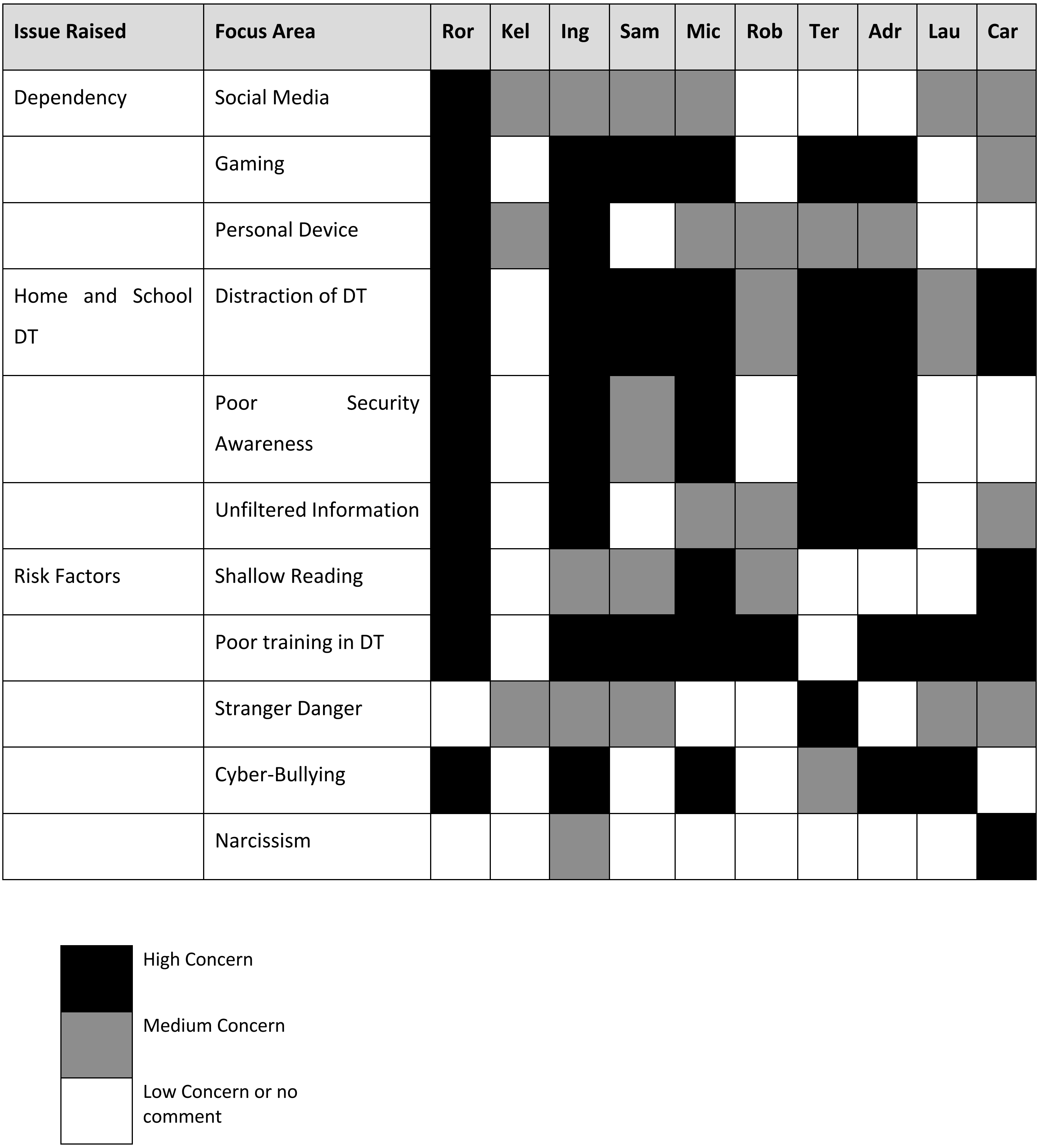

Figure 5.4 Opportunity Map of perceived concerns with home digital technology issues observed by interviewees.

In home and school DT, interviewees commented on the distracting nature of DT with 9 out of 10 suggesting that it was a concern and 6 regarding it as of a high concern. Causes for these distractions included Social Media and gaming, contact with friends and others online and general Internet activities. While the use of DT was seen as a distraction for students by a high proportion of interviewees, several interviewees mentioned that DT was also a distraction to themselves and other adults. Ingrid also suggested that "kids will get distracted by anything" and that blaming DT achieves little.

Table 5.4 in Section 5.5.2 reveals similar concerns amongst interviewees towards poor security awareness amongst students, that was likely to place their systems and home networks at risk of virus infection, online scams and possible contact with criminal elements. The fact that an open Internet at home allowed an unfiltered information in-flow, that students were incapable of sifting for quality or authenticity, was seen as a concern by 7 out of 10 interviewees and this was one aspect that was expected to be covered in school training programs in using DT. Rory expressed concern that schools had now lost control of the information in-flow in his BYOD school, bringing to mind the loss of schools as walled gardens, identified by Hartley (2009) and Willard (2010). One interviewee thought that their school was suitably equipping students for astute online engagement, while one other thought that it was an issue that should be of parental concern, rather than for the school. These aspects may not be mutually exclusive and were seen by interviewees to overlap heavily with training expectations in use of DT and DL in their schools. However, 8 out of 10 interviewees thought that training in schools was poor and that it offered students and educators little support in identifying risks. Further commentary and concern was expressed by 6 out of 10 interviewees on the issues of cyber-bullying, stranger danger and shallow reading that were all associated with open Internet access; while possible narcissistic tendencies associated with excessive Social Media engagement was noted by 20%. Each of these issues, indicate that there were significant and important elements that schools could address in DT skills programs where DL was enhanced so that students were better equipped at online self-management to avoid the hazards that were well known to their educators.

Interviewees noted many positive engagements with DT in the home that enhanced DL including: unlimited video communication, parental connection with student schooling systems, online research, use of Social Media for professional development for teachers and connection with others, cloud data storage, innovative learning with new devices, technology immersion for students allowing better understanding of DT and learning from others. None of these home uses were readily available in the schools of the interviewees, although some were mentioned as desirable, for example, effective online video communication, Social Media for professional development, access to the latest devices and DT immersion spaces. Rory summarised these elements succinctly: "At home we can play with the technology, when we do it in the school, we ... don't make it so attractive, easy to implement and understand." However, while many students may find the necessary resources to learn in the home, all of the interviewees noted that home learning was not occurring for the less digitally astute teachers in their schools. In their cases they may not have purchased advanced DT or be able to access a knowledgeable peer group online. Less digitally skilled students may also not be in homes with advanced DT, or be discouraged from using it by family or friends. In this way a type of digital use divide may be apparent between the digitally adept and the digitally challenged.

These findings confirm the challenges for schools in keeping up with DT in the home and that DT skills were enhanced through learning with the assistance of peers, friends and relatives. They also reinforce the finding that there was a type of digital divide between the digitally adept and the digitally challenged as identified in the survey findings discussed in Chapter 4.

Section 5.3 Disconnects in Digital Learning Perceived by Interviewees

While the open-ended nature of the interview questions meant that there was not a one-to-one correspondence between interview responses and survey items, they provided detailed insight into the disconnects observed in interviewee schools. Opinions on training are discussed in Section 5.4. It should also be noted that the disconnects identified in Chapter 4 were derived from variations in closed survey responses given by students, teachers and those with differing levels of digital literacy (DL); whereas in this chapter disconnects are identified from the opinions and direct observations made by interviewees. These were then coded through thematic analysis of interviewee responses to the open-ended interview questions, seen in Appendix 2. Figure 5.5 shows an opportunity map of concern factors observed of perceived interviewee disconnects in their schools. Both tone and language were utilised in determination of the level of concern felt by the interviewees. System shortcomings discussed in Section 5.3.1 refers to the hardware and software provided to the students and teachers in the interviewee schools and the associated infrastructure. These shortcomings may have involved connectivity issues such as observed slow or unreliable networks and digital technology (DT) distractions, where students had been observed in interviewee schools to engage in distracting online behaviour, or playing games during class in a distracting manner. Resistance to system change and to specific school software, such as Learning Management Systems (LMS) are also discussed in Section 5.3.1.

Stakeholder disconnects over polices and curriculum, discussed in Section 5.3.2, refer to instances where communication was observed to be emotionally charged with opinion differences between the stakeholder groups, sometimes resulting in conflict. Policy concerns occurred where interviewees had observed a poor or excessive implementation of policies that impinge on teachers or students being able to use the school system effectively. These policies may have resulted in student bypassing of security elements such as firewalls, often due to website and Social Media blocking. These policies are discussed alongside the disconnects associated with them.

In each case the disconnects identified in this section are intricately linked to decisions made about provision and access to DT, and to the training in the relevant DT reported on by the interviewees. Each of these areas are investigated in Sections 5.4 and 5.5.

Disconnect Area	**Focus**	**Ror**	**Kel**	**Ing**	**Sam**	**Mic**	**Rob**	**Ter**	**Adr**	**Lau**	**Car**
System Shortcomings	Hardware Limitations										
	Software Limitations										
	Internet Slow										
	Network Unreliable										
	DT Distractions										
	Change Resistance										
	LMS Resistance										
Stakeholder Disconnect	Student/Schools										
	Teacher/ICT Manager										
	Teacher/DT Curriculum										
	Teacher/Leadership										
Policy Concerns	Security Bypassing										
	Security Policies										
	Blocking Websites										

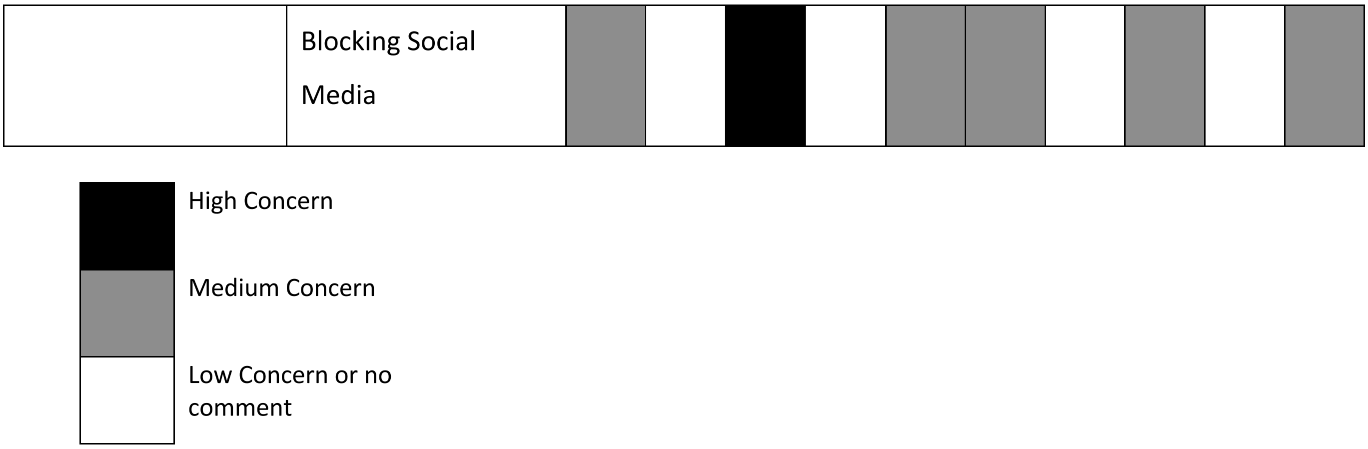

Figure 5.5 Opportunity Map showing perceived disconnects in digital learning in interviewee schools.

5.3.1 System Shortcomings

Hardware Limitations

There were numerous interviewee comments about the shortcomings of hardware that students and educators were provided with in schools, much of which was discussed in Section 5.2.3. 8 out of 10 interviewees indicated that the hardware choices made in their schools had major issues that limited what students and teachers could do with digital technologies (DT). This disconnect in limitations of hardware occurred between the teacher and student users of the system and the ICT managers and school decision-makers. It may also be associated with funding for the DT system and infrastructure.

Several interviewees thought that the devices chosen by the school's decision-makers, were not appropriate for use in the classroom. There were a range of objections to the choice for school tablets and BYOD laptops and smartphones by interviewees, reflecting their concerns in Figure 5.5, that students could easily bypass school security measures and become more distracted from their school work by these devices. This fear of the distracting nature of DT was also observed by interviewees to be a concern when using DT at home. Survey findings in Chapter 4, similarly reflected these concerns of student capacity to bypass school security measures.

A desire to use different or additional devices was also reported by interviewees. Two interviewees had a desire to connect their smartphone to their school network, although this was not permitted. At one school, educators were reportedly provided with inferior devices, unless they personally purchased the better option, while students had a more high-tech option. In each of these cases, school choices in hardware limited what teachers could attempt in using DT in the classroom. School policies such as not permitting software downloads, also restricted teacher use and limited their satisfaction with the school DT system.

In all, 8 out of 10 interviewees reported practical concerns with the devices chosen in their schools. Computer laboratories were not able to be accessed by the majority of students in 20% of cases, trolleys of computers not being maintained (10%), poor quality school laptops were being vandalised by students (20%) and school computers or tablets were unable to be recharged in classrooms (30%). These findings of unreliability of school computer equipment reflect student comments in the Stage 1 surveys, that underpin the reasons they were dissatisfied with school provided laptops. Unfortunately, these issues were seen by interviewees as entrenched issues with the delivery of DT programs and indicated that schools needed to ensure that the chosen DT were provided with sufficient resources to maintain them.

As previously mentioned, unreliable network connectivity and slow school Internet were reported to disrupt classroom use of DT in 60% of interviewee schools, causing disconnect between teachers and students, and schools' ICT managers and school decision-makers. While this caused frustration for both teachers and students, it was seen as a major concern by only 2 out of 10 interviewees, as infrastructure investment was seen to be a simple solution. This reflected directly on school leadership and funding priorities for DT. While Carolyn thought network and Internet dropouts were a concern, she thought this emphasised the importance of students developing tolerance and resilience. For others, like Ingrid and Rory, it was evidence that their schools had not engaged with the needs of a "21st Century education" and prevented them from reliably connecting to other schools with video conferencing and online resources. Adrian was the most aggrieved interviewee over his school's network services, he was in conflict with ICT Manager and ICT Technicians over a range of issues including maintenance and support and network policies that "won't let our kids print" or "get access to shared drives". Frustrations with network delivery was thought to be felt personally by teachers, since disruption to service may cause a well-planned lesson to be abandoned, causing a sudden change in direction by teachers and annoyance for students. Lockdowns for students to network facilities, of the type that Adrian experienced, also seem irrational to teachers, since they were able to use them themselves and they may then expect to be able to use them with students. Interviewees thought much of the consternation resulting from these disconnects could be avoided by school decision-makers with better resourcing and funding for DT in their schools.

Limitations in School Software

Several points arose during the interviews that showed limitations of BYOD and tablet software that also impacted on teaching with DT in classrooms. These limitations were associated with specialised licensed software, online software access and restrictions on software installation. School software was often restricted to the specific devices used by teachers and students. This meant that, in interviewee schools with BYOD or tablets, students were often likely to be using different software, or different software versions, to each other and their teachers. In each interviewee school with BYOD or tablets there was more reliance on free and online software that may be compatible with multiple types of devices. In many cases this changed curriculum use in the classroom and required greater reliance on Internet access, either to download software or to access websites. This limited the activities with DT in BYOD classrooms and increased the workload for teachers. It also meant that in BYOD schools software licensing obligations fell onto the students and their parents and there was no way of knowing whether student software was acquired legally or not.

Software for use in computer classes was mentioned specifically by three interviewees, with each facing separate problems in accessing specialised software. Michelle was concerned that BYOD laptops would create problems in accessing appropriate software, that was currently available in a computer lab, while Rory indicated that his BYOD school had to minimise computer programming, by relying on online programming tools that were limited and restricted what students could achieve. Adrian was faced with a software package compatibility problem that prevented a programming package from being used in a senior ICT class. He also reported that his ICT Technicians showed no sympathy for the fact that this would prevent senior students from running the software that was needed in his ICT class. This created a conflict and represented a disconnect between Adrian's e-learning team and the ICT technical team and ironically undermined the teaching of a senior ICT subject.

Appendix 4 outlines the main types of software in use in the schools of the interviewees. Some of this software required online access to be used effectively. Software licensing was more important for schools that provided computers or tablets for teachers and students, due to the legal requirements to have licenses for their users of software. Software licensing was given by interviewees as one reason ICT Technicians placed restrictions on students and teachers installing their own software. This limited what teachers were able to use with students and prevented trials of new software by both teachers and students. It also minimised access to free and open-source software on school devices. These types of restrictions and lockdowns that restricted software access, also had other ramifications that are discussed in Section 5.3.4.

Resistance to Learning Management Systems and Online Tools

The decision to implement a Learning Management System (LMS), had the capacity to impact on the use of DT in interviewee schools and 70% of interviewee schools had made an administrative push to a central LMS system for teachers and students to upload and access online curriculum resources. Teachers upload learning instructions and plans, video links, or a repository of documents for students to access at home. Figure 5.5 reveals that 6 out of 10 interviewees in this study thought that resistance to LMS implementations were of significant concern in their schools.

While all interviewees would like to use an effective LMS, there were several criticisms made about the systems that schools had implemented, and numerous comments about general staff resistance to school LMS. LMS could be prohibitively expensive, particularly for schools that were not particularly well-financed, including Government and Catholic schools. Lauren, who had recently worked at several Catholic single-sex female schools, said that LMS were used “at some schools” but “very little at others.” Adrian rued the fact that his Catholic single-sex female school did not have an LMS; while Rory referred disparagingly to the failed Government provided LMS, that had to be withdrawn, due to a host of functional and financial problems. No two schools in this study used the same LMS.

In this study, Independent schools had invested most heavily in school LMS. Carolyn was attempting to change her Independent school’s pedagogy in her curriculum role and was highly supportive of an LMS because “online learning tools allow students to learn in different ways, on transport and in your own home.” She has also worked at a university, where she “was amazed at the success of online learning and how active the engagement is”. However, she was surprised when she found that both teachers and students were “resistant” to using online tools because it led to more work and new practices for both groups. Samantha saw LMS student resistance to be because they do as least as possible at home, while for teachers an LMS could be “a nightmare because you try to get kids online and you can't get them to”. In Carolyn’s school she perceived disparity in LMS use, as only the minority of educators who explored online tools themselves were likely to use it effectively. Kellie was the only interviewee who was highly optimistic about the LMS at her Independent school, despite its “limitations”; while Ingrid, at her Independent coeducational school, thought that only “the advanced teachers have material available online but ... the majority don't”. In each of these interviewee schools it was only the educators, who were seen as “innovators” or “cutting edge” by interviewees, that made the effort to use the LMS, usually “modelling” its use for others.

Ingrid, expressing a view shared by 9 out of 10 interviewees, thought teachers at her coeducational Independent school were resisting the LMS because of a lack of impetus from school leadership in proselytising use of new DT. She thought teachers needed to be “encouraged” and “given an easy (LMS) system.” She believed an LMS would only be used widely when “the school values it” and “teachers are told” to place material online. Otherwise she felt teachers would not be persuaded to change traditional curriculum delivery. While the amount of online material varied from school to school in this study, the amount of resistance in each case was significant. For example, at Adrian’s school, he thought only 5% of curriculum material would be online and Michelle thought the LMS contained only old documents, placed online by teachers under duress. Even Terry, usually optimistic in his views on school DT, thought getting teachers and students to use a central LMS was “always a struggle”. Ingrid even opined that a central LMS may be passé. “It's an old way of thinking”, she said. “Even the phrase management systems as a stifling controlling word ... you need that flexibility ... you can't lock people into one learning management system”. Each of the interviewees had experience with an LMS. Through the lens of these perspectives, use of an LMS involved a change in classroom management and student learning practices, that were new to most teachers and complex to implement. Introducing LMS effectively required training and leadership in order to overcome teacher resistance to change. In conclusion, there were major challenges for school leadership in requesting that material be placed online and good change management was required to effectively implement an LMS in interviewee schools.

Teacher Resistance to Digital Technology System Change

Findings from the surveys discussed in Chapter 4 show a range of disconnects between high and low DL groups as well as students and educators. These findings were supported by interviewee comments. Each interviewee reported that there were a number of educators who did not embrace new DT that were being implemented in schools. There was resistance not only to LMS, but to laptop programs, use of digital textbooks and to training in the use of DT. Figure 5.5 shows that resistance to change was seen as a significant concern by 7 out of 10 interviewees.

A host of interviewee anecdotes told of large numbers of educators with low levels of DL, who lacked basic DT skills apart from simple word processing. This group was resistant to receiving DT training and had a desire to use older material, in textbook or worksheet form. Adrian spoke of teachers who saw no need to change the traditional teacher-centred mode of teaching. Yet the challenge for schools and teachers was driven by students, according to Carolyn, "kids come to school wanting connection and expecting connection" and there was little escape from this expectation for teachers. She felt that teachers were participants in the digital world and needed to adapt. This need for schools and teachers to adapt to DT change is central to this study and reflects priorities shown by ACARA (2018) and the Office of Educational Technology (2017).

While there was an expectation in schools like Carolyn's that it was "the responsibility of the teacher to learn about the new technology systems", teachers claimed that they had no time to learn new skills that they "have enough work to do". In a nutshell this shows the huge challenge for those agitating for change in schools, that unless there are resources, time and training provided for teachers there will be a strong resistance from traditionalists and those feeling overworked. Hence, there was a strongly felt disconnect in schools between agents for change and traditional educators, often with low levels of DL, consistent with what has been discussed in both Stage 1 findings, in Chapter 4 and in the Literature Review. Stakeholder disconnects and those that relate to training in the use of DT are discussed in the following sections.

Student Distractions

Distractions disrupted learning at some point in all of the interviewee schools with one-to one device access. Distractions caused by classroom DT, generated disconnect between students and teachers, or school administrators. These may be due to students exploring the capabilities of their devices, accessing websites not related to learning, using Social Media, using phones without permission and playing games surreptitiously. Of the interviewees, only Kellie thought that her school managed student distraction particularly well, due to the policies in place about behaviour online and the vigilance of her school's teachers. In all 9 of the other cases significant disconnect was observed, usually between teacher and students. In most cases students reportedly bypassed the school's firewall in some way, to access inappropriate websites, Social Media or online games. This reflected the Stage 1 survey results and underlined the importance of schools dealing with issues of online dependency both in school and at home. This finding reiterates both the concerns felt amongst the survey participants about dependency and the findings by Rehbein et al. (2010) and others on gaming and Social Media dependency, as discussed in the Literature Review.

Ingrid, Adrian, Lauren, Terry and Rory all offered detailed anecdotes about students who tethered smartphones and used proxy servers to access sites they were not permitted to, or used phones outside of class time. Smartphone use was discussed in Section 5.2 as being a significant concern in BYOD schools, although it was also apparent in school laptop or tablet schools. Even in Michelle's computer laboratory, she requested students leave their phones on her desk when they entered.

Interviewees in 30% of schools, felt decisions were suddenly made to introduce tablets for students that created implementation problems and led to distraction and disconnect with teachers. In Terry's Independent female single-sex school, there was significant disruption for educators when one-to-one tablets were introduced since, "the first half of the year was just a battle to get them off the games". However, his school dealt with the issue through teacher professional development and student behaviour policies. This problem was also observed by Adrian, at his Catholic single-sex female school. He suggested that "for a lot of the kids" the tablet was "more a case of being a magnificent toy than a learning instrument". Lauren also saw similar shortcomings because students viewed them as "just the best toy". Several interviewees thought that because students encountered tablets as toys in their homes, they did not take them seriously as a learning tool at school.

The main finding that can be derived from the interviews here is that student distraction was an issue that primarily impacted on classroom teachers and may result in conflict and disconnect. This finding suggests that classroom management of DT use was of critical importance and teachers needed guidance and instruction in dealing with student distractions. This was an important element that schools could approach in teacher professional development activities, as was done in 20% of interviewee schools.

5.3.2 Stakeholder Disconnects over Policies and Curriculum

There are four disconnects and types of conflict in schools, shown in Figure 5.5, that interviewees thought were of significant concern in limiting the use of DT in classrooms. These were between students and their schools, teachers and ICT managers and school leaders and teachers with curriculum leaders. Each of these is discussed in the section that follows. These interpersonal disconnects overlap policy and control disconnects in Figure 5.5, since the causes of these disconnects relate to the decisions made and restrictions placed on teachers and students in the school environment.

Student and Teacher or School Disconnect over Controls and Policies

Student with school disconnects were seen to be of significance in 80% of interviewee schools. This was due to a range of factors that all acted to limit what students could do with their devices in the classroom. Two areas were identified as giving rise to disconnect between students and their schools. Internet and hardware lockdowns for students and teachers and a limited range of hardware available.

Students were reportedly frustrated by limits in Internet access, with blocked webpages that prevented them from researching effectively for school assignments. They were also found to rebel against their school's Wi-Fi lockdowns by bypassing the school network, through the use of mobile phone tethering in at least 50% of interviewee schools. Each of the interviewees commented on these lockdowns, that occurred to some extent in 100% of the schools studied, with Ingrid suggesting that "the gates of the walled garden are wide open", that locking student Internet down "doesn't work, it is almost like the head in the sand approach". In Rory's school "one kid buys his lunch by renting out his Wi-Fi each day" and in other schools it was well known that "kids can bypass" Internet lockdowns easily. The findings here are in agreement with survey findings that show a proportion of students do actively bypass school firewalls. This indicates that schools may only be paying lip-service to their duty of care obligations, to legally protect minors from the Internet dangers, without being particularly effective.

Adrian also said he sometimes permitted students to look up blocked sites on their mobile phones that he wanted his students to access for the IT curriculum, that were otherwise blocked due to firewall rules that blocked certain sites. This was one instance of school firewall rules that inadvertently prevented students from using the Internet for curriculum related purposes, which was seen in all interviewee schools. 4 out of 10 interviewees also thought that education for students to self-manage Internet use, rather than restriction, was a more effective way to ensure safe student practices online, particularly as it was known that students face unrestricted access as soon as they turn on their phones, or return home.

There was also conflict over the equipment used in some schools, with students and their teachers frustrated by equipment that was poorly maintained or locked down by network policies that prevented the installation of software by students. In Rory's school the school laptops had the "right mouse-click blocked", to prevent students from accessing more comprehensive menus on their computers and undertaking advanced system tasks. This not only prevented teachers in his school from educating students in using the computer system on the laptops but it also frustrated students to the extent that there was a high rate of "vandalism on the laptops" that meant many devices were unusable. This limitation was also observed in Adrian's school where the computer trolleys were poorly maintained and many of the computers became so malfunctional that teachers would not use them. In these cases, school security lockdowns have acted to discourage students from respecting the school DT program, rendering it useless in many cases. These findings also reiterate disparaging survey comments made by students who thought the school equipment was inadequate. Adrian agreed with these sentiments and spoke at length of his school preventing student printing, preventing access to shared drives and blocking sites like "Dropbox". Students were similarly unable to install software on school equipment at 90% of interviewee schools. These restrictions mirror the findings of Gray et al. (2012) and Stage 1 survey findings. Samantha also thought that schools need to change and it was not helping the education of students in using DT when "we've locked everything down". She thought that education will not move forward into a more progressive system "until the whole duty of care changes and schools become a lot less like prisons". Such pointed commentary puts the challenge into the hands of school decision-makers who act to control student online access, at the cost of better learning in effective use of DT.

Teacher Disconnects with ICT Management and School Leadership

In total 9 out of 10 interviewees thought that teachers felt disconnected from their schools and from the decisions made in accessing and utilising DT, in some way. While two of the interviewees, Kellie and Terry, thought that their schools were supportive of the teachers in allowing them to access Social Media, install software and the websites they requested; this was not the case in the other 80% of interviewee schools. The majority of interviewees identified disconnects between teachers and ICT leaders or school administrators who made decisions restricting DT use. In these cases, teachers felt restricted when they had a desire to use more DT in their classes, to access blocked websites, Social Media, online video or to install other software on the school provided one-to-one device. Disconnects were also observed where teachers were unable to connect their own mobile phones to the school Wi-Fi network, where schools had restrictive network policies.

ICT leaders were mentioned in a negative light by 6 out of 10 interviewees when they monopolised DT decisions, reflecting the concerns expressed by Keane (2012). Adrian thought that the success of any school DT system depended directly on those implementing the technical aspects who needed a "dedication to ... education" and that in his school, "they don't care about the kids actually learning". Ingrid suggested that her school's e-learning specialists were trying to fix the problems inherent in the system but that "the bottlenecks are all in management ... and IT management". This meant that many interviewee schools "really struggle" with getting the DT system running effectively.

Excessive network security policies were mentioned by Ingrid and Rory in similar anecdotes of technical staff who were unable or unwilling to open up the relevant ports on the firewall to allow video conferencing with a speaker, in a professional development context. In each case these interviewees personally used their phones to tether the video call because the ICT leaders were unwilling to take responsibility for ensuring that the system worked for this type of communication. This lack of flexibility in being able or willing to open up blocked aspects of the network was a recurring theme amongst the interviewees. Ingrid thought that this rigid attitude stemmed from a "lack of flexibility in decision-making" of her school administrators who took no responsibility for poor functionality of the system in her school. She thought that there was "no value being placed on being a modern school" by her school leadership. Rory felt "tension" between himself and his school technicians, who managed a network that he saw as "a little Stalinist in its approach ... one of control". He objected to network control systems that had "take[n] the walled garden and turn[ed] it into a prison". Rory tried to pressure his ICT Technicians into more accountability and that was seen "as a very threatening thing". Rory purchased his own laptop to avoid installing the school's restrictive network policies, while his Principal blamed "the system" but was unhelpful in encouraging change. Michelle also spoke of direct conflict in her school over criticisms of excessive web-blocking, that had been directed at her school's ICT leader. Since the interviewees in this study each had high levels of skill in utilising DT, these findings indicate a system that appeared to be in crisis, with serious and profound disconnects between the most innovative teachers and the ICT leaders that were employed to offer support in the use and provision of DT.

School leadership, usually the school Principal or their representative, was indicated to have made poor decisions by 8 out of 10 interviewees, often because they did not take direct responsibility for the decisions made that impacted on the use of DT, or because they did not give this area sufficient focus. Adrian thought his Principal "complained" about slow Internet and "blamed the network admin" but had no "accountability" for the poor performance of the DT system. The school leadership had the capacity to make policy rulings, however, they rarely did this in the schools of the interviewees. It appeared that in many cases they were abrogating their responsibilities in this area and deferring decision-making to the ICT manager.

Michelle was unique in complaining about diminishing computer laboratories for students, since each of the other interviewees was supportive of one-to-one computer initiatives in their schools. She indicated that "they have removed two computer labs" and decided on BYOD, which she thought would make it almost impossible to teach senior Computing classes. She was also concerned with a lack of consultation around this process and that "nobody has worked on any policies" to do with ethical online behaviour with the new BYOD system.

The low level of support shown for the use and implementation of DT by both ICT managers and school leaders, in the interviewee schools where there were perceived problems, was surprising since all but 20% of these schools had made a commitment to one-to-one DT access by students. Without technical and administrative support, it seems unlikely that this investment would prove to be successful. It also raised the question of what goals and objectives, or evaluation measures school administrations had put in place to gauge the effectiveness of their DT programs. Only the 2 out of 10 interviewees who thought that their schools had visionary leadership and an effective management team, with a commitment to DT, considered that their schools had evaluation strategies and were open to suggestions from educators. The overriding perception amongst 6 out of 10 interviewees of this study, was that the disconnects felt between teachers and school leadership could be attributed to a lack of "vision" by decision-makers.

Teacher Disconnect due to Curriculum Changes Involving Digital Technologies

Whereas educators who were in conflict with school and ICT managers, tended to be those with high levels of expectations of DT inclusion in schools, those who were in conflict with curriculum leaders often resisted DT related change and were often teachers who appeared to fear change, or thought it unnecessary. On the other hand, interviewees also reported concern in their schools, by more progressive teachers, that the curriculum was too rigid and content-based and this was at odds with the pedagogies required to effectively teach with DT. In all, 8 out of 10 interviewees discussed disconnects in their schools that related to curriculum decisions.

Representation of the resistance of teachers was best put by Adrian who reported teachers who believed that the pre-digital way of schooling "worked perfectly" and who argued vehemently "if it ain't broke don't fix it", suggesting that new technologies were diluting the curriculum and distracting from the core elements of education. All of the interviewees spoke of teachers who resisted change and were reluctant to incorporate DT in their classrooms, in the two cases where this was not seen as a concern the most resistant teachers had been asked to leave the school by Principals who insisted on acceptance of DT strategies. Many resistant teachers were schooling traditionalists, amongst the conservative educators referred to in the Literature Review and mentioned in Section 5.3.1, for resisting digital textbooks and LMS. Whilst each educator made reference to a small percentage of school "innovators", they also commented on teachers who were perceived as conservative for resisting change. Rory suggested that "60% are sceptical" of one-to-one DT use in the classroom because they rarely used it at home. Carolyn thought that there was no desire amongst teachers at her school to use laptops "in any pedagogical way at all except to do notes on", which caused her frustration as a curriculum leader who was attempting to change classroom practice. Michelle thought that there was resistance even amongst the curriculum leaders at her school, who knew "nothing about IT" and had no interest in pushing forward with any curriculum changes. This type of resistance by school curriculum leaders had a regressive effect on teachers who might otherwise adopt DT and was likely to be one reason that schools with more visionary leaders had a higher proportion of DT users in their classrooms.

The curriculum itself was blamed for teacher reticence to use DT by 7 out of 10 interviewees. In each case it was the Senior Secondary curriculum that was referred to, known as the Victorian Certificate of Education (VCE) in the schools in this study. School leaders were seen to have an overriding interest in seeing that student performance in their schools that resulted in high results or ATAR (Australian Tertiary Admissions Rank) scores, that represent a competitive university entry system in Australia. This focus both diminished what teachers would undertake in their senior classes with DT and demanded concentration on curriculum content and test results. Lauren suggested that the main reason for a failure by her school curriculum leaders to focus on DT was due to the fact that "they are poring over [VCE] results, they are not looking at anything innovative". She thought that there was a "disconnect between what is happening in Middle School classrooms and the VCE" due to the ATAR focus that was used by middle years teachers to avoid DT, since they claimed to be preparing students for the VCE. This opinion was reiterated by other interviewees, with Carolyn suggesting "the focus on the VCE is just ridiculous", which was the reason, at her school that DT was only "starting to go into the senior years". She believed that it was outmoded "to think that you can just learn content now from a teacher in a classroom", when the Internet offered immediate capacities for research, that new "ways of measuring learning" were needed. There was an ironic aspect to Carolyn's views, as she was her school's curriculum leader, responsible for maintaining the status quo, whilst simultaneously supporting change. Terry also challenged the view that results matter. "What type of person does it make", when they needed "lifelong learning"? The discussion here does not point to a disconnect between progressives and conservatives in schools but to a system that was in lock-step with a content based senior curriculum, where performance was measured purely in test scores and ATAR results. With this pressure on educators and curriculum leaders at the senior end of school systems, it is unsurprising that there was little impetus to use DT in senior years. Some teachers were also reported to have used curriculum preparation, as justification for avoiding DT in middle years programmes. Hence there was a great deal of pressure placed on teachers to resist change, due to senior curriculum needs.

While the middle years curriculum appeared to allow more flexibility in adopting DT, 7 out of 10 interviewees thought that widespread curriculum change would be required for DT to be incorporated in most schools. Lauren was one who thought that the new middle years Australian curriculum was “not a constructivist curriculum” it was “very prescriptive … content focused” and did not mix well with a pedagogical change. Adrian also agreed that there was “nothing in the curriculum” of most subjects “to do with using any electronic device”. He believed that his school used their tablets for marketing since, “we've got them and it looks good”, he said. Carolyn believed that any debate about “progressives and conservatives ... about technology access” missed the point, that curriculum change was not about Social Media but about “building connections ... and relationships”, in which DT played a role, that using “twitter does not make you tech-savvy or a good teacher”. Robert was concerned that his Faculty Curriculum Leader resisted using DT in the new curriculum, insisting that “they can do that somewhere else”. At interviewee schools there appeared to be resistance to change both within schools and without, from curriculum leaders and perceptions about Government curriculum expectations. Going against these significant forces of resistance would require firm commitment and strong school leadership in DT since, in Ingrid’s view, there was “no value being placed on being a modern school at the moment”. She called on administrators to devise “a policy where it becomes clear that we are a 21st-century school and we do value this stuff”. Findings here show there was an absence of such a policy, and little administrative push for DT in the majority of interviewee schools.

In this section we have seen that resistance to change in schools using DT, was found amongst teachers, students and curriculum leaders. There were disconnects apparent in all interviewee schools involving the shortcomings of the DT systems that schools have put into place. In many cases disconnects appeared to stem from poor communication about system deficiencies, poor planning, organisation and low levels of support and resourcing. There was a high level of need expressed for student training, for polices on online use and for teacher professional development.

In Section 5.4 that follows, interviewee reflections on the training and professional development that they have experienced in their schools, are thematically analysed.

Section 5.4 Interviewee Reflections on Training in Digital Technologies

For an effective integration of integrating digital technologies (DT) into educational programs there needs to be a commitment from school decision-makers in providing time, curriculum and training resources in digital education, with an appropriate school vision underpinning this process. In this section interviewee responses relating to training are investigated to ascertain teacher needs. In Chapter 4 a large majority of educators agreed that they would like more professional development in DT, suggesting that schools were facing a need in this area. The findings in this section are supportive of this, indicating that schools may need to do more in upskilling their teachers.

5.4.1 Digital Technology Training for Educators

The importance of training for educators in using DT should not be underestimated. For schools providing one-to-one access to DT in the classroom, there is an essential need for them to train their teachers in effective educational use of DT in order to use the devices effectively, manage student use and deliver the curriculum. A good understanding of these requirements is equally important for school curriculum leaders and decision-makers who are responsible for funding and resourcing this area of the school.

Thematic analysis of interviewee comments showed that interviewees focussed on a few local considerations in their schools. These included: the provision of professional development for teachers in acquiring better DT skills and better digital literacy (DL); the employment of e-learning specialists; whether there were regular times set out for training or learning about DT and budgetary provision for DT equipment and training.

These factors varied considerably in interviewee schools. The following opportunity map outlines the availability and opportunities that staff were offered in interviewee schools, in terms of each of the relevant factors.

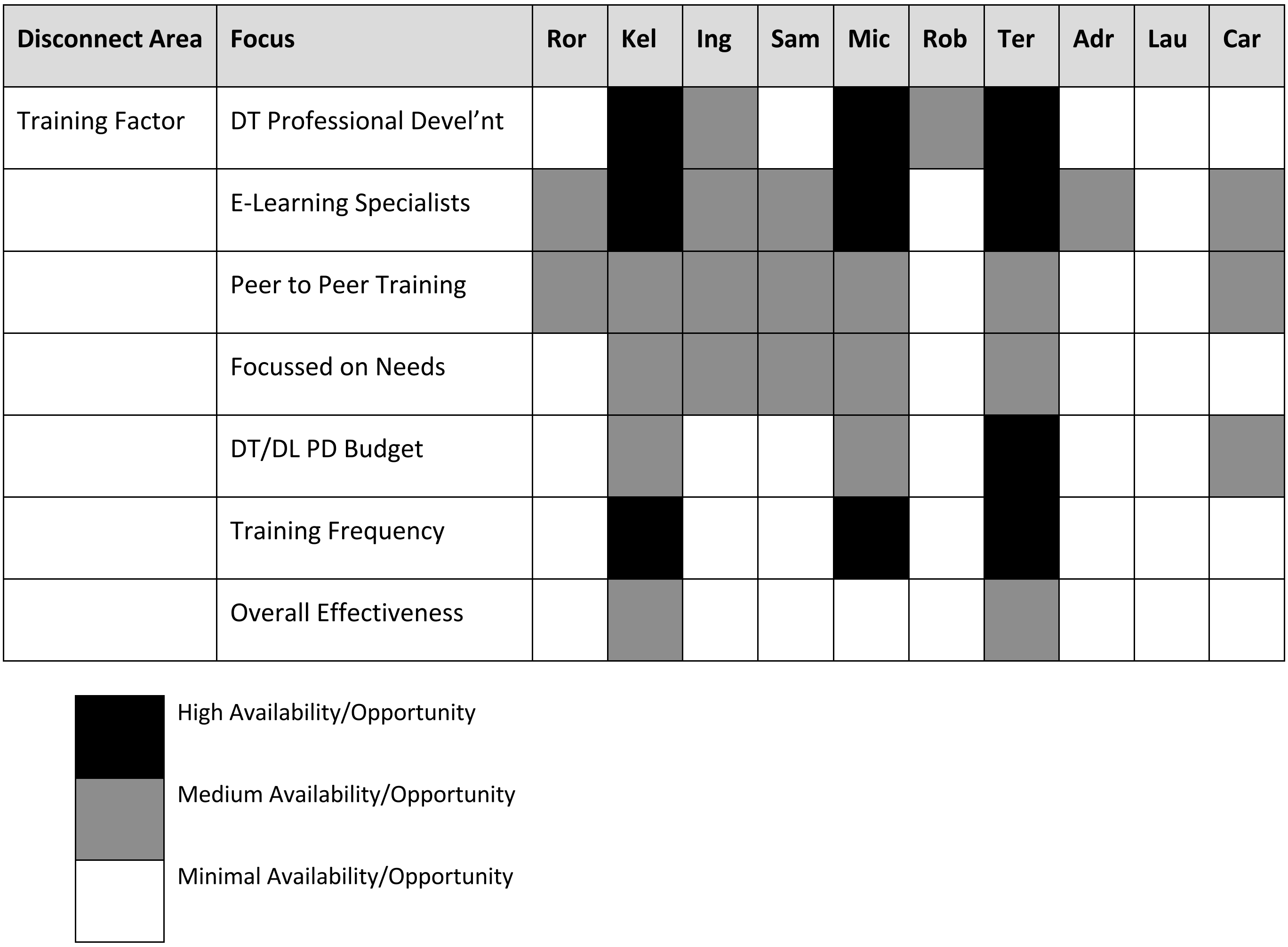

Figure 5.6 Opportunity Map of Availability of Digital Technology and Digital Literacy Training Factors in Interviewee Schools.

A regular time allocation for DT training was found in 30% of interviewee schools. This same 30% of schools featured strongly in providing e-learning specialists to assist staff and allocating an ongoing budget for the provision of DT and associated training.

It might be assumed that schools that have invested in a one-to-one DT program for students and educators, would have regularly arranged sessions for teachers to learn about DT. Yet Figure 5.6, reveals that this was not the case in 50% of interviewee schools, where there was minimal formal teacher professional development in this area.

5 out of 10 interviewees reported that one or more e-learning specialists were employed in schools. Yet in these schools, no formal professional development sessions were arranged by school leaders, there was no regular time allocation for e-learning meetings with teachers and there was no e-learning budgetary allocation. In addition, 20% of these schools did not employ e-learning specialists at all and these also did not have professional development, time for training or an allocated budget. In total,

therefore 70% of interviewee schools did not have a regular time allocated for training in DT and 60% had no formal budget for training and additional equipment. This represented a significant shortcoming for the schools of interviewees and does not suggest that there was a strong focus on teacher training needs by school decision-makers.

Each school in this study had an ICT system with considerable differences from the others, yet the similarities in the training domain were profound, with each school evidently viewing this area to be of minimal importance. They had no clearly articulated vision for the DT use, or for appropriate pedagogies in the classroom, and these were inconsistent with best practice in using DT.

There were many issues raised by interviews in schools that limited opportunities for teachers to access effective training in DT. In one case, while there was a high availability of e-learning specialists, Michelle spoke of them being condescending towards teachers who asked for assistance, which acted to discourage requests. She thought that training was ineffective unless the trainer "want(s) them to succeed". Hence, the attitude of e-learning leaders was very important. In Adrian's school, where he was e-learning specialist, he had a desire to train the teachers although he was "not allowed" to organise training sessions, due to interruptions to other meetings and school activities and because school leaders "don't see any need". Robert similarly reported that "absolutely nothing" was done to train staff, because school leaders "don't ... understand it". Hence, overall effectiveness of DT training for educators was minimal for the schools in this study. These last two interviewees indicated that their schools did not employ an e-learning specialist and that this undermined any potential DT training programs, since their schools lacked impetus to introduce them.

Time was one of the most crucial factors mentioned by the interviewees and there was universal agreement that it was one of the main limiting factors for teachers accessing training and improving their skills. Only three interviewees reported that their schools had provided regular training times with a high degree of frequency. In each of these cases teachers were required to attend training sessions of more than an hour each week on average, with their school leaders prioritising this area and insisting on attendance. Kellie thought that the regular weekly sessions of "professional learning time" in her school were "really essential" for them to remain at the cutting edge in implementing an innovative DT program. In the remaining 70% of interviewee schools there was seen to be a shortage of time for professional development in DT, with very little focus on the area. Carolyn estimated that the required time for teachers to keep up to date with new technologies would be "a 0.2 release", equivalent to one day per week for learning about and using new DT. Without this formally recognised time interviewees thought that teachers were left to their own devices with some learning at home, while others simply did not have enough time or the required motivation, to learn on their own.

Each of the factors shown in Figure 5.6 appear to compound each other, so that only the schools with an availability of all relevant factors, including regular training and a budget, were able to display a high level of overall effectiveness. E-learning professionals, although seen as essential by all interviewees, were not found to provide effective training without school leadership actively encouraging professional development in DT. This finding is an important consideration for school leaders and decision-makers who are implementing a DT program.

5.4.2 Effectiveness of Educator Training Methods in Digital Technologies

Interviewees reported on the effectiveness of a variety of training methods that were used in professional development activities for teachers in using DT. Perceptions of effectiveness of these are shown in Figure 5.7 and vary from individual one-to-one training with an e-learning specialist, to small groups concentrating on a focus area and peer-to-peer with other teachers in their learning area. Occasional opt-in modules were available in several schools and all interviewees had experience with large lecture style training methods. Home learning was another way that learning was experienced by teachers, by accessing the skills of friends or relatives, or undertaking their own research online to boost their skills. Only three of these methods were seen to be effective by interviewees.

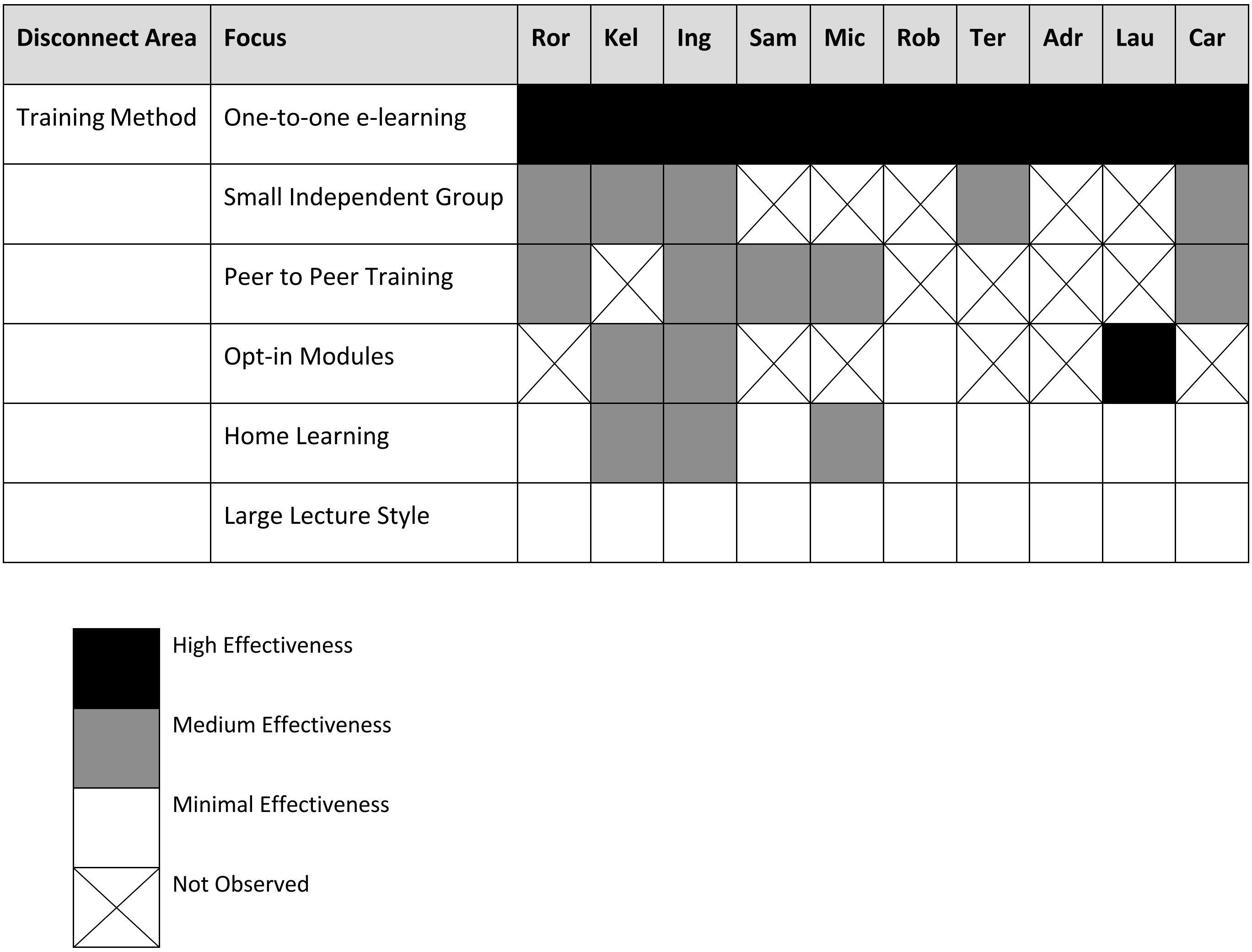

Figure 5.7 Opportunity Map of Perceived Interviewee Effectiveness of Educator Training Methods.

All of the interviewees thought that the most effective method of training was one-on-one training with an e-learning specialist. While each interviewee was familiar with this method of PD delivery, the availability varied considerably from school to school, as shown above in Figure 5.7. Interviewees made numerous supportive comments about one-to-one training. Lauren thought that it was "fabulous", Robert and Terry thought it was the most "productive" and "effective" method, while Carolyn thought it was "the best model" and that it is most effective when the e-learning coaches were employed full-time in that role. Each of the interviewees thought that one-to-one professional development allowed for individual training in what each teacher needed to know in order to be more effective in their classrooms. Samantha thought that it was essential for schools to have e-learning specialists for this reason, to enable one-to-one training. One-to-one training recognised that each teacher was an individual with a unique skillset and unique needs, relevant to what they were undertaking at the time. It allowed them to extend themselves and ask relevant questions at the time that the questions were seen as important.

Samantha saw the one-to-one method as a way to train the trainers “in each faculty” to reach “more teachers” individually. Training the trainer is a classic method of training used in the IT industry. That it could be utilised effectively in schools comes as no surprise. In the Government school system, where funding and budgets tend to be more limited, Rory thought that it was the one method that had “more potential” to allow him to “drive change”. Robert had also seen it work in schools with the ICT teachers leading the way, by being given some of the e-learning responsibility. Michelle, Rory and Adrian were each partly engaged in this capacity in their schools to varying degrees. However, in each of their cases they each had full teaching roles so that their time was limited. Schools, then, saw the value in engaging e-learning professionals in a training role and allowed some one-to-one training, although it was ad hoc and driven by individuals who had limited time to provide one-to-one opportunities for their staff, even though it was perceived as the most effective method. At Terry’s school one-to-one training was officially recognised and a team of “ICT advocates” were employed to undertake a role that he saw as highly important. At his school he was aiming to incorporate students into the ICT advocates role, where they would be freed up from some classes in order to assist with one-to-one training and classroom support. Hence, there was some indication that students may be suited to this role. The finding here is for school leaders and decision-makers to understand the importance of providing e-learning specialist trainers to engage in one-to-one training of their staff, so that each could develop better their skillsets to undertake the tasks most relevant and important to their individual jobs.

Peer-to-peer training in individual faculties was seen in 5 out of 10 interviewee schools with a variation on the train-the trainer, method mentioned above. This was seen to have some effectiveness in these schools and was mainly seen where individuals in Learning Area Faculties had enhanced knowledge about particular applications and were able to share this knowledge with their peers. However, the main limitation of this method was that each of these individual trainers were also teachers employed with full teaching loads and little time availability.

Small independent groups, that met in their own time were found in 5 out of 10 interviewee schools and were seen to be quite effective. The limitation of this method was that these groups had to meet outside of the school timetabled classes, often in “technology breakfasts” or after school meetups. The shortcoming here was that only the most enthusiastic staff would attend these meetings and they created a wider disparity in the skills of the “innovators” and the others, since it was mainly the innovators who instigated and attended these sessions. This practice had the unintended effect of enhancing the digital use divide (Office of Educational Technology, 2017).

Specialist training modules that were advertised for staff to attend were mentioned by 4 out of 10 interviewees, with 3 seeing them as effective. In particular, at one school she attended, Lauren thought that training modules offered by a particular ICT leader were "just terrific" and she was satisfied where she had seen them elsewhere. These were specialist sessions on a particular piece of DT that could be used to enhance the teaching experience. This type of training could be utilised as an effective method in more schools, as they were seen by those who had experienced them as far preferable to the more common school method of large group, lecture-style, training.

Lecture-style training sessions were by far the most common method of DT training for educators and were also perceived as the least effective. All of the interviewees mentioned these training sessions and all interviewees rated them very poorly. These sessions were associated with the greatest staff resistance to learning about DT. Lauren expressed frustration because the sessions were "never hands on ... it drives me nuts". Ingrid thought these sessions never helped to address the negative "mindset" of teachers who attend and "don't understand [them]". Carolyn faced resistance from staff who did not want to attend training, saying "my job is not professional learning" and that for many staff, DT training in lecture style sessions was "like forcing dead bodies into a room", where they "won't learn, they have to be interested". At Michelle's school teachers were forced into weekly "forum" sessions that "drag on" for two hours, although she was pleased that they were hands-on. Other schools had lecture style training sessions as infrequently as once per term, every three months, in which case teachers were thought to retain little ongoing knowledge, that Samantha thought were "just not adequate". Rory thought that large sessions were very ineffective and that they merely created "scepticism from the staff", who developed more resistance to the inclusion of DT. Lauren was most disparaging, suggesting that "if we taught like that", in large lectures without computers, there would be "parents complaining". The finding in regard to lecture style sessions was that interviewee schools were generating more disquiet and resistance to new DT programs and were imparting very little knowledge to staff. By offering these sessions schools may be seen to be undertaking training but there was no evidence in this study that this method was worthwhile.

Many of the interviewees recognised the need for teachers to learn about DT at home and the lack of time for training was emphasised by 7 out of 10 interviewees. However, home learning was only seen as effective for the "innovators" who were able to take the responsibility for their own learning. While 3 out of 10 interviewees made positive comments about home learning and the need for teachers to be self-motivated, they did not make the observation that it could be effective for most teachers. Kellie thought that teachers needed to take more responsibility for their own learning about DT, although she also acknowledged that small numbers of staff continued to develop better skills at home, due to self-motivation and ability, while others fell behind, "creating a much wider bell curve" of DT skills amongst teachers again emphasising a digital use divide.

Innovators: Educators with Advanced Skills in Using Digital Technologies

Each of the interviewees estimated the number of educators in their schools who they thought displayed advanced skills in using DT. When these were discussed in the interviews, these individuals were referred to as 'innovators' and while no interviewees objected to using this term, Terry offered a description of what it might mean, "an innovator is someone who goes beyond the norm", he suggested. In the survey findings 17% of the teachers surveyed allowed students to publish their writing on the Internet. This could be viewed as an innovative activity and is similar to the number of innovators the interviewees estimated to be in their schools. Terry, Rory and Ingrid thought that 5 to 10% of teachers could be seen as innovators, while others mentioned that there would be a "handful". Robert thought that it might be as low as 3% in his school who used "imagination [to] inform reality". In each case interviewees thought that a very small minority of teachers in schools could be seen as innovative.

9 out of 10 the interviewees could be seen as innovators in their own right, as they guided the direction of their teaching staff, in terms of how DT might be used in the classroom. They experimented with new technologies and learnt independently at home. Two of the interviewees, Kellie and Terry, felt supported by their school decision-makers in terms of instigating change in using DT, they also reported less disconnect than other interviewees and thought their schools offered more effective training for teachers in using DT. Hence the effectiveness of innovators in the interviewee schools was governed by the support that they felt from their school administrations and the importance that DT is accorded in their schools.

University Teacher Training in Digital Technologies

Findings in this study of low levels of teacher skill in using DT, both through interviewee observations and survey findings point to a need for further training in schools. However, these teachers graduate from university courses in education, where essential 21st Century skills may be expected to be imparted to students. 4 out of 10 interviewees made mention of university teacher training courses and the failure of schools to attract highly skilled ICT graduates. Michelle thought that student teachers had poor ICT skills and Terry thought that most ICT teachers in schools did not have a great deal of formal ICT training and that "not many teachers" could teach an advanced ICT course. He mentioned industry contacts who were mystified that there were not more secondary students doing ICT courses in schools, since there is such a need for more ICT graduates in the workplace. "Why can't the education system catch up with what is happening in the rest of the world and produce computer scientists" that are needed in industry, he said. Michelle, Carolyn and Samantha all discussed how there was very little ICT teacher training at universities. Hence, there is a strong argument that teachers have poor skills and schools are not encouraging students to consider advanced ICT courses, because teachers lack the skills to teach them.

5.4.3 Student Training in Digital Technology Skills

In the literature it was suggested that pedagogical practices such as constructivism, SAMR and the 4Cs were linked to effective student engagement and learning with DT (Janssens-Bevernage, 2014; Keane et al., 2016). As was discussed in Section 5.2.3, there was some use of these pedagogies in interviewee schools and that these uses were associated with elements of the SAMR model (Puentedura, 2013). Interviewee schools used some of the SAMR elements to varying degrees, as shown in Figure 5.2, although the higher levels were explored sparingly. In Chapter 4 it was also shown that there was significant student desire to acquire more DT skill, although, on the crucial question relating to more training, students with low levels of DL were very much in the minority in desiring more training (24%) and were seen to waste time in using DT by other survey participants. Yet students with high levels of DL felt encouraged to learn by discovery in using DT in the classroom, while those with low levels of DL did not. Importantly, all survey groups, other than low DL students, felt that students should be encouraged to use DT and to explore self-expression in using DT. In this section interviewee perspectives are investigated to enhance understanding of student training in using DT in the classroom.

Although students in 80% of interviewee schools had one-to-one access to a personal DT device and 70% of interviewee schools used an LMS with class materials online, there was little availability for students to access specialised DT training. Figure 5.8 shows the opportunities for students in each interviewee school to access specific DT training.

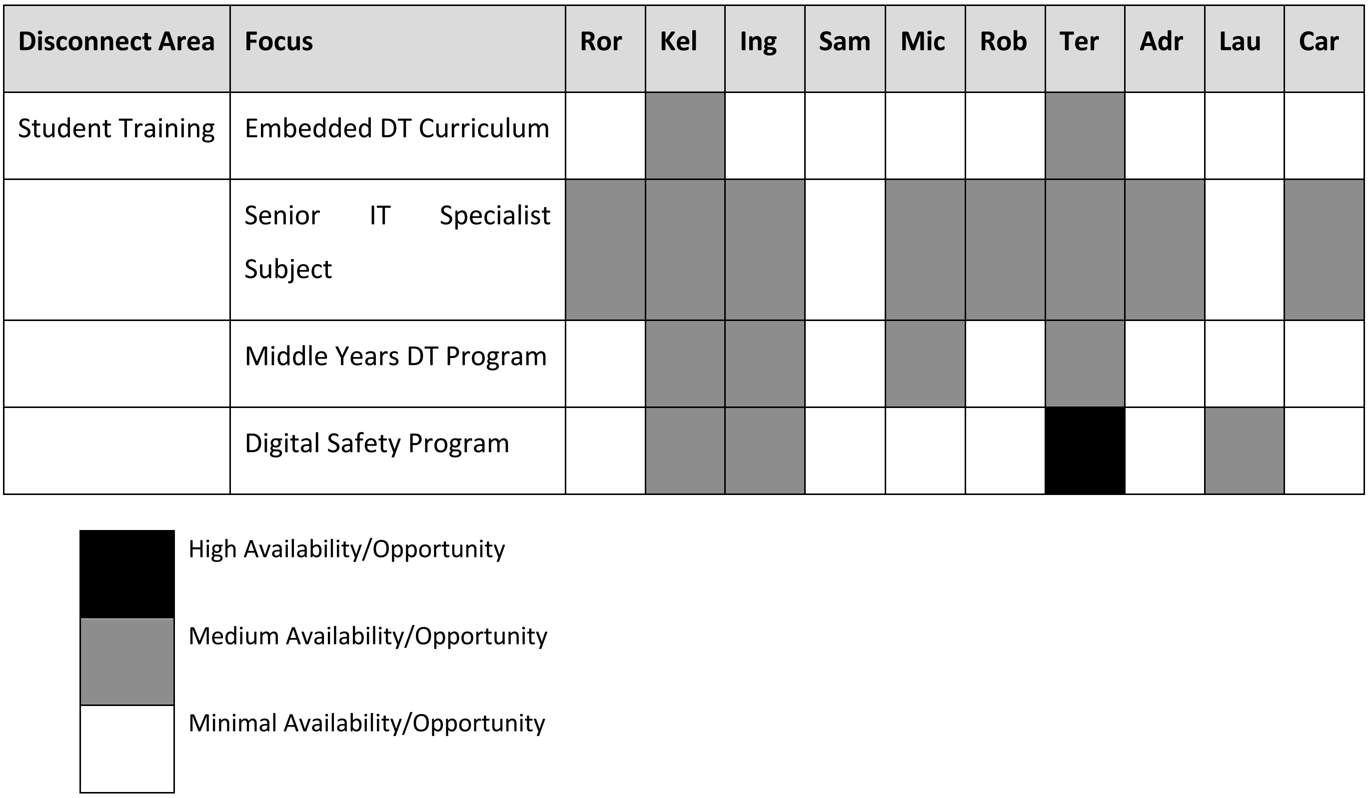

Figure 5.8 Opportunity Map of Student Opportunities to Access Digital Technology Training.

The opportunity map shown in Figure 5.8 reveals that the opportunity for students to access DT training in their schools was scarce. 20% of schools had an embedded middle years program where DT was seen to be covered in the wider curriculum, although it was not specialised. 30% of interviewee schools offered specialised DT programs for their middle years students. While Kellie saw value in her school's DT program, she felt it lacked effectiveness when it became constrained by curriculum needs in senior classes. In Terry's case his school had tried several different methods of incorporating a DT program for students in the middle years school curriculum, with his school making a focussed attempt to develop a "culture of integrating ICT" across all subject areas. Terry and Michelle were the only interviewees who discussed specific areas in which students received advanced DT training, such as "Web Design", "Photoshop" and "creative multimedia". Ingrid was not very positive about her school's attempts to include a DT program since there was "no explicit teaching" of DT skills with the students just doing "cool things" in their classes, although she was not specific about what she was referring to. Overall, 7 out of 10 interviewees thought that little was done to help develop student DT skills. One example was that while all students had tablet computers at Adrian's school, he believed there was "nothing done to show the kids what to do or how to use them". Michelle thought it was "scandalous" that the middle years students at her school could not do anything more advanced than making "a pie chart in maths", the reason being that teachers did not follow the expectations of school curriculum leaders to incorporate DT as they did not want to take time out of their curriculum and there was no follow-up. Kellie was the most optimistic interviewee about the DL of her BYOD students and seemed surprised that parents “don’t believe students are going to be independent enough” to learn online. There was therefore little in the way of DT training for students in the one-to-one schools in this study, reiterating the findings of a need for better DT training in schools.

There were significant challenges for interviewee schools in implementing effective DT programs. Terry discussed the challenges that his school had faced in developing its DT program from classes “dedicated to IT” in years seven and eight, embedding this knowledge across the curriculum to having short training sessions “during 20 minute form times”. He emphasised the importance of understanding the difference between “information technology and information literacy” and that embedded programs have “mixed success because ... a lot of teachers ... aren't confident” in using DT. This view is consistent with the survey findings, and other interviewees, that there are large numbers of teachers with low levels of DL that are unable or unwilling to engage with DT programs. Terry described the importance of the “three C’s” of creativity, collaboration and communication, in “21st Century” learning, reflecting the views of (Keane et al., 2016). Terry’s school has subsequently gone “full circle” back to a “dedicated 45 minute per week period for year seven and eight students, to have specific ICT training by an ICT trained teacher”. The problem for most interviewee schools in implementing classes of this type, by a specialist ICT teacher, was that the number of teachers capable of taking specialist ICT classes in interviewee schools was limited, due both to a lack of focus on this area in university teacher training, discussed above and low availability of ICT teachers.

Cyber safety programs to upskill students in how to cope with online risks, was another area where there was little consistency was in interviewee schools. 30% of schools had implemented cyber safety programs, with varying degrees of perceived success. Once again, it was Kellie and Terry’s schools who had implemented specific online safety programs for middle years students, with Ingrid and Lauren mentioning occasional safety lectures that students and teachers attended at their schools. Adrian had delivered lectures to older students, however, he thought that they showed little interest at that stage. Ingrid thought that safety lectures to students were worthless without practical instruction on how to enhance online security using actual computers connected to Social Media sites, that were blocked in her school. The result was that students “need to work it out themselves”. Ingrid was one of 6 interviewees who believed that cyber safety was essentially a ”parenting issue”, due to the fact that many of the online risks were accessed at home. Samantha agreed with these sentiments that “life is full of risks” and kids needed to “develop a kind of antenna for danger” for “risks online”, that you can’t “put kids in bubble-wrap”, that actions at home were not a teacher’s responsibility. This home-school boundary was a sensitive issue for interviewee schools who were providing one-to-one device access for their students. It also needs to be noted that the views of some of the interviewees were at odds with Government requirements to educate students in cyber safety in schools, requirements that the interviewee schools in this study were not meeting and that interviewees thought were methodologically inadequate.

In conclusion, for the vast majority of interviewees there was widespread frustration with the lack of a formal DT program in their schools, that led to low levels of student DL. Kellie's optimism was not shared by other interviewees, with 6 of 10 indicating that students had poor DL because their schools did very little to train students in the use of DT, suggesting that student skills in using DT and acquiring DL usually depended on individual learning at home. Students were also not being trained effectively in cyber safety, that 9 interviewees identified as problematic (Figure 5.4), as discussed in Section 5.2. If students developed most of their DT skills at home, then schools were both failing to meet student needs and doing little to redress the low DL levels of many of their students, as exposed in the survey findings discussed in Chapter 4. This shows that a digital use divide (Office of Educational Technology, 2017) was one of the main causes of the differences in DL of teachers and students in the survey and interviewee schools examined in this study.

Section 5.5 Leadership and Decision-making in Interviewee Schools

School leaders and Principals faced many challenges in interviewee schools when they implemented digital technology (DT) programs, exacerbated by the fact that they universally came from educational backgrounds, with little DT experience or knowhow. All interviewees thought that their school Principals had little personal knowledge about DT, although Kellie thought that hers was "switched on" and Terry's had acknowledged her shortcomings and engaged a team to independently manage DT. Yet school decision-makers were faced with a plethora of decisions associated with the DT system, that were identified by the interviewees, including financial decisions about insourcing and outsourcing, employment of ICT Technicians and network specialists, purchasing of the hardware and network infrastructure, software and licensing. They then needed to oversee the DT curriculum for students and the training and professional development for teachers and school leaders. Decisions involving the employment and job specifications of e-learning professionals and other staff involved in school DT implementations, were also made. Finally, measures and evaluation strategies that were necessary to assess the effectiveness of the DT system needed to be put into place.

Interviewees also discussed the pressures that school leaders faced from legal, Government and community expectations. They needed to take responsibility to ensure that students were protected online when they used the school system to meet legal duty of care obligations (e-Safety

Commissioner, 2018). In many cases this might have involved drafting responsible use agreements for students or parents to sign and blocking of Internet sites that were seen to place students at risk, for one reason or another. There were also financial obligations placed on school financial managers to ensure that financial records were kept securely and backed up for an appropriate length of time. Parents and school communities also placed expectations on schools to focus on test performance and results, to allow students the best chance to obtain a university placement when they complete their education. This was reflected in media and Government discussions about the comparative results obtained by Australian students on international testing like PISA (OECD, 2018).

In interviewee schools each of the above responsibilities and decisions was undertaken by school leaders with varying degrees of success and are discussed in the Section 5.5.1. Each school of the interviewees also had unique decision-making structures that were related to the success of their DT implementations, these are discussed in Section 5.5.2.

5.5.1 Perceived Efficacy of Decisions Impacting on Digital Technologies

In this section efficacy of decision-making in interviewee schools is investigated. Efficacy here relates to the abilities of decision-makers to make decisions that produce a desired effect or result. Figure 5.9 shows a visual representation of interviewee perceptions of the efficacy of decisions made by school decision-makers that impacted on the use of digital technologies (DT). Interviewee opinions on efficacy of decisions were grouped and coded thematically into the various decision-making areas of financial, policy and training. In turn, each of these areas has additional specific elements that are discussed in this section.

Decisions in Hardware and Infrastructure

Financial decisions shown in Figure 5.9 had widespread acceptance and were perceived as having the highest level of efficacy by interviewees, particularly in terms of hardware and infrastructure. Of these, decisions that were associated with device access in one-to-one DT schools, were rated by 8 out of 10 interviewees to have medium or high levels of efficacy, with the remaining 2 not having on-to-one access for students and this impacted negatively on interviewee perceptions of decision efficacy. Infrastructure provisioning decisions that impacted on network and DT systems were also seen to have medium or high efficacy in all 90% schools that had Wi-Fi access for students; with the remaining school yet to provide students with Wi-Fi access, that Samantha thought kept her school from advancing in DT use. Typical of interviewee attitudes to infrastructure was Adrian's comment that his school "equipment ... backbone ... connections to the world are quite good", suggesting that Internet access and network hardware is sufficiently funded and advanced for its intended purpose. However, both he and Terry understood that it had taken a great deal of effort for their schools to adapt their systems to support one-to-one device access for students.

While the decisions of school leaders in hardware access and provisioning had relatively high efficacy, 5 out of 10 interviewees expressed disquiet with decisions that had been made to allow students to use tablets and BYOD devices. In each case, these decisions meant that students used different devices to their teacher's school laptops. Michelle complained that her Principal had made what appeared to be an autocratic decision about BYOD the following year, after receiving a recommendation from his e-learning specialists; while Adrian was not pleased that staff had different devices to their students and he questioned the rationale of the decision. Similarly, Lauren was mystified with decisions where students were provided with tablets while teachers had laptops that had software incompatible with that of students. Terry also told of a complex series of decisions that resulted in three separate hardware solutions for students, placing them at odds with devices teachers used. Three interviewees were also aware of school leaders who insisted students use school-provided devices at home, although these were not interviewee schools. In each of the hardware provision decisions discussed here, poor efficacy of decision-making has resulted in low satisfaction and poor system useability for stakeholders using DT in interviewee schools.

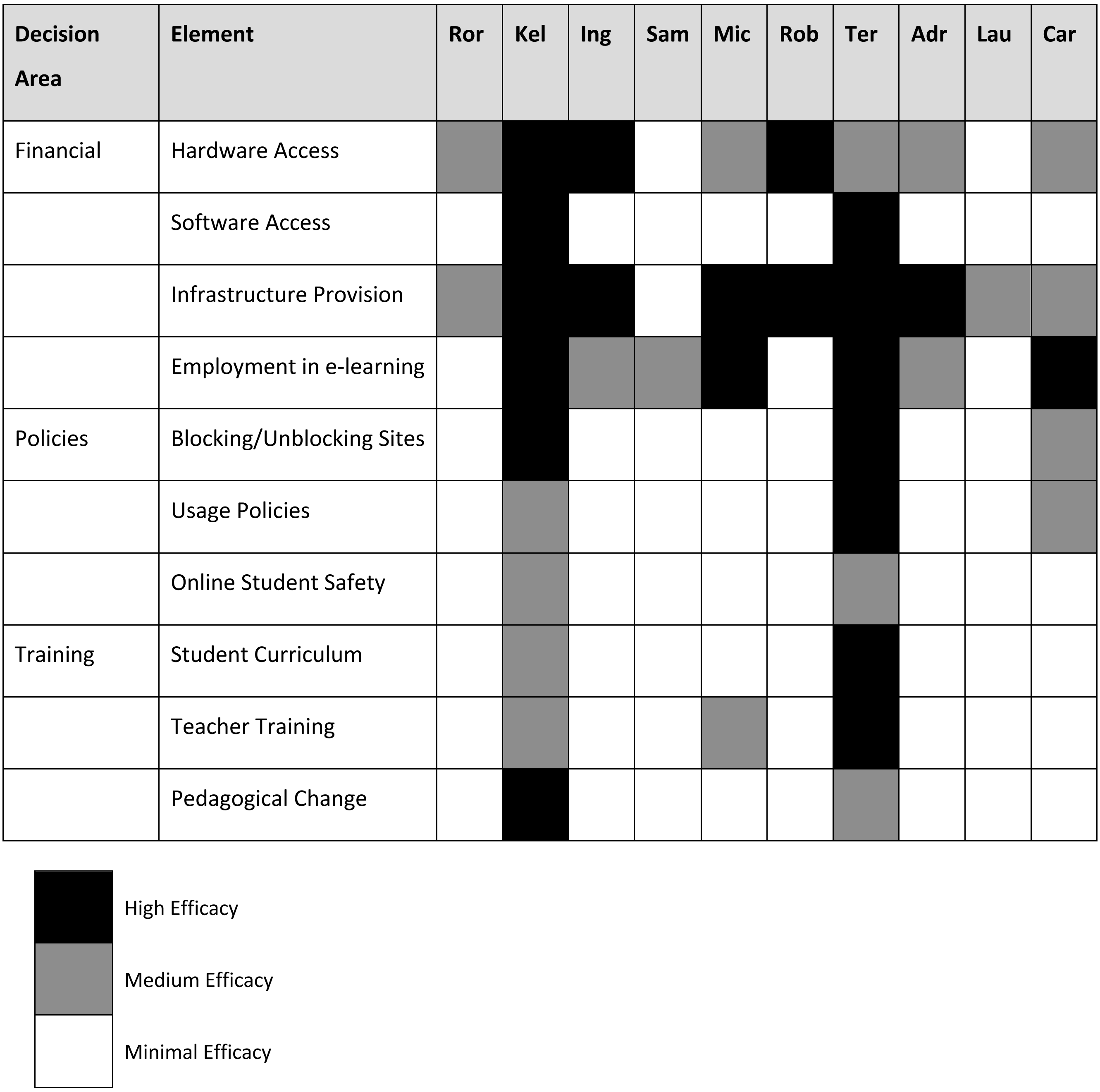

Figure 5.9 Opportunity Map of Perceived Efficacy of Decisions for Digital Technologies in Interviewee Schools.

Decisions Involving Software Access

Software access decisions in interviewee schools were seen as having minimal efficacy and being very restrictive by 8 out of 10 interviewees, with 2 interviewees believing that their schools' decisions had a high level of efficacy in distributing software to students and teachers. Restrictive decisions that limited what students and teachers could install on their machines was one of the major shortcomings of one-to-one device access for students in interviewee schools. There was also no doubt in the minds of the interviewees that these restrictions were dependent on the decisions made, either by school administrators or the ICT Technicians employed by the school. There were a range of concerns about the decisions made, including staff not being consulted and schools locking their school laptops down so that programs could not be installed without technical assistance. Ingrid thought that these factors caused her school to become "quite stagnant and behind for a lot of years", and prevented teachers from exploring new DT. Lack of flexibility with software access and inconsistent software access for teachers and students, due to different devices, has previously been raised earlier in this chapter and in both the Chapter 2 Literature Review and Chapter 4 Survey Results Analysis.

In the 2 out of 10 interviewees where decisions on software had high efficacy, there was a more flexible and open system for installing and utilising a range of software. Terry saw the limitations of using a small variety of software and had acted in his school to implement student use of a wider variety, so that students would gain knowledge that would enable them to use a multitude of different devices. However, he acknowledged there were limitations in the software that students could install and a lack of consistency in student and teacher software in large numbers of classes in his school. Kellie reported that her BYOD school had a most flexible system that allowed software use that was both provided both by the school and downloaded and by students and teachers. However, this approach placed her in a minority in comparison to the other interviewees.

It needs to be emphasised that interviewees perceived software access problems as stemming directly from decisions that had minimal efficacy, through either a lack of consultation or through excessive security controls. In each case, these decisions were seen to undermine the usefulness of DT in interviewee schools. The reasons for low efficacy decisions reportedly stemmed from rigid policy application, poor DT knowledge of school administrators and poor understanding of education needs by ICT Technicians. In each of these cases, additional specialist training for decision-makers may help to enhance decision efficacy.

Decisions Involving e-Learning Specialists and e-Learning Budgets

In 70% of interviewee schools decisions were made to employ e-learning specialists to assist in furthering the DT skills of teachers and students. In 40% of interviewee schools e-learning specialists were provided with a budget that allowed purchase and updates of DT equipment. Where both occurred, interviewees saw decision-making as having high efficacy in providing e-learning professionals in their schools.

The budgetary allocation to e-Learning was seen as an important element in enhancing e-learning objectives for students and teachers. Budgetary constraints on e-learning professionals in their schools was mentioned by 20% of interviewee schools. Samantha thought that e-learning "requires so much training and so much time" and yet there was no teacher release time and little effort, by Governments or schools, and no "incentive pay" for schools to employ e-learning professionals. This meant that there was "no overall plan and scheme" for e-learning in the schools she had worked in. Samantha thought that every school needed a "professional position ... like a Principal position, that is an e-learning position" and that Governments and schools did not really view these needs seriously. Rory also saw "huge budgetary constraints" preventing the employment of e-learning professionals and teacher training in Government schools.

In 30% of interviewee schools there was significant employment of e-learning professionals who had a budgetary allocation, that they could use to invest in new DT and in meeting e-learning objectives. Yet in two of these three interviewee schools, there did not appear to be any clearly articulated vision for what this budget was to be used for and who managed it. Carolyn also thought that this money was absorbed into the "massive" professional development budget in her school and that "learning about technology [was] not a priority" for her school's leaders. Hence, 80% of interviewee schools failed to have a clearly understood and funded e-learning strategy and decisions made were perceived to have minimal efficacy.

In 2 interviewee schools, Terry and Kellie's, there was both a vision and significant funding towards e-learning and decisions were seen to have high efficacy. In each case the budget was managed by e-learning leaders who worked in a team environment and funds were allocated for e-learning training sessions. In Terry's case there were members of the ICT team who were assigned to help teachers in the classroom and there were "ICT advocates" who had time release to train teachers and assist them in e-learning. Once again, this finding placed these two schools in the minority, having high decision-making efficacy, that was a repeating theme in this study. These findings paint a disappointing picture of a school system struggling in managing e-learning, where low levels of perceived efficacy of decision-making was seen as the norm.

Policy Decisions in Digital Technologies

Policy decisions in DT systems in interviewee schools involved so-called responsible use policies, blocking websites; and placing restrictions on the hardware and software provided. Figure 5.9 shows that, 7 out of 10 interviewees thought that decisions made by school leaders in policy had minimal efficacy. In 3 current interviewee schools, where decision-making was seen to have medium or high levels of efficacy, there was a responsiveness to blocking and unblocking requests by ICT Managers and Technicians, and teachers were permitted access to most sites that were blocked for students. However, in the remaining 7 current schools there was a perception that restrictive over blocking occurred with little responsiveness by ICT management, or school decision-makers, to requests to unblock a site, creating the impression of rigidity and autocratic control, displaying minimal efficacy in decision-making. In each of these schools, with less responsiveness to requests, school decision-makers had adopted a “walled garden” philosophy, while simultaneously ignoring the apparent ease with which students bypassed school firewalls, through using “proxies” or “phone tethering”. Ingrid thought her school failed to recognise that “parents know” students were always able to “access the unfiltered Internet” since “they always have their phone”. Lauren and Adrian both commented that students in their schools appeared to have more access to the Internet, and it was “bizarre” that “it is only the teachers that are being blocked”, since the students could wilfully bypass the firewall. Several interviewees also mentioned that they found it necessary to bypass their school firewalls. These findings reiterate survey findings of teachers believing that students bypass school firewalls.

There were numerous anecdotes offered by interviewees about blocking decisions that lacked efficacy and illustrated that decision-makers, or ICT Technicians, lacked the technical knowledge to implement solutions that would put blocking rules into place. Michelle’s described a chaotic attempt at changing blocking rules from “a black-listed approach” [where a specific list of sites were blocked], including unintended results such as “photoshop tutorials”. This solution was then, without consultation, inexplicably changed to a stricter “white list” [where only a list of requested sites were opened], where you “couldn’t get anything” online. Yet Michelle discovered that her “mac lab” remained unblocked, “they left it wide open”, she said. “Because the IT guys don't know how to configure a Mac server. Dumb as dog shit. Really! It is all over the place”. In Adrian’s school, students downloaded a browser that encrypted web traffic on their tablets, so that they could readily bypass firewall rules. Terry was also aware of this issue in his school, while Rory knew that his students could use their phone Internet, rather than the school’s web access. In each of these cases students used unrestricted access to the Internet, although this involved breaking school usage policies. These types of frustration were common in the experience of the interviewees with each expressing similar disquiet and ridicule of poor decision efficacy in decision implementation.

Usage policies were perceived to have been developed with a medium or high level of efficacy in 30% of interviewee schools, with interviewees like Terry, seeing the importance of treating the issue “carefully and properly ... in terms of digital safety and cyber and digital citizenship”. However, usage policies in the remaining schools were seen by the majority of interviewees to pay lip-service to the risks that students face online and rules were put in place primarily to legally protect the school. While Terry was actively ensuring that his school introduced excellent policies for students, these did not enhance student safety online, if students chose to bypass the firewall. In every school in this study students were able to bypass their school firewalls, so that no decision-making in interviewee schools had a high level of efficacy. In Kellie’s case she said her school’s policy was to educate students about the fact that they had to self-monitor their own online behaviour, due to the risks they inevitably encountered at home and at school.

Ingrid thought that schools had policies not to protect students but to protect decision-makers with legal indemnity, so that in legal cases schools face, they can say students “have signed a behaviour agreement” and “this is the document that the child has signed, these are the rules that the child has broken”. This type of cynicism about usage policies was expressed by 4 out of 10 interviewees with the remaining 3, in the low efficacy group, expressing doubts that there were any school policies that relate to “cyber safety”. 4 out of 10 interviewees separately expressed the opinion that it was time for Government to “update their policies” to recognise the reality of student behaviour online, that schools were reacting to outdated legal obligations under Government expectations of “duty of care”. It was also thought that online safety of students should be seen as an important home issue and not the responsibility of the school. It has been discussed elsewhere that schools are recognised as slow to change and this issue is one where change seems unlikely until Government policy changes, despite the fact that school decision-makers are placed in a paradoxical dilemma where they must legally protect students online, while this appears impossible in many circumstances.

Training Decisions in Digital Technologies

In similar vein to the policy decisions discussion above, interviewee perceptions of efficacy in training decision-making was seen to be minimal in 80% of schools, both in student curriculum in DT and in instigating pedagogical changes that would be consistent with DT use. As seen in Section 5.4, interviewees thought there was an overall low level of effectiveness in training in interviewee schools. This, in turn, reflected poor support from decision-makers for DT training. Figure 5.9 similarly shows that a majority of interviewees believe decision-making lacks efficacy in all three areas: student curriculum, teacher professional development and in encouragement for pedagogical change. Where schools gave focus to the importance of these areas, particularly in Kellie and Terry’s schools, decision-making supported training and decisions were high in efficacy. This finding suggests that desirable results in training, providing enhanced understanding and capabilities in using DT, are only obtained where school leaders recognise and value of training for stakeholders in using DT and make decisions accordingly.

It is significant that pedagogical change was seen as central to the process of incorporating one-to-one devices in the 20% of schools where pedagogical change decisions are seen to have medium or high efficacy. In both Kellie and Terry’s schools this change was actively supported by the schools’ Principals and e-learning teams. Terry’s school was seeking “a complete change in the pedagogical technique within 10 years” where teachers entrust knowledge control to the students by showing them where to find relevant information, rather than controlling a “content-based bubble” and where more “interdisciplinary stuff” is introduced. Student-centred learning and pedagogical change was also seen as crucial in Kellie’s school, where open-learning spaces and high-end DT had become part of the school’s physical design. These types of student-centred pedagogies were consistent with the SAMR model (Puentedura, 2013), constructivist and 4C’s (Keane et al., 2016) pedagogical approaches, viewed as important in one-to-one DT schools, in the literature review and discussed earlier in Section 5.2.3. However, in the remaining 80% of interviewee schools, pedagogical reform was not viewed positively by school leaders and decision-makers. Interviewees in these schools commented negatively on both physical features of their learning spaces, and regressive attitudes of decision-makers, that were not conducive to a change in teaching methodology. Ingrid’s viewpoint personified that of the other interviewees, complaining of heavy furniture that was difficult to move to enhance student group discussion and she wanted “everything open” on the Internet, “BYOD”, “more constructivism”, DT for “videoconferencing” and to have online learning that is not “shackled by the classroom walls”. Rory wanted more “group work” while Samantha thought that “the idea of schools has to change”, that students over the age of fifteen should have “flexible school hours” and “learn more at home”, since learning was really about “self-motivation”, although she thought these changes were unlikely with politicians and school decision-makers who were “obsessed with statistics and assessment” and resistant to progressive change in education. There was also discussion that schools should have more of a “social element” and be a “central hub for the community” like “international schools” that Robert had worked at. Every interviewee offered ideas that would change schools, ideas that could not be implemented in their schools. Only in Kellie and Terry’s schools were decision-makers actively seeking to make changes in teaching spaces and pedagogy. Findings here strongly suggest that schools do not change without impetus from school leaders and decision-makers. These types of change also inevitably require not only philosophical commitment but a financial commitment to change, as in Kellie and Terry’s cases, where their schools had actively designed and built newly designed, more open learning spaces to enable team teaching in a digitally supported area.

Student curriculum in DT was supported by efficacious decisions in the same two schools mentioned above, where decision-makers were attuned to the importance of DT in education and cognisant of the need for an associated high DL amongst students. By overseeing a strong DT curriculum, leaders ensured that learning with one-to-one DT devices would be effective in their schools. Whilst the logic linking these two elements together may seem self-evident to the interviewees and to the knowledgeable observer, school decision-makers in 75% of one-to-one interviewee schools seemed mostly oblivious to the importance of developing a student curriculum in DT that would enhance the use of their devices and encourage use in their classrooms. Interviewees in the 80% of schools that did not have efficacious decisions were disparaging of their school's DT curriculum. In Section 5.3.2 disconnects in implementing DT revealed school deficiencies in this area, where 80% of schools had an absence of DT curriculum, a limited number of school ICT teachers to deliver such a program and made little apparent attempt to remedy this problem, according to the interviewees. School decision-makers in these interviewee schools did not recognise the importance of the DT curriculum area and they did not allocate curriculum time and space to its implementation. For schools to do more in this area, they need to upskill their teachers in the use of DT, so that they are able to educate students and assist in putting into place an effective DT program. This means in turn that school leaders and decision-makers themselves need to be upskilled in student needs in DT and DL. Only the two interviewees who thought their decision-makers were innovative, Terry and Kellie, whose school leaders had put into place separate DT management teams, believed that genuine efforts were made in the area of upskilling stakeholders. This team approach is discussed in the following section.

The key to overcoming this challenge for school decision-makers is to upskill school administrators and the teachers themselves. Unfortunately, as described below, this important aspect was not widely apparent in interviewee schools and decision-makers attributed little importance to this area.

Interviewees reported that teacher training in enhancing their DT skillsets was very limited and efficacious decisions in the area of professional development were rarely made by school decision-makers. Carolyn was one e-learning specialist employed by the school, who was unable to gain access to teachers' significant professional development time and seemed mystified that the area "just does not seem to be supported by administrative staff". Most professional development was "subject based" and therefore, without a student curriculum in DT, there was not a space for it. School decision-makers appeared to be very results focused, as mentioned by 7 out of 10 interviewees and discussed in Section 5.3.2; therefore professional development was focused on senior subject areas, in attempts to improve senior results. Teacher reluctance and resistance to engage with training in DT, as discussed in Section 5.4.2, also acted to limit what schools provided. These staff include the "old very comfortable teachers", referred to by Leanne and also Adrian, who "use textbooks" and see little need for DT in schools at all. Without an administrative expectation that teachers be upskilled in the area, decisions would not be made to allocate the time and resources that were required to implement better teacher training. High levels of efficacy in decisions around DT in schools would be unlikely until school leaders recognise its importance and this was only likely to come as a Government initiative that would place pressure on school leaders. Hence, leadership training would need to be the initial focus for successful implementation of professional development in DT in Australian schools before a student curriculum could be implemented effectively.

5.5.2 Decision-making Processes for Digital Technologies in Interviewee Schools

It was elucidated in Section 5.5.1 that decision-making in interviewee schools lacked efficacy in many areas and that these shortcomings were often likely to be caused by poor knowledge and training in digital technologies (DT) by school leaders and decision-makers, that a poor awareness of stakeholder needs would mean that this area was not prioritised in training for students and professional development for staff. While leadership training would assist in enhancing decision-making efficacy in a number of areas, there were also indications that the schools with the highest decision-making efficacy had particular strategies and processes for making the most appropriate decisions for their schools. In this section the processes at play in the interviewee schools are investigated and conclusions are drawn about the best practice in decision-making arrangement and processes in schools with the most effective implementations of DT.

Complexities in Schools that Impact on Decision-making Strategies

Schools are complex organisations and have many decision-makers involved in administration that are likely to participate in decision-making surrounding DT and the interviewee schools in this study were no exception. This complexity was further enhanced due to the fact that each school had different language use surrounding its people and activities that were involved in managing DT. The people included the Principal, Deputy Principals, Finance Managers, Curriculum leaders and e-Learning specialists. Curriculum leaders, for example may have been referred to as curriculum coordinators or directors, or the curriculum could be the responsibility of a Deputy Principal. E-learning coordinators may be referred to as specialists in learning technologies, digital learning or digital technologies. In this study the complexity of this terminology used by the interviewees has been simplified, with financial decision-makers referred to as 'Managers', DT education specialists are 'e-learning' specialists and DT technical staff are referred to as 'ICT Managers' or 'ICT Technicians'. It became abundantly clear from the views of the interviewees that each school had their own bottlenecks that had the capacity to prevent or limit change.

Where schools had selected ICT teams that had a combination of all the elements necessary to implement a program for change, they had greater success. An 'ICT Management Team' of this type had a combination of five people involved to ensure decisions could be implemented without reporting to other decision-makers. These people included: The Principal or their representative, e-learning educational representative, curriculum representative, financial manager and the ICT manager. Each of these had a vital role in ensuring that decisions were enacted in interviewee schools and the ability to limit change effectiveness. The Principal and ICT manager were referred to as having a 'power of veto' over any impetus for change, with ICT managers being able to raise computer security or technical concerns that prevent possible change. The Finance manager was necessary to advise the team about budgetary availability for purchasing or employment decisions, while the e-learning and curriculum representatives were able to take on the mantle of curriculum change and training manifestations for teachers and students.

The finance available in each interviewee school was also an important constraint that should not be underestimated, as it was seen to limit the availability of DT and acquisition decisions directly in several interviewee schools. Financial aspects of administering schools varied enormously and lessened from Independent Schools to Catholic Schools, with Government Schools at the lowest end of funding for the schools touched on in this study. One example of this was the Catholic male School that Samantha worked in, that had in place an ICT management team that was hamstrung by very poor funding and external influences. Finance availability and funding arrangements are therefore significant constraints in school DT decision-making and provisioning.

External influences on school decision-making may also play a role in the directions that schools take with DT. Major decisions in schools that are long reaching in terms of financial investment, such as provisioning a one-to-one school with the necessary infrastructure, portable devices for staff and agreements with hardware and software suppliers, may be referred to a body beyond the day to day school operations, known as a School Board or Council, which may have administrative representatives from an associated church, who may strongly influence decisions where finance or employment are concerned. Catholic Schools may have had influence from Church representatives that impacted on school access to websites, since the church office provided Internet access and controlled the firewall for some Catholic Schools directly. Lauren comedically suggested that “God makes those [firewall] decisions”, due to the Catholic School network provision that limited what students and teachers could access in her Catholic single-sex female School. Government Schools were also limited in ICT support since the Government Education Department provided schools with part-time ICT Technicians who acted as local ICT Managers of the DT system, they were also subject to a number of Government provided systems. Hence, external factors such as school councils or Church decision-making authorities acted to limit what interviewee schools were able to do with DT.

In order to overcome the problems inherent in measuring the importance of external factors, the focus in this study is on the decision-making processes and the attempts made to enhance DT in each interviewee school. The focus is on internal school influences, rather than external, on internal decisions and decision-making, not external factors.

Decision-making Processes in Interviewee schools

In each of the interviewee schools, without exception, the managers of the ICT system and the school Principals were detached from the classroom and disconnected from classroom and teacher DT needs. Curriculum leaders were also often detached from the classroom in the majority of interviewee schools. This meant that the people who made the decisions about school DT made available to stakeholders were not users of the system for educational purposes. They instead used DT systems primarily for administrative purposes: for accounting, email, reports, budgeting, calendars and meetings. School administrators also needed to make decisions that related to their DT systems, in financial aspects, systems management, employment and DT provisioning. As seen in Section 5.5.1, school leaders often made these decisions with little training in DT, according to the interviewees.

Only in Kellie's school did the school Principal have some skills in the DT domain and he had also appointed a Director of Innovation and a Director of ICT, who together met with the Principal to create a decision-making team of at least three; while in Terry's school, the Principal had entrusted control of the DT system to a DT management team, where a number of employees with skills in the area, discussed school DT strategies and made all decisions that related to the system, including employment of technical specialists, training and DT curriculum. In both of these interviewee schools there was an expressed focus on these teams being "very much in favour of an educational outcome", as Terry explained, while in many schools the ICT "department rules what happens" with DT access, rather than being responsive to the needs of teachers and students to create educational benefits. Samantha's school also had an ICT management team, that she had instigated, although their budgetary allocation for significant change in DT was minimal in her Catholic single-sex male School. In other schools a variety of people made decisions that impacted on DT programs, as discussed below in Table 5.4.

Table 5.4 Decision-making Processes and Individuals in Interviewee Schools.

Main Decision-maker	Interviewee	Description of Decision-making Process
ICT Manager/Technician	Ingrid	Ingrid thought her Independent coeducational school had senior managers who she described as being in the "Luddite group" who would not or could not make effective decisions. Decisions therefore passed to the ICT manager who focused on "restrictive practices" and "security". "Learning technology people" listened to requests and advised others but had little influence over decisions. There was not a team management approach.
	Adrian	Adrian had been brought in as an ICT curriculum specialist, at his Catholic female school. However, his school's ICT manager rarely implemented his requests for change. School leaders resisted allocating professional development time to train teachers. Adrian had suggested an e-learning team. There was not any team management of digital technologies.
	Robert	Robert had worked at two coeducational Independent schools where ICT managers acted conservatively to limit school uses of DT, in similar ways to Ingrid's school, with little influence or interest shown by other school leaders. There was not a team management approach at either of the schools.
	Rory	Rory was the e-learning specialist at his coeducational Government school. The school Principal listened to requests from a group of interested teachers and had introduced BYOD. However, he did not seem able or willing to influence decisions made by the ICT Technicians who managed the school system, placing them at logger heads with Rory and the teachers. There was not a team management approach.

	Lauren	Lauren reported that one young ICT Technician, with no educational experience, was making all DT management decisions. Internet access was managed by the Catholic education system. The Principal and other school leaders appeared disinterested in influencing decisions made by the ICT Technician. There were no e-learning specialists. There was not a team management approach.
	Carolyn	Carolyn's Independent male school had an e-learning team that had suggested some changes in curriculum direction. However, the ICT manager acted independently and made most management decisions. He would not respond to teacher requests without direction from the Principal, who remained distant from the process. There was not a team management approach.
Principal and School Administration	Michelle	Michelle's Independent coeducational school had "outsourced" all ICT technical support and management of the school DT system and it was mostly managed externally. Her school's e-learning team was able to influence decisions that were ultimately made by the Principal. The outsourced ICT management of the system resisted attempts at change and Michelle thought there were major problems with the arrangement, that her Principal ignored. There was an e-learning team but not an ICT management team. Decisions rested with the Principal.
ICT Management Team	Samantha	Samantha's school had recently implemented a full ICT management team, with representatives from all five relevant areas, where she was the e-learning specialist. This school did not have one-to-one access to DT for students. There was little finance available for the

		school to move beyond the current computer laboratory approach. Many of the computers were old and few teachers and students could access the computer labs, apart from in media and computer aided design subjects.
	Terry	Terry's Independent female school had implemented two ICT management teams, the main decision-making team was referred to as the ICT Policies team, which was supported by a type of e-learning team that suggested change, called the ICT initiatives team. These teams seemed to work effectively to manage the change process, under Terry's guidance as a senior curriculum manager and leader in DT. Terry had received an award for his work in digital education.
	Kellie	Kellie's Independent coeducational school had a Principal, who she described as a visionary leader, who had received a "Principal of the Year" award, primarily for his work in digital education. He had set up an ICT management team to implement changes in the DT domain. The ICT management team was advised by a "skills associates team", similar to an e-learning team. The Principal also encouraged individual teachers to initiate change themselves through the ICT Technicians, using the motto "don't think, just do it". This process was seen as a success in Kellie's school.

Table 5.4 shows the formal DT decision-making arrangements observed in interviewee schools, from individual ICT Managers and Technicians, school Principals and decision-makers, through to ICT management teams. In each school the school Principal had determined which approach the school would adopt, as the primary decision-maker and always had the "power of veto" over decisions made by others. In all of the interviewee schools, the school Principal rarely made direct decisions about the acquisition of DT in their schools, relying instead on their administrative team, ICT Managers or

Technicians, or on a specific ICT management team. Only in Michelle's Independent coeducational school, was the school Principal central in selecting the DT used in the school.

E-learning specialist teachers, often with some time release for this role, were seen in 80% of interviewee schools, where they were primarily responsible for supporting and training teachers in their use of DT. They acted in advisory roles to school administrators and ICT managers and they advocated for changes that would enhance the use of DT in classrooms. They had limited influence over professional development time allocated to teachers, the budget for DT and decisions relating to acquisition of DT, other than where they participated in ICT management teams. E-learning specialists and teachers who were passionate about using DT, arranged and participated in meetings about future uses of DT in 5 out of 10 interviewee schools. They then made recommendations to the Principals or the decision-making team about new innovations. The perceived responsiveness of school decision-makers to these suggestions for change, appeared to vary widely in interviewee schools and depended on the decision-making structure, finances available and on the commitment of the school Principal to accept changes.

Figure 5.10 shows satisfaction levels with the decision-making processes and the individuals involved in decision-making in each interviewee school.

Satisfaction with Decision-making Processes in Interviewee Schools

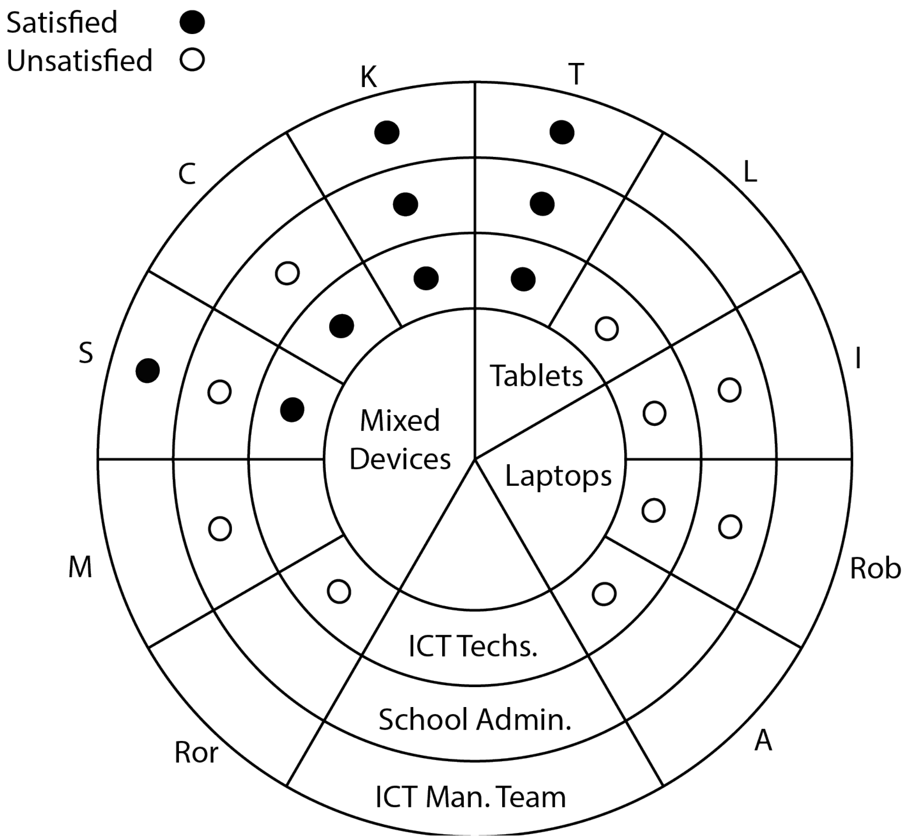

Figure 5.10 Satisfaction with Decision-making Processes: Spectrum Chart showing device type, decision-making groups and interviewee satisfaction in their schools.

Figure 5.10 reveals interviewee schools showed all possible combinations of decision-making strategies. While there are limitations in this study in terms of the numbers of school representatives of each method of decision-making, each area is represented in the views of the interviewees and each interviewee was able to express opinions clearly about the processes involved in decisions about DT access and training. There was no knowledge about decision-making structures in interviewee schools prior to the interviews and this range of decision-making strategies may reflect the range seen in schools generally. Where decisions were made by individuals the decisions were more autocratic, while groups making decisions engaged in more democratic or collaborative processes. As seen in the literature, more democratic decision-making processes allowed for more engagement by stakeholders with decision-making processes (Rikkerink et al., 2016) and more ownership of decisions made.

In 3 out of 10 interviewee schools, the ICT Technicians or Managers were solely responsible for decision-making and implementing change in DT. In these schools (A, L, Ror) there was little satisfaction expressed by interviewees in decision-making processes and decisions.

In 1 of 10 interviewee schools the Principal or representative decision-makers, had the responsibility for the decisions made with DT change and interviewee, Michelle, thought that the decisions made were less than satisfactory. One of the reasons she gave was that there were no ICT Technicians involved in decisions, and none to whom staff could directly make requests, due to the ICT management outsourcing the school had adopted.

In 3 out of 10 interviewee schools there were combinations of school decision-makers and ICT Technicians who made decisions about DT and in each case, there were less than optimal levels of satisfaction. Carolyn was the one interviewee who thought that the school ICT Manager and ICT Technicians were generally responsive in some respects. However, for all three, there were many decisions where there was a lack of responsiveness to requests made and decisions that were seen as less than satisfactory. The lack of consultation felt by interviewees, for this model, was a major concern undermining this decision-making process. Ingrid felt that only the "learning technology people" listened to teacher concerns, while there was "no reaction from the higher up management of I(C)T" to teacher requests and minimal system evaluation, with no one in ICT asking, "what are you doing, what would you like"? The failure of her school to offer ICT support for teachers wanting to incorporate more DT, was expressed as the "tail wagging the dog", with ICT technical support controlling educational uses, rather than the other way around. Robert also reiterated Ingrid's concerns and at his school he thought the ICT technical team "seems very clumsy and clunky and lacking in direction", while "open creative communication in schools" was "critical" with implementing new DT. Where ICT Managers and Technicians were responsible for DT decisions, there was an overwhelming sense of dissatisfaction, reflecting the findings of Keane (2012) that ICT management was detached and apparently unaware of educational needs, focusing instead on network security and lockdowns.

In 3 out of 10 schools, all layers of decision-making groups were incorporated into an ICT management team and these interviewee schools had the most positive interviewee responses, of any of the decision-making arrangements. Amongst this group, only Samantha thought that her school did not make satisfactory decisions, mainly due to the lack of funding for the DT area and equipment, since the students were restricted to computer laboratories and they did not have access to one-to-one DT devices. There were discussions at her school that the parents came from an area of low socio-economic status and would be unable to afford to purchase a school laptop for their students. However, Samantha was positive about the new decision-making structures that her school had recently put into place because “voices can be heard from all sides”, in the ICT management team and she was optimistic that good decisions would eventually flow from this. She also thought that this process involved better communication and the ICT Technicians were more responsive to staff needs in this case. In Kellie and Terry’s schools there was a high level of satisfaction with all levels of the decision-making process and all were seen to be supportive of DT change. In each of these two schools the Principals had significantly different attitudes. In Kellie’s school the Principal had a laisse-faire attitude to decision-making and allowed teacher implementation of new innovative practices and Kellie expressed surprise that he was so open to teacher requests, saying “why are you even asking me? Just do it”. On the other hand, Terry indicated that his Principal was more conservative and required thorough discussion before any change would be adopted “not wanting to rush into decisions ... certainly not just wanting to go with the latest thing” and she wanted to be sensitive to the needs of her teachers, although she had implemented a collaborative democratic decision-making group. These different approaches show that the decision-making process of an ICT management team, may be flexible enough to be able to be sensitive to the needs of the school community and strong enough to be independent of the Principal. The success of an ICT team approach to managing all aspects of ICT implementation within the school, found in this study, also strongly supports the theory of Keane (2012) that the school ICT Manager is a necessary member of all leadership and decision-making teams. The schools in this study with a team approach to decision-making involving DT, all had the ICT Manager as part of the team that included members of the school leadership with responsibility for DT decisions and finance. This suggests that democratic decision-making processes, through a team approach is likely to push these school towards best practice. This is turn would result in more acceptance of decisions by school communities, since there is a representation of all school groups on these teams, creating more ownership of decisions made. However, while Keane suggested the ICT Manager be a part of numerous school teams, in this study, in the schools mentioned above, one group was responsible for all DT funding and implementation decisions.

The fact that ICT Technicians and Managers were seen to be supportive of change where there was an ICT management team is significant. In schools with ICT management teams there was more ownership of system changes, responsiveness by ICT Technicians and capacity for teachers themselves to influence change, through conversations with school e-learning specialists, or others involved in the ICT management team. On the other hand, in the 70% of schools without an ICT management team approach, the e-learning specialists and classroom teachers felt disempowered, with little ownership of the system. Teachers in these schools felt less capacity to influence the decision-making process, with a more distant and autocratic decision-making approach with less responsiveness to requests from ICT Technicians, Managers or school Principals. A transparent decision-making process was seen by interviewees to open the way for improved communication and more satisfaction with the decision-making process.

Limitations and Observations

The most obvious limitation in this study is the fact that there was a small number of interviewees. These ten interviewees each gave insight into a large range different decision-making processes and arrangements in their schools, each with varying efficacy. While this is useful, in that it illustrates that there were many different decision-making processes involved, as schools face the many challenges put forward by the inclusion of DT, it also is limited in that there is no information of what the frequency is of each type of decision-making arrangement, or if the relative successes of each arrangement varies significantly from what is observed in this study. Decision-making processes would provide one useful direction for future qualitative research in schools.

Interviewees also made numerous observations about the uses of DT and associated decisions that showed variation in teacher and student acceptance, ownership and resistance to new DT in their schools. This variation included differences in training and professional development and the incorporation of DT into the wider curriculum. It may be the case that schools have invested heavily in this area, since the data in this study was collected, due to stronger Government expectations. On the other hand, it is likely that schools are all facing the challenges identified in this study. Further investigation into these challenges would reveal if there have been significant changes in Australian schools in professional development and student training in DT.

The reasons for the disconnects and low levels of DL in interviewee and survey schools and the reason teachers want more training in DT, was due to the failure of school administrations to provide appropriate funding, time and staffing resources to the area of professional development for teachers. School Principals and school decision-makers in this study, aside from two of the interviewee schools, did not put focus on DT and regarded traditional areas as having more importance, for example traditional classroom pedagogies and subject professional development, that they perceived may improve senior results.

Home vs school DT is also an area that could be researched in future, if schools are moving towards more acceptance of DT that are used by students at home.

It seems extraordinary that new DT would be introduced suddenly into classrooms, with little training or support for educators and students. Yet this was reported repeatedly by the interviewees, as well as in the survey comments from students and educators, despite school differences in finances and staffing. There were also few systems in place to evaluate the effectiveness of DT inclusion in schools and poor decision-making and management practices. Interviewees thought in many cases that new

DT were purchased due to persuasive marketing practices from vendors, or for school marketing purposes, rather than for their educational value. At the current time it is unknown if schools are still making wholesale changes without the supporting processes and evaluation strategies that are necessary to ensure their effectiveness

ICT managers in this study did not meet with educators in the majority of the schools, other than having discussions with e-learning leaders or ICT management teams. The relationship, between ICT teachers and ICT managers, was fraught with problems in all interviewee schools except where the school Principal took a direct interest in the inclusion of DT. This disconnect in communication between the ICT manager in schools and the school's educators; was seen by (Keane, 2012) to have a regressive effect on the provision of effective DT. This area has rarely been studied in detail, in Australian or other schools, and there is an avenue here for more qualitative research.

6 Findings Synthesis and Conclusion

In this chapter findings that relate to the four research questions are discussed in Sections 6.1 – 6.4:

- What are the attitudes and attitudinal differences of the various stakeholders towards digital technologies in secondary education?
- Are there attitudinal disconnects between stakeholders that impact upon the delivery of curriculum content and use of digital technologies in the classroom?
- How do schools train stakeholders in developing digital literacy and in using digital technologies? Are these methods effective?
- How are decisions made in providing training in digital literacy and in implementing digital technologies in digital education? Are there decision-making and change management practices that allow for more effective provision of digital literacy and implementation of digital technologies?

This chapter discusses findings indicating that schools face monumental challenges when they are implementing new digital technologies (DT) and training stakeholders in digital literacy (DL). Problems in DT implementation in the schools in this study were found to be caused by a range of organisational malfunctions in decision-making, poor professional development and training, misunderstandings of student and teacher DL (Kirschner & De Bruyckere, 2017), and poor awareness of the digital use divide (Office of Educational Technology, 2017). Conflicts and disconnect between stakeholders led to conclusions that interviewee and survey schools were beset with organisational change management issues. This chapter outlines these issues and points to the need for change in DT decision-making processes. Recommendations are made for decision-making strategies that schools could employ to improve implementations and integration of DT, in schools outlined in Sections 6.3 to 6.5.

Section 6.1 Attitudinal Findings in Digital Technologies

In this section findings from both Stage 1 surveys and Stage 2 interviews are analysed, that reflect on the first research question: What are the attitudes of the various stakeholders towards digital literacy and use of digital technologies in education?

6.1.1 Similarities in Student and Educator Digital Literacy

The theory that there is a distinct 'digital native' generation of students with peculiar and unique characteristics that distinguishes its members from older generations of educators (Prensky, 2001), perpetuated in contemporary media, is not based on evidence (Kirschner & De Bruyckere, 2017) and is directly contradicted by survey findings in this research. Survey analysis in this study confirms that digital native theory is a myth. While there are no doubts from the surveys and interviews that the use of digital technology (DT) by many students is very popular and widespread, there is also evidence that it is similarly endemic for many teachers, including in the home. Closer examination of the data reveals little digital native impact on schools in this study; instead, it was found that educators and students with low digital literacy (DL) were at a distinct disadvantage when using DT. This study provides significant quantitative and qualitative data, to support this conclusion.

Survey data revealed that differences in DL were not significant between educators and their students in the Independent coeducational Schools with one-to-one laptop programs, that participated in the surveys. There were more similarities than differences in the self-estimates of DL of students and their educators. The survey findings illustrated in Figures 4.1 and 4.2, show marginal differences in the range of DL, self-reported by students and educators. There was also a very high correlation ($r = 9.5$) between self-estimates of DL with a highly significant similarity $p<0.01$ between distributions of survey responses of educators and students. This data strongly supports evidence in the literature that it is a myth that there are digital native students, with superior DL to their educators.

Survey participants also reported similar ability to use DT in the classroom, revealing similarly high levels of self-efficacy, and similar high correlation to DL self-estimates between the distributions, with significant similarity of $p<0.01$. This data shows that the majority of educators and students in this study had high DL and self-efficacy in using DT in the classroom, shown previously to be related to capacity to use DT (Aesaert et al., 2017; Ale et al., 2017). In each group there were high and low DL participants and the differences between the groups were not significant.

It was also significant that there were large numbers of educators (42%) and students (35%) who admitted to not having a high DL and a similarly poor to moderate ability to use DT in the classroom, revealing the need for further training and professional development of both groups of stakeholders. In each group there was therefore a continuum of DL with a range of DT abilities, not two groups distinct to each generation; representing a type of digital use divide within each group of educators and students. There is a need for greater focus by schools on implementing DT and in imparting DL, even in schools similar to those that participated in this study, with one-to-one integration of DT via laptop programs.

Low DL amongst surveyed students and educators also impacted on curriculum delivery using DT, which was reiterated in the interview findings. Interviewees suggested that low DL teachers were more reticent to use DT in their classrooms and resistant to change. School decision-makers also appeared to be hampered by low DL and self-efficacy in using DT, as only the most skilled school leaders in DT were more open to introducing new DT. In the survey and interview schools in this study, it was the low DL groups that needed further training and professional development to improve their DL and DT skills, to enable or enhance classroom uses of DT.

However, it was significant that interviewees reported high DL users to be more effective and more frequent users of DT both in the classroom and at home, and that this was the case for both students and teachers. Teachers with the highest DL were also noted by the interviewees to be at least as skilled as the students with the highest DL, although each had developed skillsets that reflected their uses of DT and their individual interests.

Digital native theory was further challenged through major similarities in the attitudinal congruence of educators and students on numerous survey items. These shared values and attitudes included majority beliefs that using DT:

- was greatly enjoyed both within the classroom and at home;
- enhanced learning by ‘discovery’ and ‘self-expression’;
- was ‘well-suited to group projects’, that supporting constructivist, 4Cs and SAMR pedagogies;
- provided opportunities to be ‘innovative’ and ‘creative’;
- in computer gaming and Social Media, enhanced DL;
- enhanced quality of presentation of assignments and homework, and that students wrote more using DT.

Interviewees reported the widespread perception that frequency of DT use equated to a high DL. However, low student DL affected DT activities and although students may appear to be engaged, they may be merely distracted. This was best described by Michelle that “kids are ... ignorant ... with DT ... game-playing and Facebook, that's all there is”. Therein lies an unresolved issue, that many teachers and school decision-makers, appeared to have an unrealistic overestimation of student DL, perhaps due to an acceptance of digital native theory. This finding was also reflected in survey data, where teachers seriously over-estimated student DL (Figure 4.3). This was also reflected in interviewee perceptions that school decision-makers did not think students needed more DT training, since there was little focus on DT curricula in interviewee schools. Interestingly, only 30% of low DL students themselves, were enthusiastic about obtaining a high DL and 24% wanted more training in DT.

It has been thought for some time that DT integration in schools depended on the DT training of the school’s Principal (Dawson & Rakes, 2003) and the interview findings of Stage 2 in this study, support that view for school decision-makers. 2 out of 10 interviewee schools had Principals with an effective understanding of the DT needs of their teachers and students and were perceived by interviewees to have made efficacious decisions. In the remaining 8 out of 10 interviewee schools, decision-making was seen to lack efficacy in teacher DT professional development, student DT curriculum, and in encouraging pedagogical change to assist DT integration. Interview findings strongly suggest that schools did not change without impetus from leading decision-makers who could provide the necessary resources for a successful DT system. In any school this group of school leaders may include the school Principal, Curriculum leader, e-Learning leader, Finance Manager and ICT Manager.

6.1.2 High Digital Literacy Group Attitudes

Amongst the survey participants were two groups, high DL educators and high DL students, who used DT effectively and who had positive attitudes about its use in their schools. They each had distinct attributes that are expanded on below and they shared a high degree of optimism about DT programs. Their beliefs and attitudes towards DT roughly coincided with what we otherwise might expect of the 'digital native'.

Approximately 58% of educators self-estimated a high DL in the surveys and were amongst the highest skilled users of DT in participant schools. This group also contained the small core of educators who use DT more regularly than their colleagues, who led their communities in trialling new equipment, specialist software and Social Media for education. This group could be termed the DT 'innovators'. When asked about DT innovators in their schools the interviewees in this study reported that the number of such innovators in schools was a minority, that they estimated to be in the range of 5 - 20% of teachers. These users were the early adopters of new DT and were likely to be involved in assisting others in adapting to technological change, a finding consistent with Rogers' (1962) diffusion of innovation curve. These users were also often self-taught outside of school hours, at home, although they may have learnt due to specialist subject requirements, such as Computing or Media, or because they had a suitable mentor. They were often not involved in school decision-making in DT, or DT curriculum development, although they could arguably offer a significant contribution. Incorporating this group in decision-making will be explored further in Section 6.4.

In a similar vein to the above educator group were 65% of students who also self-reported a high DL. Interview and survey findings independently confirm that these were often self-taught students, who had learnt specialist or advanced skills at home with or without a mentor. These individuals spent personal time outside of the school enhancing their DT skill levels due to interest and curiosity. They were unlikely to have acquired their skills from the school DT curriculum. They were also quick to notice educator shortcomings in terms of using DT and they may have assisted educators and other students in using DT, as some teachers reported.

Minimal research in the literature reflected upon the attitudes of those self-reporting high DL and self-efficacy in secondary schools (Aesaert et al., 2017). However, the level of confidence shown by high DL participants in this study draws a close comparison with previous research findings in higher education, that "positive student attitude and digital literacy significantly contribute to self-efficacy. In turn, self-efficacy has positive effects" (Prior et al., 2016, p. 91) on use of DT by postgraduate students. The two high DL groups of students and educators in the current study, therefore learnt at home independently of school programs and shared optimistic and positive attitudes about DT in schools. They were more likely than their low DL counterparts to:

- be 'passionate' and 'confident' using DT;
- encourage others to use DT and were more likely to want others to publish material online;
- believe that schools should allow students to explore 'self-expression' using DT;
- believe that DT provide opportunities to be 'creative' and 'innovative';
- think that students get 'bored in class' if not using DT;
- think that the quality of homework improves and that students follow instructions when using DT;
- think that DT is well suited to group projects and that Social Media offers new digital literacy;
- not find DT challenging, not think DT at home is a major distraction and prefer not to use pen and paper.

The above quantitative findings point to a shared vision amongst a majority of those with a high DL, that schools should be places of digital exploration, where students and educators had access to the latest DT and received opportunities for up-skilling in the latest DT tools and software. However, 6 out of 10 interviewees in this study indicated that their schools were not providing regular DT training opportunities for students or teachers. 6 out of 10 thought that there was no formal professional development (PD) budget for improving the DL of teachers. Hence there was ample evidence, from the surveys and interviews in this study, to conclude that the majority of schools were not upskilling their students or educators effectively in the use of DT. This finding in Victorian schools, is in agreement with the observation in schools in the Netherlands, that there was simply a lack of vision and knowledge among school leaders about the relevance of DT to the learning process (Swager & Bottema, 2012). There are ways that leaders could ensure that schools do not allow their own lack of vision or knowledge to hamstring the desire of their high DL staff and students to further their skills in

DT, by incorporating their most visionary and innovative DT staff in the decision-making process. This suggestion is elucidated further in the following sections.

6.1.3 Low Digital Literacy Group Attitudes

In the survey findings students (35%) and educators (41%) who did not agree to high levels of DL, had less confidence in using DT. They also shared attitudes towards the use of DT that are outlined below; while on other items they did not express strong feelings and showed ambivalence, particularly in the case of the students. This might be expected for participants who lacked self-efficacy, that they may be uncertain of how to respond to the survey statements. It also points again to the need for further training in the use of DT.

This finding, that there was a need for further training, was further supported by the fact that both students and educators recognised the need of the opposite group for more support when using DT in the classroom. Yet training for the low DL participant group was problematic with only 29% being passionate about the use of DT in education. Similarly, a minority agreed that they were enthusiastic, or confident, as expected. One suggestion that can be made here is that training programs could focus on using software of particular use in the home; since a large majority of the low DL group enjoyed using the Internet at home and approximately 40% tend to be curious about finding out more about DT for entertainment. This information could be used to develop DT topics in the classroom, that were more closely associated with home use.

Negative Attitudes Undermine Programs

Students and educators with low levels of DL shared a number of negative attitudes that showed that they were often unsupportive about the use of DT in the classroom. This finding stems from a number of survey items but also from interviews, where mention of the challenges facing e-learning professionals was frequently made. Teachers with poor DT skills resisted both the use of DT in their classrooms and pedagogical change that might enhance its use. The low DL groups of students and educators represented two of the biggest challenges in schools for those who wished to integrate DT in the classroom.

Adverse opinions amongst students and educators were also found to have a disruptive effect on attempts by others to usefully employ DT. This appeared to be related to fears about DT and the associated changes to traditional education. Survey items revealed that 21% of low DL participants would rather students use pen and paper than use DT. Interviewees reported that teachers in one-to-one DT schools, often needed to act as technicians to assist students directly, so it was unsurprising that educators with poor skills found this more time consuming and frustrating, leading them to resist the inclusion of DT in their classrooms. The lack of ICT technical support in the classroom for teachers, also led to the feeling that they were not supported by ICT management in their use of DT. Students also reported in survey comments, that some educators have such poor skills that they may be unable to use display technologies, expressing frustration that educators were not equipped with the appropriate skills to use the DT available. There is a question here of whether schools were taking up the challenge of ensuring that their educators were being effectively trained and supported in using the DT with which they were provisioned.

Digital Technology Training Lacks Effectiveness

It seems that students with low DL (35%) needed to be provided with better DT skills in their schools. In schools with one-to-one laptop programs it was expected that the number of high DL students would be higher than 65%. In confirmation of this, all 10 interviewees indicated large numbers of students who had less than effective DT skills in across all school sectors. Surprisingly, 49% of students with low DL, thought DT was not important in future employment, which may be one of the reasons they lacked motivation to learn more about it. They were also the only group where a minority thought DT allowed them to be more creative (42%) and innovative (33%) and thought students wrote more (44%) when using DT. These were strong indicators that many schools did not have effective DT training programs for the low DL student group. This indicates that there was much to be improved in the delivery of DT programs in the schools in this study. It is also conceivable that the low DL student group may not represent the lower end of student performance only in DT, but across the board in all subject areas. Is it reasonable to expect that most students have a degree of knowledge and optimism about DT? Further research studies into detailed student performance in the area of DT would be helpful.

Students with low DL in interviewee schools often acted to undermine educator attempts to use DT within the curriculum. They reportedly did this in interviewee schools, by being challenging of a teacher's authority, being distracted, bypassing the firewall, and failing to complete tasks. They also made unnecessary demands on teacher time, drawing the educator away from curriculum delivery to deal with small DT issues. These issues may involve simple tasks in a word-processing or other software package, involve Internet or network access, or be related to poor student enthusiasm for school in general. DT has the potential to be disruptive and provides students with more avenues to avoid work tasks and become distracted, causing teachers to restrict classroom use of DT (Gray et al., 2012). This makes it paramount that educators develop enhanced skills in using DT, especially in schools where it is used by students in most or all classrooms. In this way teachers would have a better understanding of when students are not being honest and be able to train them effectively in the DT basics.

Teachers who were not supportive of DT and who lacked confidence were less likely to use it in their classrooms, representing the corollary of Prior et al. (2016) observations that self-efficacy relates to use of DT; hence, teachers with low self-efficacy show least interest in using DT. This attitude may undermine DT integration in schools. Numerous interviewee anecdotes indicated problems for schools where educators failed to support moves to embed DT in classrooms, with two interviewee schools having policies of employing educators with advanced DT skills and requiring those with fewer skills to either undertake training or find other employment. In schools where DT is available for all students, it would seem necessary for decision-makers to ensure the highest skill levels amongst their educators in order to meet student DT needs. Where educators have poor skills, provided they are not highly resistant to new technologies, schools should aggressively pursue training for them to support their DT programs.

6.1.4 Conclusion: Attitudes to Digital Technologies

Significant differences in DL between students and educators were not found in this study and challenged digital native theory, that would predict student and educator differences in DL. There were many positive attitudes expressed in the surveys, that reflected well on implementation of DT programs and one-to-one technology provision in schools. These include satisfaction with school DT programs, and a belief that they provided opportunities to be innovative and creative. Stakeholders with high DL had more positive attitudes towards DT and were more passionate and more supportive of constructivist (Webb, 2014), 4C's (Keane et al., 2016) and SAMR (Puentedura, 2013; Romrell et al., 2014) pedagogies. However, it appeared that the high DL group of both students and educators gained most DL at home, rather than at school and that schools were not meeting their training needs, or challenging them with new DT.

Low DL stakeholders had more negative attitudes and were generally less supportive of DT school programs. They were not satisfied with school attempts to train them in acquiring DL or in using DT. They were also less likely to learn at home. Low DL educators desired more training in DT at school whereas low DL students, who seem more disaffected generally, did not see this as a priority. General student disaffection with school hardware lockdowns, firewall blocks, system limitations and poor ICT support services, made it more likely that active student dissent and vandalism undermined the school DT programs in this study.

Section 6.2 Survey Comparison Group Attitude Disconnects

In this section analysis is undertaken that pertains to findings that shed light on the second research question: What are the disconnects between stakeholders that impact upon the use of digital technologies in the classroom?

6.2.1 Attitudinal Disconnects Between Students and Educators

Many of the differences in responses to the survey statements could be more attributed to the differing attitudes of teachers and students towards schools and the schooling process than to their differing levels of DL. These survey differences were also reflected in interviewee opinion, where student boredom and student challenges to school security lockdowns and bypassing firewall filters were frequently mentioned. These findings revealed differing attitudes towards the setup of classrooms, pedagogy and curricula in DT, which often involved teacher control of student behaviour and information access, rather than reflecting differences in DL or ability to use DT.

Dissatisfaction with Lockdowns and Limitations

In schools with one-to-one laptop programs both students and educators had little discernible difference in online access, with many educators excluded from online tools, like Social Media, in the same way as their students, in the majority of interviewee schools. Student comments show they wanted better DT access, fewer hardware lockdowns and more online access. Students desired less control by educators and ICT Managers and more freedom, while school ICT Managers focused strongly on control of student online access and setting up a protective learning environment. The fact that school decision-makers were primarily focused on delivering community expectations of numeracy and language literacy, and on exam results, meant that DT was a low priority, according to the majority (7 out of 10) of interviewees. Interviewee schools were slow to change and the findings reiterate traditional educator attitudes and the challenging attitude of students. The overriding question remains whether schools are adapting quickly enough, to a changing world in terms of DT.

Student Disaffection with Digital Technologies Management

A majority of students challenged the effectiveness of school provision of DT, reflected in the findings from both the interviews and surveys, showing students believed their schools were not meeting their needs in terms of access to, or learning about DT. Interviewees indicate that students undertook disruptive activities when using DT in the classroom either because it represented a challenge, or due to their boredom with schooling in general. Boredom without DT in classrooms was also widely reported in the surveys. Disruptive activities, reported by interviewees include: gaming in the classroom, using Social Media, tethering of phones or using proxies to bypass firewalls to access inappropriate sites. These activities revealed a proportion of the student population that was actively undermining the educational process, inadvertently pushing schools towards implementing more advanced DT security solutions. These security solutions, described by interviewees or observed in survey schools, included elements such as: screen capture and viewing software, classroom mirrors, hardware restrictions, software distribution and installation control, online search filters, blocks and firewalls. These tensions and reactions of each side, led to an ‘us-and-them’ mentality and overt conflict in some schools, between the student population and the school ICT Managers and school decision-makers. This adversarial situation between students and ICT management, together with teacher resistance to DT use in classrooms, found in the current study, needs to be resolved in many schools (Erstad, 2011) before there can be ownership, acceptance and genuine progress in implementing effective educational DT systems.

Where control measures were used excessively, students rejected and rebelled against the school-imposed DT restrictions. The reasons for these restrictions included: technical capabilities made available by monitoring software, educational justifications that DT was a distraction, legal arguments that students should be protected while online and social responsibilities that students should not go online unless it was curriculum related. School leaders in the schools in this study, appeared to genuinely believe that if they had the capacity to restrict and control student activities and software installations on school equipment, that they should. Students generally, were also least satisfied (27%) with the way their laptop was setup by their school ICT Technicians. This was one of the root causes of student cynicism about DT programs, that web blocks and security lockdowns of equipment was recognised by students as representing a lack of trust and an attempt to control their DT use and behaviour, which they were then likely to resist.

The internal frictions in survey and interviewee schools, between school decision-makers and students may be one reason students were unlikely to want to use Social Media in education (Bruneel et al., 2012), since they preferred to use it for personal enjoyment, without school involvement. Discordance around DT provision and control was observed in 9 out of 10 interviewee schools in this study and there appeared to be little trust in school DT systems and disconnect between students and decision-makers. Student survey comments indicated “frustration” with “unreliable” laptops “clogged” by school security software and unnecessary programs. This may be one reason students wilfully damaged school-provided laptops in interviewee schools. Student involvement in decision-making may act to reverse this stalemate, allow détente and be an advantageous prospect. In relevant Australian research, Brown (2012) found that students would like to participate in decision-making. However, in none of the schools in this study was there any student involvement in decision-making or policy development. This attitudinal disconnect represents a gulf that schools may need to close, through greater acceptance and trust of students and student engagement in the decision-making process, without which students may feel no ownership of the school policies that restrict their use of DT.

Student Lack of Enthusiasm for School Programs

One third of surveyed students were desirous of more DT training (33%) at school, with similar numbers believing that DL was best developed at home. Interviewees suggested that, for the more digitally adept students, this was because they saw schools as limiting rather than enhancing their digital education, due to many reasons outlined in the current study, including poor and outdated DT equipment and lockdowns. Students may have felt that they were not able to explore their own particular interests, be it coding, design, gaming, media or Social Media creation, whereas they were able to do this at home. It seems counter-intuitive that many students with low DL did not see schools as providing better opportunities to learn about DT. Most (9 out of 10) interviewees agreed that schools needed to do more in the area of training students in using DT, stimulating interest, relieving boredom with traditional schooling and in undertaking activities that diminished student time-wasting. Further research could be conducted into the specific reasons why students saw schools as not meeting their needs and into what could be done to improve student perceptions of schooling. There were indications in the literature that this disaffection (Hartley, 2009; Office of Educational Technology, 2017; Prensky, 2011b) was a global tendency for students facing traditional education. Interviewees suggested this may relate to traditional teacher-centred pedagogies and content-driven curriculum. However, assessing the effectiveness of traditional pedagogy and curricula is beyond the scope of the study. Clearly some of these findings reflect poor DT curricula and fewer DT learning opportunities for students. Schools could have done more to address these needs by creating learning objectives that were more stimulating and relevant to student needs. The slowness of schools to change, noted by several interviewees, made it more difficult for them to adapt quickly to technological change. Significant numbers of surveyed students reported being bored in class unless they were using DT, whether they had high DL (72%) or low (42%), suggesting that they might be keen recipients of curriculum changes involving enhanced DT use. It is to be hoped that the Australian Curriculum Digital Technologies (ACARA, 2018) program may assist in meeting this need in future years, including more focus on an ICT general capability.

Online Control and Student Risks

Survey data showed that educators had a strong desire to control student behaviour when online and vastly more educators (62%) than students (9%) thought that using the Internet in the classroom needed guidance by teachers. This was likely to be because educators thought that students may misuse the Internet, or become overly dependent (76%) on it. This partly explains the reason why schools blocked and controlled DT use. However, graduate teachers in schools may be appropriating the more conservative attitudes of their mentors when they join new schools (Swager & Bottema, 2012). This, in turn may be one of the reasons why interviewees universally perceived schools as being so slow to change, like “turning around the titanic”, as Ingrid said in her interview. The need for pedagogical change was recognised by all interviewees, as crucially important in schools using one-to-one DT, in order to adapt to evolving technology and to use online resources. However, few pedagogical changes were observed in interviewee schools and traditional teacher-centred pedagogies predominated.

While the Internet is an avenue for online publishing, only 28% of high DL and 5% of low DL educators supported students publishing their work online, showing that educators were resistant to changing traditional classroom practices in this way and perhaps, more sensitive to privacy issues. Similarly, 60% of educators believed there were significant risks for students when using Social Media, due to online bullying and other hazards. Willard (2011) suggested that educators and school decision-makers, had exaggerated fears about online hazards for their students. Yet according to 8 out of 10 interviewees, while schools seemed to take their duty of care for student online safety seriously, they apparently paid more attention to protecting decision-makers with legal indemnity. They were not particularly effective in providing ‘walled gardens’, since students could readily bypass firewalls and had an unfiltered Internet on their phones, and in their homes. According to the interviewees, this gave both students and educators the impression that school decision-makers, did not regard online risks as issues of great importance and not worthwhile to include in mainstream school programs. Interviewees thought these risks could be covered more thoroughly and more sensitively by schools, in order to provide students with the skills required to cope with online risks and hazards, and that parents should be part of this process.

6.2.2 High vs Low Digital Literacy Disconnects

Survey and interview findings show significant attitude differences between educators and students with high DL and those with lower levels of DL, revealing key challenges for schools in implementing effective programs in DT. Despite the excitement and optimism with which high DL survey participants regarded DT in schools, who showed the highest acceptance and support for new DT in schools, interviewees reported major hurdles needing to be overcome. Stakeholders with high DL had more advanced skills and wished to explore new ways of using DT while low DL stakeholders were more inclined to use DT in more mundane ways, for word processing and to access information from the Internet, reflecting substitution, and perhaps augmentation, in the SAMR model (Puentedura, 2013). In terms of SAMR, interviewees reported effective substitution activities and a significant amount of augmentation in their schools. However, there were very few modification uses of DT in interviewee schools and activities that could be described as redefinition were scarce.

There were major disconnects found between high and low DL stakeholders, and two main areas in which there was significant disconnect: use of DT at home and attitudes towards the benefits of DT in learning.

Digital Literacy Interactions at Home

Amongst the greatest disconnects between survey participants with high and low DL, was where DL was acquired, in the home or in schools. That many high DL educators (54%) and students (84%), reported that they acquired the majority of their DL at home; and that 37% of high DL students thought that DL was best developed in the home, seems counter intuitive. This makes logical sense only if we assume that schools were not effectively training these advocates of DT and were failing to provide exploration into new and challenging DT. Interviewees reported this was indeed the case, that educators or students with high DL, were acquiring home DT equipment that schools were not providing. In this way these stakeholders ensured that they maintained a connection with the latest technology, regardless of school contributions. Those with low levels of DL were not inclined to do this, although this may have been for a number of reasons: financial, social, lack of motivation or knowledge. That schools were making ineffective contributions to the acquisition of DL of their most skilled users, is an indictment of their DT curriculum programs, training, and associated decision-making.

Survey participants who self-assigned themselves a high DL, were more likely to report their use of Social Media (59% educators and 70% students) had contributed to their DL. Schools were therefore failing to offer training and access to new DT, ignored Social Media that could enhance digital education (Kaewkitipong, Chen, & Ractham, 2016) and failed to assist students in adapting to the DT encountered in the world beyond school. Interviewees reported that students used Social Media regularly on their phones, that they had on their person, or could readily access after school. Decisions to block Social Media in schools were therefore seen as irrational by all 10 interviewees in this study, who were aware that the walled garden had its gates wide open, locks eroded by the pace of technological change. Students carried smartphones and hence Social Media, with them into classrooms in 8 out of 10 interviewee schools, phones that could also be used to bypass school firewalls.

DT was least likely to be seen as a major distraction at home by those who were most likely to use it, those with high levels of DL. The high DL group was reportedly more efficient when using DT and less likely to see it as a waste of time or a distraction. This was equally the case in the classroom, where those with lower levels of DL were more challenged by DT, more likely to waste time and to find it a distraction. This finding further emphasises the importance of effective training in the use of DT for all stakeholders, particularly those with low DL.

Skill Development of High Digital Literacy Stakeholders

Survey responses revealed that more than 80% of high DL participants were more likely to believe that DT 'allowed them to be more innovative', in comparison to a minority of their low DL counterparts. Members of the high DL group were more likely to see value in using DT for group projects (>69%) consistent with the pedagogical practices mentioned above. They were also more likely to readily support student use of DT and to use online video. This brings to the forefront the issue of leadership surrounding the use of more DT in the classroom. Interviewees report that transformative educators were self-motivated in working with and exploring new DT independently, although they often lacked the support of school decision-makers and ICT Managers. Instead, they often learnt at independently at home or in small learning groups in breakfast or private meetings, unsupported by school decision-makers. Without active support and resources for DT integration in their schools, any impact on the student group as a whole by high DL teachers would be minimal. Interviewees noted that without the support of ICT managers, the effectiveness of new classroom DT activities was piecemeal at best, and often beset with technical problems and barriers.

Students and educators with high levels of DL agreed they were more confident (>90%), passionate (77% educators and 56% students) and creative using DT in their classrooms, than low DL participants. This may seem paradoxical when we know, from the survey and interview responses, they had acquired most of their DL at home. Furthermore, they believed that DT allowed students to be creative (>78%), that schools should encourage new technology use (84%) and high DL educators allowed students to explore self-expression in using DT (>70%). These were findings that were generally consistent with self-efficacy findings in the literature (Aesaert et al., 2017; Ale et al., 2017; Prior et al., 2016). There were many disconnects between teachers with high DL and their low DL colleagues on many survey items, as detailed in Chapter 4, that were reinforced in the interviews. It was thought that schools would benefit from using their high DL teachers as a resource, as exponents of new DT changes. 2 out of 10 interviewee schools encouraged this. The reason for the failure of most schools to listen to their high DL teachers appeared to be due to school decision-makers being resistant to change, including pedagogical change. The challenges in interviewee schools for effective integration of DT were manifold, impacting on school decision-making in finance, curriculum development, classroom practice, and professional development.

6.2.3 *Disconnects with School Decision-makers and ICT Managers*

Interviewees confirmed that school decision-makers and ICT managers reportedly had an almost obsessive control over student and staff uses of DT in schools (Willard, 2011), that alienated students (Gray et al., 2012) and also high DL educators. This control appeared to mirror teacher classroom control methods, with close ICT monitoring of every educator and student activity online. Amongst the reasons interviewees gave for schools limiting what students and teachers could do on the Internet, or on school devices, were: online dependency, Social Media and gaming distractions, unfiltered Internet risks, online bullying, hardware limitations and a restrictive curriculum focus.

None of the interviewees thought that their school policies were effective in limiting or preventing online risks. Every interviewee expressed views that schools were either avoiding the opportunity or responsibility to educate their students about online risks, or adopting a head in the sand approach, since every student could access unfiltered online content when unsupervised. The actual risk of online addictions has been found to be culturally and gender linked (Park et al., 2008; Rehbein et al., 2010), with between 5 and 10% of boys addicted or at risk, and fewer girls. Hence, it seems that schools were failing to equip their students with the necessary skills to avoid online hazards, that interviewees described as important, consistent with best practice mentioned in the literature (Office of Educational Technology, 2017). Each of the schools in this study complied with Government online safety requirements to address online hazards but only 2 out of 10 interviewees reported that their schools actively trained their students in responsible online use.

There were many DT restrictions in schools, that limited how educators and students could use DT devices. These limitations affected those with high levels of DL more than others, since they undermined their confidence in school DT systems, and prevented the new DT activities that they would otherwise introduce into their schools, undermining innovation. Consequently, disconnects between system users and decision-makers were unsurprising, given the restrictions that were applied, yet these acted to prevent DL enhancement for all stakeholders and limited access to new DT.

Digital Technology Restrictions

DT integration and DL development were restricted in schools in numerous ways, which both undermined innovation with DT and contradicted school advertising claims of their DT programs. The primary way DT was restricted was through ICT system and device controls. Surveyed educators were generally more accepting and less likely than students to view school controls as limiting classroom activities. However, students (57%) and educators (33%) with higher DL were less forgiving and more demanding of change, being less satisfied with the way their school laptops were set up. Interviewees reported that device dissatisfaction was due to several factors including: lack of device choice, device restrictions and lockdowns, poor school Internet access, excessive site blocking and software restrictions. All survey schools and 9 out of 10 interviewee schools in this study prevented unauthorised software installation by students, educators or both; which included updates to installed software and installing any experimental trials of new software. When this occurred together with Internet blocking, school ICT restrictions could completely derail lesson plans and undermine attempts to use higher level SAMR activities; providing enormous frustration for educators and discouraging DT exploration. Low sensitivities by school decision-makers to educators' needs and unresponsive ICT Managers were seen as two of the largest failures in DT integration. Where schools outsourced ICT management this further separation compounded the sense of isolation and led to pronounced frustration amongst high DL stakeholders. In the 2 interviewee schools with the most effective DT integration, decisions rested with the educators responsible for new DT activities, usually those with the most advanced skills in DT. Yet this was rarely allowed to occur and disconnects between ICT Managers and the most digitally literate educators were the norm in the majority of interviewee schools, consistent with findings on ICT leadership in the literature (Keane, 2012).

Budgetary Constraints on Digital Technologies

The minimal budget for new DT and training, observed in 6 out of 10 interviewee schools, limited the availability of resources and what was ultimately possible to achieve within the school environment. There was interviewee perception that there needed to be provision for e-learning resources including a budget, time for trainer and trainee, DT hardware and software, and ICT technical support. Decision-making in how to provide these DT resources in schools ultimately created an atmosphere of acceptance or resistance, which was arguably the most fundamental aspect of DT integration, as 8 out of 10 interviewees emphasised. The DL of the least skilled students and educators, who primarily relied on school training and professional development, was contingent on this direction from school decision-makers. ICT technical support can only be provided if technicians are employed, or if solid partnerships are made with skilled DT practitioners. Unfortunately, ICT Technicians were in short supply in 7 out of 10 interviewee schools and some schools reportedly cut costs by employing as few as possible. In these cases, it was highly unlikely that there would be time for an ICT Technician to provide classroom support. Budgetary constraint in schools was one way in which the provision of DT equipment and support was limited. Schools utilising one-to-one DT need to be mindful of support, budget, training and expertise needs of stakeholders. If they do not keep these elements in mind, then there will inevitably be disconnect and conflict between those who wish to enhance DL and DT in schools and their decision-makers. Efficacious decision-making was observed in only 2 out of 10 interviewee schools in this study and was seen to be very poor by the vast majority, reflecting educator and student survey comments in Stage 1.

Minimal ICT Management Support

ICT Management in schools was rarely seen to provide sufficient support and more generally seen to limit educational opportunities for both educators and students in survey and interviewee schools. There were repeated interviewee comments that while ICT Management was in place to provide DT services and support in schools, they made many decisions that were restrictive and maintained the status quo. Whether this was intentional or inadvertent was open to question in individual schools. For the average teacher in interviewee schools wishing to undertake a new DT activity in a classroom, there were various barriers that needed to be overcome before the activity could be undertaken. These DT barriers included: low availability of laptops or labs, inadequate maintenance, blocked websites, software not able to be installed, technical support unavailable, defective equipment, poor network or Internet connectivity, security software that restricted activities, and poor responsiveness of ICT services to requests. In each of these cases the result could be demoralising for educators and students alike. Many educators in interviewee schools, particularly those with low DL, often came to believe that it was too difficult to consider undertaking Internet research or other DT classroom activities. In each of these cases ICT Management could provide better service, often without additional cost. The lack of an educational focus of such decision-making was reported in 7 out of 10 interviewee schools. For interviewee schools to take a step toward improving their DT systems, they needed to ensure an educational focus by ICT Managers, to avoid technical focus on security and restrictions. ICT system blocks and limitations faced by educators wishing to advance student DT skills, need to be minimised if schools are to keep up with rapidly changing technology and effectively integrate DT.

6.2.4 Conclusion: Disconnects in Digital Technologies in Schools

There were large disconnects revealed in the survey findings between students and school decision-makers: on teacher control of student Internet access in classroom activities, on Internet over-blocking, hardware and software functionality and ICT security lockdowns. Educators were more likely to believe that students could become dependent on DT, that there are more risks with using Social Media and that students should be limited in using DT.

There were high and low DL groups of both students and educators, shown in survey responses, each with varying attitudes, with high DL groups being more positive about DT generally. However, high DL were displeased with the lockdowns and security overkill, and the limitations that schools placed on their access to DT, including their laptop setup.

Low DL students were most negative about using DT in school, saw it as less related to future employment and were the most resistant group to learning about DT, or acquiring more DL. This low DL student group was deserving of more study, as they may be disaffected with schooling generally.

Students and educators with low DL were more likely to waste time when using DT and needed more DT training and ICT support in the classroom in order to enhance their DL. Interviewees reported widespread vandalism to school provided laptops, due to a lack of ownership felt amongst students to school-provided devices and associated restrictions.

There was some resistance amongst educators to using DT in schools and there was disconnect between high and low DL educators about whether DT detracted from other more important educational activities. This resistance often stemmed from traditional educator views towards pedagogy or curriculum. Decision-making in schools contributed to the disconnects felt about the delivery of the one-to-one DT programs and it was seen to be more driven by ICT technical and security priorities, rather than educational ones.

High DL students and teachers, having high self-efficacy, acquired more DL at home than at school, due to their online use of Social Media, gaming and DT for entertainment. However, those with low DL were hampered in their use of DT at home and acquisition of DL at school by their incapacity to self-learn, due to their poor self-efficacy. Schools in this study were not meeting the training needs of any of their stakeholders, nor providing access to the latest available DT.

Section 6.3 Training in Using Digital Technologies

In the following section findings are analysed that pertain to the third research question: How do schools train stakeholders in the acquisition of digital literacy and in using digital technologies and how effective are these methods?

6.3.1 Student Training and Digital Literacy

The importance of furthering student digital literacy (DL) and student training in use of digital technologies (DT) was agreed upon by the majority of interviewees and surveyed educators in this study (83% were enthusiastic about students obtaining high DL). However, many students did not agree that schools were the preferred place for this to occur, suggesting that there was a failure by schools to address this need. For students, 70% indicated that most of their DL had been developed at home, while only 33% suggested DL was best developed at home. Therefore, many students might be happy to acquire more DL in schools, if they had the opportunity. However, interviewees did not see frequent opportunities for this to occur. It also appeared to be contradictory that 33% of students wanted to obtain more training in DT, while 47% were enthusiastic about getting a high level of DL. In the surveys, it is conceivable that statements about 'training' might have been associated with schools, while more DL could be associated with uses at home, where most students acquired it.

One conclusion that follows is that survey schools were not providing the type of training in DT that many students desired; another is that that students had little confidence that their schools were capable of providing effective training in enhancing DL. These survey findings were reinforced by 8 out of 10 interviewees who suggested that most stakeholders adept in using DT, acquired most of their DL at home, with little help or encouragement from their schools. Unfortunately, stakeholders who were more digitally challenged, with low DL, were less able to develop better DT skills at home or enhance their own DL. Stakeholders rarely associated schools with cutting edge DT or in the provision of DL, even though many of the schools researched here, provided one-to-one access to the best digital devices available to school students. School decision-makers implementing DT systems, will need to do more in future to change these negative perceptions of their capacity to effectively integrate DT into their curricula. The success of the ACARA (2018) Digital Technologies curriculum is unknown at the time of writing, although future research into its impact on the attitudes discussed here towards training in the use of DT would be useful.

6.3.2 School Professional Development of Educators

While schools offered some DT professional development (PD), for their educators, the bulk of the findings from both surveys and interviews in this study suggested that they were not meeting their needs. As many as 45% of surveyed educators agreed that most of their DL had developed through DT use at home. However, surveyed educators wanted more PD in DT in the school environment (86%), as opposed to a preference to acquire it in the home (9%). Large numbers of educators also needed ICT support in the classroom, as confirmed by both interview and survey findings; admitted to not having a high level of DL (42%) and agreed they found the use of DT challenging (24%). Teachers with lower levels of DL were obvious to the students when attempting to use DT, as more than 50% of students agreed that teachers often had DT difficulties and needed more ICT support. These findings strongly reveal the PD needs of educators were not being met in their schools.

In terms of training methods, educators overwhelmingly preferred one-to-one PD in the workplace to assist them in enhancing their personal skillsets, with all interviewees rating the one-to-one training method as highly effective. Opt-in specialised modules were also seen as effective, by interviewees, although these were only found in 4 of these schools. This was similarly the case with small focussed workgroups and peer-to-peer training methods, offered in 5 out of 10 interviewee schools where they were seen to have a medium level of effectiveness. These allowed a focus on specialised areas or DT equipment for teachers who had developed this interest, or for whom it was relevant in the curriculum. The least preferred PD method was large lecture style training sessions, seen in all interviewee schools but rated as the least effective, imparting scant knowledge in sessions that were criticised by interviewees for not being “hands on”. These lectures were apparently arranged by school decision-makers who wanted to be seen to provide PD, with minimum budgetary expenditure. There is a strong case here that there was a need for the schools of this study to provide more ICT classroom support and more focussed and individual PD for educators in using DT.

School leaders who actively enhanced the DL of their educators by providing accessible and effective PD programs, were rare in interviewee schools. The most effective schools each had e-learning specialists, that were readily available to assist educators throughout the school day (3 out of 10). The remaining 7 interviewee schools, did not have high availability of e-learning mentors to assist staff, lacked DT PD budgets, had infrequent and ineffective PD. These schools reportedly paid little regard to the acquisition or enhancement of DL for their teachers, as it was low on the PD priorities set by school decision-makers. Even in the 3 schools cited above, actual PD programs for DT were inconsistent and not rated as highly effective. E-learning professionals generally received limited time release and simply volunteered their expertise in interviewee schools, despite the fact that this availability was acknowledged by interviewees as an essential component of an effective PD arrangement. Hence, not one interviewee suggested that their school had highly effective PD programs in DT.

In interviewee schools, there was practically no leadership push for better DT PD for educators, no regular PD and minimal focus on developing DL or improving pedagogy for educators wishing to integrate DT. It was also the educators with high DL who most noticed the absence of this PD, educators with less DL often resisted change and simply retained their traditional classroom practices. According to the interviewees, school decision-makers in only 2 out of 10 schools, acknowledged the necessity for schools to keep abreast of the evolving nature of DT, bringing into question their capacity or motivation to make effective decisions involving DT.

6.3.3 Classroom Pedagogies and Digital Technology

Classroom conflict between educators and students, together with poor decision-making strategies in DT infrastructure and a paucity of DT training and PD, caused the majority of schools in this study to falter when introducing new DT into the classroom. Interview findings indicated that there were few processes in place to assist teachers with the changes that needed to occur, little support involving pedagogy to enhance DT and few inclusions of DT (4 out of 10) into the middle-secondary curriculum. These problems were highlighted with only 10% of surveyed teachers identifying as specialist ICT teachers and while senior Computing classes were offered in 8 out of 10 interviewee schools, DT was embedded into the wider curriculum in only 2 cases. Declining student skills in DT was raised by several interviewees, confirming literature (Office of Educational Technology, 2017; Wilson et al., 2010) that expressed this concern. It was concluded that the majority of schools in this study were failing to encourage students to enhance their skills in DT, with many students reportedly enhancing their DL only at home. There was little evidence that decision-makers prioritised DT in their schools or had sufficient knowledge about integrating DT, with only 2 out of 10 school Principals recognising and prioritising pedagogical and budgetary DT needs.

Internet access and one-to-one DT in classrooms introduces numerous elements that distract from traditional classroom content-based learning activities. If DT is not incorporated effectively with a change in classroom pedagogy (Keane et al., 2016; Romrell et al., 2014), it could potentially disrupt teaching and learning processes. Interviewees reported that many teachers struggled to adapt their teaching methods to the DT changes occurring, to create entertaining and engaging lessons that students could become immersed in through using DT. Every interviewee described problems faced by educators who were unable to use DT effectively and how this undermined the classroom dynamic, further emphasising the need for more DT training and resource allocation.

Educators with high DL were more likely to see constructivist activities, like group projects, being more effective with DT (71%) and interviewees reported student-led projects using DT in 6 out of 10 of their schools. Pedagogies appeared to be beginning to change in interviewee schools, with a significant amount of substitution and augmentation activities being frequent. However, modification and redefinition activities were observed rarely in interviewee schools. Only 2 out of 10 interviewees acknowledged that their schools placed emphasis on the importance of enhancing pedagogies, to allow more effective classroom use of DT. Hence, for the majority of schools in this study, it appeared that classroom pedagogy had changed minimally since the introduction of one-to-one DT. Compounding this problem was the poor student training and teacher PD in DT seen in most interviewee and survey schools and a reluctance by most school decision-makers to resource effective PD methods in DT or relevant pedagogies.

There were numerous opportunities that schools were failing to cultivate, in the areas of DT integration and training in DT, which had led to stakeholder disconnect and classroom conflict. These issues need to be addressed by school decision-makers in future DT implementations, if their schools are to evolve ways of integrating DT and adapting to continual technological change.

6.3.4 Social Conflict and Managing Change

All stakeholders: students, educators, ICT Managers, Principals and other school decision-makers, face different pressures when one-to-one DT systems are implemented in their schools. These pressures may come from marketing of new devices by vendors, government or community expectations, and social pressures from families, friends or peers. There is a strong argument that with any new DT device brought into a school environment, informed decisions need to be made. For a decision to be informed, decision-makers need to be equipped with the relevant knowledge of what skills need to be acquired to use the DT being introduced and the training of stakeholders that needs to be undertaken. Marketing propaganda and peer pressure may be overwhelming for each group of stakeholders, who remain less acquainted in the finer points of what new DT are capable of and how they may impact on the broader curriculum and classroom pedagogy. All stakeholders and decision-makers are in need of high-level training in the capabilities of DT and how new devices may enhance digital education.

Conflicts about DT in schools, were reported in all interviewee schools in this study, between educators and students, students with school decision-makers, and also teachers with ICT Managers and school decision-makers. Each stakeholder group inevitably focused on what they perceived to be issues of pivotal importance, often reflecting their own biases. These biases stemmed from individual perspectives and personal choice, curriculum directions, communication needs, marketing ideology, peer acceptance and the perception of some devices being superior for one reason or another. The challenge for decision-makers was to help stakeholders adapt to change and to position their schools at the forefront of strategies to harness DT productively. However, in the majority of interviewee schools, decision-makers favoured a teacher-centred pedagogy and content-driven curriculum, with success being measured through senior student university entry results. This was seen by interviewees to be at odds with a push towards student-centred pedagogies, such as those shown in the SAMR model, 4Cs and other constructivist practices and created conflict between decision-makers and educators desiring more integration of DT in their classrooms.

Without an effective training program of stakeholders in DT there could not be consensus in directing future approaches, to introducing DT and generating ownership of the DT system. Conflict was not reported in the 2 out of 10 interviewee schools that had effective training and DT implementations. However, in these schools the teachers were hand-picked to have high DL and very good skills in using DT, with others asked to work elsewhere. Only through ensuring that there is effective training for all stakeholders can school decision-makers ensure that conflict is minimised, with better understanding of the DT system and more collaboration amongst stakeholders.

6.3.5 Conclusion: Training in Digital Technologies in Schools

Interviewees pointed to the fact that there were unaddressed needs in schools for training and PD in DT and in developing DL. This need was not being met through educator PD programs and it was not being met in DT curriculum programs for students. The following findings represent the main unmet needs, mentioned by interviewees, for training in DT and enhancing the DL of stakeholders.

Students were not being given the opportunity to study DT in interviewee schools, other than a minority who chose senior Computing subjects. Yet there were Government pressures via ACARA (2018) to introduce better curriculum programs in 'Digital Technologies'. It is unknown whether this curriculum impetus has improved the situation observed in this study, so further relevant research would be advantageous.

Educators in schools were not receiving the depth of PD required for effective DT integration into the curriculum. Methods of educator PD in interviewee schools were generally in lecture format, with little opportunity to obtain one-to-one training with a specialist, in order to enhance individual skillsets. Most schools need to change their methods of DT PD and improve DT curriculum delivery. While updated pedagogies have not been confirmed as being essential in enhancing DT use in schools (Webb, 2014), the improvement of relevant pedagogical skills is thought to assist DT integration and transform learning (Keane et al., 2016) and this latter view was shared by all of the interviewees in the current study.

School decision-makers, in the vast majority of cases, did not have high levels of DL and were not known to be trained in DT resourcing and management, nor in the way DT impacted on classroom design, curriculum or pedagogies. ICT Managers were also security focused in the majority of interviewee schools, with no evident educational background, according to all 10 interviewees.

That DL was mostly acquired in the home rather than at school, by stakeholders with high DL, should be a concern for school decision-makers. Low DL stakeholders, on the other hand were not equipped to enhance their own ability to use DT in the home. Despite this the majority of school decision-makers gave low priority to DL and DT training programs, perhaps due to an acceptance of the unsupported digital native theory (Kirschner & De Bruyckere, 2017).

High DL educators and students were a rarely used commodity in interviewee schools, who could have assisted in training others, if provided with time. Schools could do more to incorporate these groups in PD, DT training and classroom support. PD budgets and time allocation were reported by interviewees to be focused more on other areas and with minimal focus on enhancing DL or on uses of DT.

These findings signify poor decision-making processes in school DT provisioning and training. This segues into the following discussion of school decision-making processes.

Section 6.4 Decision-making Systems and Processes

In this section an analysis is undertaken that reflects on the final research question: How are decisions made in providing training in digital literacy and in implementing digital technologies in digital education? Are there decision-making and change management practices that allow for more effective provision of digital literacy and implementation of digital technologies?

6.4.1 A System in Need of a Decision-making Model

There were many essential decisions associated with school digital technology (DT) systems, identified by interviewees, including financial decisions about insourcing and outsourcing, employment of ICT Technicians and network specialists, purchasing of the hardware and network infrastructure, software and licensing. Then there was the issue of integrating DT into the school curriculum and professional development (PD) of educators. These were wide-ranging issues that often required specialist knowledge.

Findings revealed in this research show that many school decision-makers had little evident training in DT and low levels of digital literacy (DL) appeared to be common. This led to poor and inconsistent choices in hardware and software, without significant user involvement in the majority of the schools studied. However, there is a complex DT system in schools that goes beyond hardware and software and includes: online access, firewall rules, training and professional development, communication and collaboration tools, and decision-making processes. It is argued here that without positive support for classroom use of DT and commitment to enhance DL that schools will not be successful in implementing an effective and efficacious one-to-one DT system. It is argued here that in order to do this, schools must also ensure they have a flexible decision-making process, to manage school policies, financing, specialist employment, curriculum change, change management for all stakeholders, DT acquisition, DL training and educator PD. Findings in the current study show that if these elements were not managed carefully, with an understanding of the possible negative consequences, then stakeholder disaffection and disconnect was likely to undermine the effectiveness of the DT system.

The majority of ICT Managers and school Principals, mentioned by interviewees in this study made decisions that appeared to focus on restricting and limiting access to DT, reportedly due to reasons including budgetary limitations, security concerns, legal rationalisations and fears of misuse. Each of these restrictions then acted to retard access to DT and undermine the enhancement of DL, for all stakeholders. Even if some of these concerns were valid, they did not provide adequate rationale for restricting educator and student access to one-to-one DT, since other arguably superior solutions had been applied in best practice schools.

DT one-to-one access was not seen by interviewees or from survey findings, to inevitably lead to an enhancement of DL, although the corollary, the limitation of access to DT, was definitely seen to limit DL development. Therefore, for schools to actively enhance student and educator DL, that was acknowledged in the surveys as crucial for future student employment, decisions needed to be made that ensured reliable one-to-one access to DT with good connectivity, as well to as effective DT training and PD programs that improved stakeholder DL.

6.4.2 Walled Gardens, Blocks and Online Controls

Many schools in this study appeared to rely on maintaining a 'walled garden', an approach aimed at maintaining the status quo, resisting change by implementing DT system security, blocks and lockdowns. These walled gardens were created through fears of students accessing unsavoury online material, ostensibly to protect them. However, the walled gardens employed by schools in this research, did not train students in how to filter for themselves, when faced with online hazards, when they were free of the school environment. This represented a failed educational model, since students were not learning self-management lessons for online life. Hence, without these important tools, they remained at risk to online hazards, including predators, criminal elements and dependency. Schools would need to put up fortress walls and cut the communication lines, to avoid the technological change that is upon society, an impossibility. Yet by adopting a fortress mentality that limited access to DT and not providing the necessary training for educators and students, schools in this study were failing to recognise that the invasion had already occurred. The availability of DT predominated in the homes of students and educators, where new DT appeared regularly, disguised as birthday presents and in regular purchases like smart phones, console games, Wi-Fi devices and smart TVs. This access to new DT provided opportunities for those with high levels of DL to enhance their skills at home, rather than in their schools, and created an atmosphere where schools seemed out of touch with modern technology. Decision-makers in the majority of schools in this study did not appear to grasp the importance of making decisions that kept this in mind. DT is a tidal wave of change that is irresistible, and schools need to overcome any fears that fuel a siege mentality, to embrace change by making decisions that consider the needs and experiences of their most high DL stakeholders.

Educators (76%) and reportedly school decision-makers, were more likely to think that students could become dependent on DT. Yet this dependency, to gaming, Social Media or Internet use, may develop as easily in the home as at school. This risk factor appeared to reinforce educator belief that limits should be placed on student online access and their use of DT. Educators in this study were therefore accepting of school restriction and supportive of control measures, security lockdown practices and Internet controls. Yet, students who were likely to develop addictions especially needed effective guidance, support and training programs for them to understand and overcome these risks. Schools, appeared to be best placed to detect students at risk and they should arguably be at the forefront of meeting this community need, rather than avoiding this responsibility to the community. Compulsory Australian Government programs, like the National Safe Schools Framework (e-Safety Commissioner, 2018) are in place to inform students of online risks, although their effectiveness was brought into question by interviewees in this study, since they were undertaken without practical application or first-hand online guidance, since the sites and Social Media discussed in such programs, were blocked in all schools in this study.

Several interviewees in this research also acknowledged personal and other teacher Internet or mobile DT dependency and pre-service teachers have also been shown to be unaware of their Social Media obligations as educators (Poth et al., 2016). However, no school in this study appeared to consider these factors as necessary in educator DT PD.

School decision-makers were justifiably concerned about student safety online, exposure to unsavoury websites and online predators. This was used as rationale to block and restrict Social Media and a range of websites, to the extent that a great deal of over-blocking was reported in the surveys and interviews. Survey findings showed that 62% of educators believed that students needed guidance while on the Internet, compared to 9.1% of students. Educators similarly believed there were more risks to students using Social Media and online communication. This finding suggests that educators had a strong motivation to control student behaviour online. Yet online DL cannot develop without free access to a wide range of online resources and communication tools. There were no doubts in the minds of the interviewees that school decision-makers feel similarly strongly about control of student behaviour and often that of their staff, when stakeholders were online. This caused the creation of school policies and restriction to online resources, including website blocking that hampered Internet research and undermined teacher attempts to use Social Media and online communication tools in schools. This was purportedly done to protect students when online but also the school from legal ramifications in worst case scenarios. It is debatable whether restricting access was the best strategy to protect students, as there were strong arguments amongst interviewees, and more than 70% of educators surveyed, that greater DL would allow students to better protect themselves online. Therefore, school decision-makers appeared to be implementing policies that may better protect schools from litigation, while putting low Dl stakeholders more at risk at home. This was exacerbated by poor DT integration into school curricula and poor focus on the importance of enhanced DL for stakeholders. This is a very strong argument that poor decision-making was potentially placing students, and possibly teachers, at greater risk.

6.4.3 *Decision-making and Classroom Use of Digital Technologies*

Decisions surrounding DT access in interviewee and survey schools, gave little priority to curriculum integration of DT. A change to curriculum and pedagogy only occurred in these schools at the behest of high DL teachers who were passionate about the use of DT in their classrooms. This lack of leadership in terms of decision-making, caused low DL teachers to be more defensive about change, and more likely to resist or limit access to DT in their classrooms. In terms of school DT provisioning, interviewee findings revealed that decision-making impacted heavily on DT usage patterns. Decisions that allowed more student choice of device, for example, created greater difficulties for ICT Managers to exercise DT access controls. Student owned devices may require open network access, and allow installation of any software, meaning that there would be a likelihood of less security and less standardized software, preventing consistency of DT in classrooms. Where students brought their own devices (BYOD), device maintenance responsibility also fell onto the students and their parents, ultimately causing less device reliability. Decisions to allow tablet computers in classrooms, also allowed for easier student bypassing of school firewalls.

In a number of interviewee schools there was a sudden introduction of DT, where devices were offered to students and teachers, with very little structured curriculum change. This caused mainly a substitution of old tools with new DT tools, with little impact on the learning process.

It was noted in many interviewee schools that there was pressure placed on teachers through expectation of better test scores and university entrance results. With this pressure on educators and curriculum leaders at the senior end of school systems, it was unsurprising that there was little impetus or encouragement to use DT in senior years classrooms. Some teachers were also reported to have used senior secondary curriculum expectations as justification for avoiding the use of DT in more junior programs. Hence, there was a great deal of pressure placed on teachers in interviewee schools to resist curriculum and pedagogical change. In 8 out of 10 interviewee schools, pedagogical reform was not viewed positively by school leaders and decision-makers. Interviewees in these schools commented negatively on both physical features of their learning spaces and on the regressive attitudes of decision-makers, that were not conducive to change. Hence, DT resistance by school decision-makers had a retarding effect on teachers who might otherwise adopt DT and was likely to be one reason that schools with more visionary leaders had a higher proportion of DT users in their classrooms. Leadership in terms of DT was therefore found to be a requirement for schools to use it effectively.

Teaching methods and pedagogy was found to be related to classroom use of DT. Autocratic decision-making processes were seen to be at play in the classrooms with a teacher-centred pedagogy, as expected. More democratic processes operated in classroom pedagogies with more student-centred pedagogies and those that allowed student exploration of topics and concepts, such as in the SAMR and 4Cs models. Some educators actively restricted student access to DT for a range of reasons including: students' time wasting, bypassing of school filters and online DT distractions. Other educators felt that their school systems were not effective in allowing Internet access due to the blocking of relevant sites, network or technical difficulties and student misuse of DT and the Internet. Educators with low levels of DL also reported needing more curriculum support when using DT and expressed frustration with the lack of support provided; their students were also aware of teacher need of support. One conclusion is that educators with high levels of DL, being more digitally adept, had obvious advantages over their colleagues when using DT. Rather than restricting access and issuing more control, schools should therefore aim to increase the availability of PD opportunities for educators to enhance their DL.

School decision-makers in the interviewee schools rarely appeared to recognise the importance of DT and did not allocate curriculum or PD resources to its implementation. This was recognised by interviewees as a shortcoming in the training of both school decision-makers and ICT Managers.

6.4.4 Decision-making in Digital Technologies Training and Professional Development

Schools in this study were not engaging their most skilled users in decision-making involving DT and not allowing their most skilled educators in DT to contribute to teacher PD or to DT curriculum design. Each of these elements was seen as crucially important for schools in developing an advanced approach to incorporating new DT and developing high levels of DL in their students and teachers.

Where students and teachers were using one-to-one DT, there were needs for regular and consistent training for students in the use of DT and in PD for teachers, who were integrating it into their classrooms. Yet, this consistency was observed in only one school, where specific efforts had been made to integrate DT learning for both students and teachers. In one other school, student DT learning had been effectively integrated, with a strong support team. In the remaining 8 interviewee schools, decision-makers did not view DT as a priority, while ICT Managers recognised little educational need for DT.

For successful DT integration, educator needs to master the DT systems in place, must be considered by school decision-makers in PD considerations. Unless resources, such as time and professional development are provided for teachers, there will continue to be a strong resistance from educational traditionalists and those feeling overworked, who feel unable to add more work to their current obligations. 8 out of 10 interviewee schools failed to have a clearly understood and funded e-learning strategy, and decisions made were perceived to have minimal efficacy in all three areas: student curriculum, teacher professional development and in encouragement for pedagogical change. These findings painted a disappointing picture of a school system at the crossroads in terms of DT use, struggling in managing DT, where low levels of perceived efficacy of decision-making was seen as the norm. Several interviewees thought that their schools were in a type of DT crisis, with some teachers adopting it and even bypassing school security systems, while others resisted attempts to integrate it. This disconnect related directly to failures in the provision of effective PD for teachers, and in school leadership, as Keane (2012) also recognised, in recommending that ICT Managers have an educational background.

This failure of schools to address an obvious educational need of more DT training for stakeholders, was a serious concern and suggested that school decision-makers were out of their depth in understanding DT and the DL needs of their stakeholders in the DT systems. ICT Managers, with an eye on the functionality and security of the system could not be expected to perceive educational perspectives, since they had little or no training or background in education. This meant in turn that school ICT Managers and decision-makers were likely to have lacked the necessary knowledge about DT management and implementation in education and needed themselves to be upskilled in a range of relevant factors, including stakeholder requirements in DL and in integrating DT. The school Principal would presumably be responsible for this shortcoming, possibly due to a lack of knowhow about DT management.

6.4.5 Decision-making Processes in Digital Technologies

A small group of individuals in schools make decisions that impact on DT access, student training and teacher professional development and there is a strong argument that many autocratic decisions alienate stakeholders and restrict more than enhance the use of DT and acquisition of DL. While this is a contentious viewpoint, the findings of this research indicate that this was the case in the majority of schools in this research and, arguably, could be attributed to most schools in Australia. In thirteen of the fifteen schools mentioned in the interviews and surveys, the leadership structure was autocratic, the method of decision-making was ad hoc and there was strong resistance to many of the decisions made, particularly amongst stakeholders with high DL. Each of the interviewees belonged to the high DL group and only 2 were satisfied with the decision-making processes in their schools.

There were a variety of decision-making arrangements observed in interviewee schools, from control resting with school Principals and curriculum leaders, to control being delegated to ICT Managers, through to schools with ICT management teams. In each school the school Principal had determined which approach the school would adopt, sometimes after negotiation. While it was noted that teacher autocratic control was the norm in classrooms, school Principals appeared to have a similar autocratic focus on decision-making. If they delegated control to an ICT manager, the focus was on security, with the consequence that access to DT systems and new DT was minimised. While school Principals or curriculum leadership had the capacity to make DT policy rulings, they rarely did this in interviewee schools. It appeared that in the majority of schools they were abrogating their responsibilities in this area and deferring decision-making to the ICT manager. Unfortunately, ICT Managers had little educational grounding and in no interviewee schools, were the ICT Managers trained in education.

In 1 out of 10 interviewee schools the Principal took the responsibility for the decisions made with DT. This interviewee thought that the decisions made were less than satisfactory, due to the decision to outsource ICT management and maintenance. In 3 out of 10 interviewee schools, ICT Managers were solely responsible for DT decisions. Once again, there was little satisfaction with the decision-making in these schools. 3 out of 10 interviewee schools had combinations of school leaders and ICT Managers who made DT decisions about DT. In each case there were less than optimal levels of satisfaction. In these cases, interviewee comments indicated ICT Managers were detached from teaching staff, not very aware of educational needs and focused on network security and DT lockdowns. None of these decision-making processes provided high levels of efficacy, or satisfaction with either the decisions or the decision-making arrangements.

On the other hand, in 3 out of 10 schools, interested parties were incorporated into an ICT management team and these interviewee schools had the most positive interviewee responses, in terms of both satisfaction with the process and efficacy of decisions. Amongst this group, only one interviewee thought that her school did not make satisfactory decisions, mainly due to the shortage of funds for the DT area and equipment, since the students were restricted to computer laboratories and did not have access to one-to-one DT devices. Resourcing of DT in terms of people, time and funds, is obviously an essential element of a successful DT system in schools, without which little could be achieved.

While the sample size of interviewee schools was small, the problems identified by interviewees accurately reflected the disconnects found from the Stage 1 surveys of teachers and students, and this provides a degree of reliability. Where there were restrictions and limits placed on DT access, or where training and professional development were limited, dissatisfaction and disconnect between stakeholders and school leaders was observed in both Stage 1 and Stage 2 schools.

While 2 out of 10 interviewees were satisfied with DT efficacy and decision-making processes, in best practice schools, the remaining 8 interviewees each struggled with either poor resourcing or restrictive school management decisions, that undermined attempts to use DT. These problems could be likely to be overcome with a more inclusive decision-making process and greater awareness of stakeholder needs. In interviewee schools the Principal rarely made direct decisions about the acquisition of DT in their schools, relying instead on their administrative team or ICT Manager. In the best practice schools, decisions were made by a specific ICT management team with mixed membership; and in one of the best practice schools there were two such teams working in tandem.

The following Use-case diagram, Figure 6.1, represents the complex interplay of those involved in the decision-making process and those acted upon by the decisions. In most schools in this research, the ICT Manager made most of the decisions surrounding DT access, provisioning and network policies, while the Principal, or Curriculum leader may also have been involved. However, there was no consistency in any interviewee schools about who was involved. Students and educators are the stakeholders most affected by these decisions along with parents, indirectly. Teachers with high DL, 'innovators' in this diagram, are the ones most personally affected by decisions that limit what can be achieved with DT. This group may potentially have the most to offer in contributing to the decision-making process. Decisions made also impact on many elements in the school DT system including hardware, software and the DT curriculum. Ultimately, the DL of the schools' stakeholders is affected by decisions influencing DT access or restrictions.

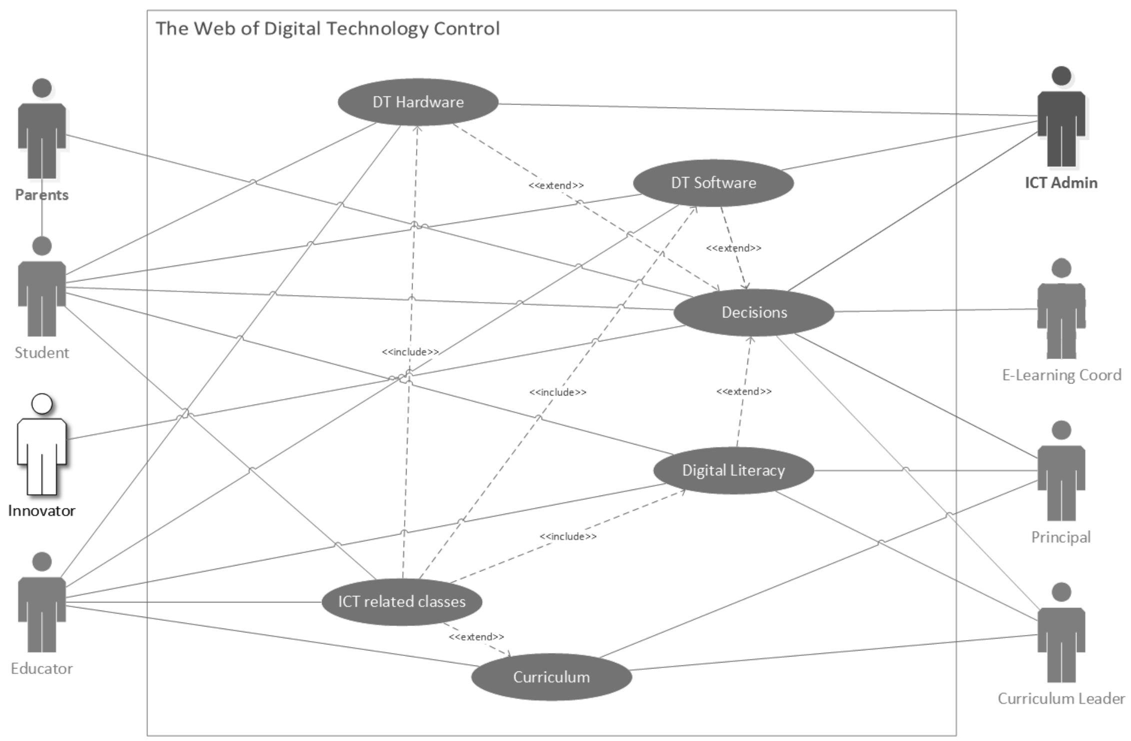

Figure 6.1 Web of Digital Technology Control: the interaction of decision-making in schools. Decisions were usually made by the ICT Manager – red line. Others could potentially contribute to this process.

In schools there is arguably a management bottleneck, or web of control which is dominated by one or several leaders, including the Principal and his or her delegates: ICT Manager, curriculum leader and Finance manager. This small group, in all interviewee schools, reputedly had limited DT knowledge and a background that was unlikely to be relevant to DT classroom contexts. There were crucial decisions made by this group in the schools of this research that impacted on the following areas: DT hardware, networks and software, DT curriculum and on student DT training and educator PD. There were also decisions that impacted on budgeting, staff expertise, time availability for training, specialist employment in DT and the decision-making process itself. Each of these decisions requires specialist knowledge in areas that, without training, would generally be unfamiliar for professionals in the leadership positions mentioned.

ICT Managers might be expected to have the specialist knowledge required in the more technical aspects of network connectivity and hardware provisioning, of the DT infrastructure. However, in interviewee schools, they were not at all sensitive to classroom needs and highly focused on the security of the system and on supporting school administrative services. There was strong dissatisfaction with decision-making and the decision-making process in schools by those most attuned to the needs of stakeholders in the classroom: the educators with high DL, innovators with new DT, e-learning professionals, ICT educators and students with high levels of DL. One pertinent conclusion in this research is that the decision-making process in schools could be improved by being more inclusive of those users of the system who have the most relevant knowledge, high DL educators and e-learning professionals. It is thought that high DL students could also make a contribution, although this is a more controversial proposal, since schools have traditionally resisted moves to include students in decision-making (Johnson et al., 2012).

High DL Stakeholders an Underutilised Resource in Schools

The findings of this research indicate that the most highly skilled stakeholders were rarely included in DT decision-making. There was an untapped resource of educators with high DL, who would be well placed to assist in the decision-making process. This high DL educator group was passionate (77%) about using DT in their classes and agreed that DT assisted them in becoming more creative (76%) and innovative (83%). They were also more enthusiastic for students to obtain high DL (87%) and for themselves (93%). They wanted more PD in DT (83%), and agreed that Social Media offered new digital literacies (63%). They thought schools should provide students with opportunities to be highly creative (89%) explore self-expression using DT (72%), and show support for constructivist pedagogies, in using group projects with DT (72%). While there was an obvious digital use divide and disconnect between this group and their school decision-makers, it seems indisputable that school communities would benefit from utilising their skills and optimistic perspectives. The suggestion from these findings is that high DL educators should be represented in a team management approach to DT.

6.4.6 Best Practice Decision-Making in Digital Technologies

Each interviewee school in this study had distinct decision-making arrangements that were ultimately the responsibility of the Principal. These arrangements set the tone in these schools of how DT was integrated and how it was used in individual classrooms. Decisions impacted on a wide variety of areas that affected the use of DT by students and teachers. This included: curriculum elements, the actual DT hardware chosen for students and teachers, the policies surrounding use, software, firewall limitations and system restrictions. Schools that put in place a management committee with a number of people representing the various interest groups, were perceived by interviewees to have the highest levels of decision efficacy and greater satisfaction in the decision-making process. This committee approach involved the Principal, ICT Manager, e-learning specialist, Finance Manager, Curriculum leader and various others, including a 'Director of Innovations' at one school. Due to the level of perceived success of these schools in integrating and utilising DT, this decision-making process was deemed to be best practice. In these cases, a full range of opinions contributed to decisions made, allowing for more inclusivity of those most affected by the changes that decisions caused and more ownership of the DT system.

There were 3 out of 10 interviewee schools that had a DT Management team. These schools were also unique in that they arranged for new DT to be explored and evaluation of the DT system, that was absent in schools with other types of decision-making structures. Interviewees from these schools were highly optimistic and positive about the integration of DT into classrooms and felt the schools supported change, including pedagogical change. The decision-making process in these schools was also perceived as transparent. A transparent decision-making process was seen by interviewees to open the way for improved communication and more satisfaction with the decision-making process. These interviewee schools had the most positive interviewee responses, of any of the decision-making arrangements. It is therefore concluded that the decision-making process involving an ICT management team, may be flexible enough to be able to be sensitive to the needs of the school community and strong enough to be independent of the school Principal, although they would need to support the team approach. Finance availability and funding arrangements are also significant constraints in school DT decision-making and provisioning by an ICT management team.

The overriding perception amongst 6 out of 10 interviewees of this study, was that disconnects felt between teachers and school leadership could be attributed to a lack of 'vision' by decision-makers. These findings paint a disappointing picture of a school system, struggling in managing e-learning and

DT, where poor perceived efficacy of decision-making was seen as the norm. Findings here strongly suggest that schools do not change without impetus to change from school Principals or other major decision-makers.

This suggests that democratic decision-making processes, through a team approach would be likely to push schools more towards best practice. This in turn would result in more acceptance of decisions by stakeholders and more ownership of decisions made. In the two best practice schools with a decision-making team, educators were regularly asked what they wanted from the system and encouraged to ask for DT equipment or resources by asking ICT Managers and Technicians directly. They also reported improved responsiveness from ICT Managers to requests and reported less red tape in decision-making surrounding their requests. ICT Technicians were also more likely to be supportive, more empowered to initiate immediate change and more likely to appear in classrooms to offer teachers direct assistance. The decision-making process was more transparent and newer DT uncovered by educators, was reportedly trialled without delays or constraints. One of these best-practice schools also had significant surveying of educators as a means of evaluating the DT system to ensure better functionality and responsiveness to requests. Evaluation measures appeared to be absent in almost all interviewee schools. The team management approach was the only decision-making process that was seen to contribute to satisfactory outcomes for stakeholders.

Section 6.5 Conclusion

In responding to the four research questions in this study a number of key findings can be drawn from this research study.

There were numerous positive attitudinal findings from this study that support the use of digital technologies (DT) in schools, that it is perceived to enhance creativity, innovation and 4Cs and SAMR pedagogies. Self-efficacy was also shown to be directly related to digital literacy (DL) and ability to use DT in the classroom, although this effect was not quantified. There was also a digital divide between those with high DL, with DT available at home, and those that had little personal access to either DT or others that may assist them in enhancing their DL, that was not happening in their schools. Survey data confirmed that the notion of the digital native was a myth. The fact that effective support for the development of DL in schools was generally absent, was seen as a major indictment of school implementations of one-to-one DT access for students and educators, who needed more training and skill development in using DT.

Many disconnects between school stakeholders were also found that undermined the use, training and implementation of DT in the schools in this study. Lockdowns and security measures prevented the effectiveness of DT programs and limited what could be achieved with new DT. High DL users were frustrated by these restrictions to accessing new DT in their schools and learned more and acquired more DL at home. There was poor DT training of students and poor professional development (PD) of educators in using DT. The methods employed for educator PD were generally of the least desired type, large lecture groups, with the preferred one-to-one method rarely available. Pedagogies in the schools in this study were also not consistent with the preferred approaches of the constructivist, SAMR or 4C's models, and little pedagogical change was observed in interviewee schools. The schools in this study needed to do much more to upskill both students and educators in DL and use of DT.

The disconnects in survey schools were found to be due to poor decision-making in provisioning, implementing DT programs and training students and educators in effective DT use. Low DL students and teachers were therefore hampered and limited in their use of DT and resistant and avoidant of DT in many cases and frustrated by poor training and DT access problems. Low DL students were found to be generally disaffected and require further in-depth study, as this may reflect disaffection with schooling.

School ICT Managers and Technicians in this research seemed ill-equipped to make decisions surrounding uses and access to DT in education, although they were responsible for these decisions in many schools in this study. Many skilled teachers in DT in this study, believed that offerings in school DT programs were being hampered by ICT Managers with little educational knowledge. They reportedly had poorly developed skills in understanding the needs of the main stakeholders in digital education: the teachers and students wishing to use more DT in their classrooms. Decision-making problems were then compounded and exacerbated by Principals who exerted autocratic control, in 8 out of 10 cases, that they delegated to ICT Managers. The ICT Managers then made autocratic decisions that prioritised security over DT access for all stakeholders. Principals appeared ill-equipped to deal effectively with any management problems or conflicts that arose from this disconnect.

The advent of better training programs for all stakeholders, including Principals and ICT Managers, and others involved in DT decisions, may have been able to ameliorate these problems in DT integration and decision-making. However, effective PD was absent in almost all interviewee schools and not seen as a priority, over other demands for PD time. The result was that student training in DT was virtually absent, the curriculum offerings in DT were minimal and teacher skills in DT did not allow many teachers to assist students in classroom use of DT. The majority of teachers wanted more PD in DT that they did not receive. One reason for this was that schools failed to employ sufficient e-learning specialists or provide them with the time, budget and resources that they required to deliver one-to-one PD effectively.

The best practice schools had decision-making ICT management teams, with specialist members who democratically made decisions with the purpose of guiding best practice in integrating DT. These groups all included: the school Principal, ICT Manager, e-learning specialist, Finance Manager and Curriculum leader, other personnel were also included. Schools with teachers perceived as innovators or cutting edge, could also incorporate them into these decision-making teams and employ them in PD programs. Time and resources for ICT technical support and PD in DT, was also a crucially important management decision that best practice schools had put in place.

Principals and other school decision-makers could benefit from appropriating recommendations made in this study to enhance school DT training and implementation. The key recommendation is the commissioning of a Digital Innovations Team to oversee the one-to-one DT program, online access and use of new DT. The conclusion that flows from these findings is that: an effective use of DT in schools relies on an inclusive decision-making framework, with responsive ICT and e-learning support, such as a collaborative ICT management, or Digital Innovations Team approach, that is responsive to stakeholder needs.

6.5.1 Digital Innovations Team

It is strongly suggested in this thesis that, to ensure a best practice approach, that schools adopt a Digital Innovations Team (DIT). This would improve the decision-making process and also minimise attitude-related disruption and disconnect in schools, that undermine DT integration.

In the best practice schools in this research, where there had been an ICT management team approach, there were a number of advantages. These include:

- Less conflict between users and decision-makers;
- More rapid incorporation of new DT;
- Systematic appraisal of new DT that arise;
- A team-based approach to recommend and oversee adoption of new DT;
- Attempts to ensure some degree of ownership about new DT implementations;
- Fewer complaints about lockdowns and network rules;
- More open networks and a more agnostic DT system;
- Fewer fears about DT generally amongst administrators;
- Staff surveys and vehicles for staff input about decisions;
- Acceptance about the need to adapt to new technologies;

- Educative approaches to mis-use of technology or misadventures, through pro-active education rather than control.

These features provide items to incorporate into the decision-making processes and suggest recommended practice for decision-making DIT to govern new DT implementations and adaptation to technological change. The DIT would undertake the responsibility of communicating change needs to the school Principal or collaborate directly with them. There must be a collaborative team to ensure school community needs are best being met.

It is therefore suggested that schools have a Digital Innovations Team to embrace the collaborative and innovative nature of school DT systems and undertake all relevant decision-making.

The DIT team could also have a public presence to offer support, perhaps with a central and obvious location, where people could come and get assistance from support personnel at a DT Support Centre. These support personnel may be educators, e-learning specialists, students or technical ICT specialists, working together to ensure a streamlined approach, responding efficiently to stakeholder requests. Training and professional development could be directly provided where there is an immediate need, incorporating both helpdesk and one-to-one individual training or teacher professional development in using DT. Members of this support group could also attend to classroom requirements as required. This approach requires resourcing and support, with significant time and budget, as a requirement for an effective DT system.

The Digital Innovations Team would need to undertake an information systems management approach so that schools would be able to make decisions to implement DT systems changes in a timely manner. There would then be user involvement in a change management approach, showing compassion and understanding for those with low levels of DL. The DT Support Centre would ensure support and training for all stakeholders participating in DT use.

The Digital Innovations Team would manage the entire system and ensure that they:

- Undertake DT professional development for all staff;
- Ensure administrators are kept abreast of the latest DT and school needs;
- Undertake research what other schools are doing and what industry developments are relevant;
- Keep abreast of the literature in new e-learning and DT initiatives and implementations;
- Lead the school ICT Manager in ensuring services are provided for all users;
- Oversee curriculum offerings for students in DT and design and technology;

- Oversee parent meetings to keep them abreast of school changes and to offer training and information sessions for parents;
- Oversee needs for digital and online safety information, policies and procedures in school;
- Assist teachers in implementing classroom uses of DT;
- Determine student needs for specialist training in using technology and to find students with outstanding skills who may be used by the Support Centre to train others;
- Determine student needs for assistance in managing their own use of DT including those at risk of addictions, that may be remedied through counselling;
- Oversee and make new purchases of DT for school and classroom including hardware, software and networked systems and display technologies;
- Undertake an information systems analysis approach to managing change.

Membership of the Digital Innovations Team may be various according to positions of responsibility in any school, for example a 'Director of Innovations'. It is recommended that this team have full representation from interested parties: The Principal, ICT Manager, Finance Manager, Curriculum leader, e-learning leader and high DL 'innovative' teacher representatives and students, where appropriate. This team needs to manage responsibilities for funding, policy, PD, curriculum and all decisions pertaining to DT in the school, as described.

Section 6.6 Limitations and Critique of the Study and Methodology

There were a number of limitations to this study that are outlined in this section. In any study of this type, where a particular sample is used for surveys and interviews, the main limiting factor is in extrapolating findings to a wider population of similar groups. Hence, while the Stage 1 surveys were conducted amongst a small sample of Independent coeducational schools with one-to-one laptop programs, there are limitations in how the findings may be interpreted to be relevant to other Independent coeducational schools with or without such programs. In every school case the findings have been phrased to avoid any mention of specific schools both in the interviews and surveys. Hence, schools are not identified in this study. The reader should not assume generalisations apply to a particular school or school type from the findings in this study. However, relevant cautious extrapolations from the survey findings could be meaningfully attributed to schools of varying type, with some success. Individual subjective interpretations need to be made according to school characteristics that may indicate similarities with schools in this study.

In this study the Stage 2 interviews, that included responses from interviewees from all school sectors, could allow some conclusions to be drawn that may be relevant to a greater or lesser degree, to other schools. The reader themselves, and those interpreting the findings' relevance to particular schools, need to interpret relevance. The author of this study makes no claims that the mixed-methods findings can generally be extrapolated to all Australian schools, or schools elsewhere. However, there are interpretations in this study that will be of interest to school leaders in any schools that are implementing DT programs. Hence the findings herein may offer advice that could be sensitively applied in any modern school integrating DT, keeping in mind the limitations explained above.

In terms of the surveys, several limitations are apparent and some of these were mentioned in survey comments from participants. After analysing the results, it appears that there was an overly repetitive use of the terms 'digital technology' and 'digital literacy'. These terms were specifically chosen in order to avoid specific technologies that change regularly and specific skillsets that may be measured from time to time. In this way the terms were useful. However, in some cases they appear to be too general. This factor should be kept in mind by the reader when assessing the findings from the survey items. The definitions of the terms used in the survey were similarly and intentionally broad and may not have been instructive enough for some of the participants. However, in order to keep the survey comprehensible for all participants, the definitions were phrased in an uncomplicated manner. So, this element of the surveys is a deliberate limitation, in order for the survey phraseology to be consistent for the educator and student groups.

Another limitation that was intentional, was that the survey findings are not relevant to any reader who might be seeking specific information about particular devices, or software. However, some of the interview findings are more specific. Where 'tablet' computers appear in the interpretations of the interview statements, they generally refer to Apple iPads, although in BYOD schools, they may refer to Microsoft or other branded tablets. Hence, in the findings, brand names and devices of particular types were generally avoided, although survey participants and interviewees individually mentioned a large variety of brand-name devices. Portal and Content Management Systems were also referred to in all schools in the interview findings and, again, brands were avoided. Similarly, with software brands. This has had two effects in the interview findings. Firstly, it allowed convenient coding of similar device and software types for general analysis and commentary. Secondly, the findings were limited in that criticism may have applied to one brand-name and not another. There were no conclusions surrounding specific brands, there was no intention to do this in this study and no questions were phrased to be brand-specific. Brand interpretations should therefore be avoided by the reader.

The survey data reflects only on the sample undertaking the surveys in this study, Year 9 and 10 students and educators in Independent coeducational Schools with laptop programs in Victoria. This group may not be indicative of groups of students and their educators at other schools and may not be indicative of the community at large. It may be argued that teachers working in laptop schools have a higher DL than the average adult, due to acquired job skills and that 'digital natives' are extant in the wider community relative to, say, parents, as is often perpetuated in the media. Nevertheless, the finding here is in keeping with the assertion that a teacher and student digital divide is not as simple as is often assumed (Waycott et al., 2010). It is also conceivable that the community at large has changed significantly since the time the digital native notion was developed over fifteen years ago.

There were a number of terms that were used in the surveys and interviews that were assumed to be generally understood in the community. However, analysis of the findings suggests that this may not be the case. In the findings there are attempts to describe what has been assumed to be meant by terms like 'innovative' or 'innovator'. Other terms used that may be variously interpreted include: 'creativity', 'challenging', 'enthusiastic' and 'constructivist'. While there has been some attempt made to describe constructivism in this study, from the perspectives used in the literature, the reader is open to interpret the meanings of other terms used in this study and, indeed, to discount findings if desired, as there is no doubt some subjectivity in these interpretations.

Due to the need to reduce the amount of data shown in the survey and interview interpretations and analysis included in this study, there is a lack of thorough analysis for other possibly relevant factors that could be drawn from the data, other than digital literacy, which was the intended focus area. Focus and filter areas could include: gender, subject area, age group, enthusiasm, creativity etc., allowing for huge interpretation of the data obtained, that was not possible within the scope of this study. In addition, further surveys of this type could be developed that focus on these or other areas.

In terms of the interviews, the determined focus group was educators who were experienced in using DT, so that they would be able to reflect on the survey findings and elements that were derived from the surveys. In each case these educators taught in the classroom, for at least some of the time, so they had contact with the student group. Some of these interviewees were also involved with decision-making, and all of them acknowledged that they were aware of the decision-making mechanisms that were at work in their schools, pertaining to DT. As identified in the interview interpretations, there were other school leaders who were relevant to the provisioning of DT in classrooms and schools. These were the Principal-class school leaders and the senior ICT Managers in each school. It was decided to focus on the group that would have best knowledge about how DT were used in the classroom, hence the reason the first group was chosen in Stage 2 of the mixed-methods approach employed here. This allowed their responses to the interviews to be directly related to the

Stage 1 survey findings. However, one limitation of this study was that either of the other two groups would have equally been able to provide valid alternative perspectives on the same or similar issues, although they would arguably be detached from the classroom experience. Other studies of this type could focus on this group, as the Keane (2008) study has done with ICT leadership.

The two stages of this mixed-methods study took place over several years and the analysis and interpretation of the data, and drafting of this thesis, has also taken a number of years: from planning commencing in 2010, data collection until 2013 and completion in 2018. This elongated time-frame has been a function of the author's need to maintain full-time work during the course of this study and has been unavoidable. Although it could be argued that the data from the surveys is not current, the use of general terms in the survey has acted to cushion the data from the effects of time. Hence, in this way the use of general terms, has helped this study to retain relevance over the time period that has elapsed. In the author's impression, and that of his university supervisors, is that schools may now have more penetration in terms of DT at the time of writing, than was the case when the surveys were conducted, but the findings are as relevant now as a few years ago. In fact, given that the survey and interviewee schools had one-to-one student access to DT, when many other schools did not, the findings in this study may point to characteristic problems that all schools encounter when they make the transition to a one-to-one system. It is up to the reader to measure the truth of this statement and to gauge the importance of the limitations described.

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Appendix 1. Survey Statement and Structures

Educator Survey Statements

[Note: in the following statement list, if a statement does not have its own specific data representation e.g.: 9 and 35, it is structured as a Likert scale from strongly disagree to strongly agree – as per statement 1 below.]

Definitions:

Digital Literacy – Digital literacy is the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers

Digital Technologies – all computerised or computer-aided devices e.g.: laptops, desktop computers, mobile phones, digital cameras, interactive whiteboards, tablets, readers etc.

Social Networking – interactive Web sites where users can post photos, messages and chat with others e.g.: Facebook, MySpace, Bebo etc.

Web 2.0 technologies – website that allows its users to interact with other users or to change website content e.g.: Youtube, Flickr, social networking sites, blogs, wikis, forums etc.

Attitude to student use of digital technologies

1. Students often use digital technologies inappropriately in the classroom.

|--------------------|--------------------|--------------------|--------------------|

strongly disagree disagree undecided agree strongly agree

2. Students can become dependent on using digital technologies.

3. I am tolerant of occasional misuse of digital technology by students.

4. I think students often by-pass my school's Internet filter.

5. Students should be limited in their use of digital technologies.

6. Students tend to write more when asked to complete an assignment using digital technologies.

7. I find that students work more efficiently when using digital technologies

8. Many students waste time when using the Internet at school.

9. What percentage of your school's students do you estimate have a high-level of digital literacy?

[0 ----- 20 ------ 40 ------ 60 ------ 80+]

Digital Technology at home

10. I enjoy using the Internet at home.

11. Most of my digital literacy has developed through my use at home.

12. Friends and/or relatives often assist me in improving my digital literacy.

13. Digital Literacy is best developed at home rather than at school.

14. Digital technologies at home can be a major distraction.

Training in digital literacy

15. I would like to obtain more professional development in digital technologies.

16. I am enthusiastic about obtaining a high-level of digital literacy.

17. Digital literacy helps to protect students when on the Internet.

18. I would like students to obtain more training in digital technologies.

19. I am enthusiastic about students obtaining a high-level of digital literacy.

20. I would like to find out more about digital technology for entertainment.

Digital Technologies in the classroom/curriculum

21. I encourage students to use digital technologies in the classroom.

22. I find students with a high level of digital literacy helpful when I am using digital technologies in education/classroom.

23. Some students get bored in class if they are not using digital technologies.

24. Students are less productive when they use digital technologies in the classroom rather than pen/paper.

25. The quality of homework assignments and presentations is better when students use digital technologies.

26. I find students with low levels of digital literacy need more support than I can provide, when they use digital technologies in the classroom.

27. Students with a low level of digital literacy are more likely to waste time in using digital technologies in the classroom.

28. I encourage students to publish their writing on the Internet. (e.g.: on blogs, wikis, webpages, forums, Facebook etc.)

29. I would rather students work with pen and paper in the classroom than with digital technologies.

30. Students generally follow instructions when they use digital technologies in the classroom.

31. Digital technologies are well-suited to group projects.

32. Students with a low level of digital literacy are generally able to use computers efficiently in class.

33. Digital technologies enhance cooperation in the classroom between students.

34. I encourage students to learn by discovery, using digital technologies.

35. Please rate your self-perceived ability to use digital technologies in education/classroom situation.

|--------------------|--------------------|--------------------|--------------------|

Poorly skilled   Poor to moderate skills   Moderately skilled   Moderate to high skills   Highly skilled   Uncertain

Attitude to digital technologies and digital literacy

36. As an educational resource the Internet is:

Too unreliable   very effective for research   essential in schools   of great risk to students   needing guidance by teachers   of poor quality   of excellent quality   of average quality

37. I enjoy having my own school laptop.

38. Digital technologies provide students with an opportunity to be highly creative.

39. Digital Literacy is important in future employment opportunities for students.

40. Social Networking sites (like Facebook or MySpace) offer new ways of developing digital literacy.

41. Video Games offer new ways of developing digital literacy.

42. I am satisfied with the way my laptop and the way it is set up by my school.

43. Digital technology detracts from more important educational activities.

44. I would say I am passionate about using digital technologies in education.

45. I think it is important for schools to explore student self-expression using digital technologies.

46. Students should be encouraged to use new technologies in schools.

47. There are many risks involved with using Web 2.0 technologies (e.g.: Facebook, Youtube, Flickr) in education.

My Digital Literacy

48. My accounts on Social Networking sites (e.g.: Facebook, MySpace, Twitter, Bebo etc.) would number:

|--------------------|--------------------|--------------------|--------------------|

0 1 2 - 3 4 – 5 > 5

49. My use of Social Networking sites, online email, forums, wikis etc. has helped me develop digital literacy.

50. Youtube or other Web video is used in my classes (by myself or my students):

Not at all less than once a month At least once every two weeks At least once every week Every day or more frequently Uncertain

51. I find the use of digital technologies challenging.

52. I feel confident in using digital technologies in my classes.

53. I use digital technologies to enhance my learning:

Not at all less than once a month At least once every two weeks At least once every week Every day or more frequently Uncertain

54. I have found that I have become more creative in using digital technologies.

55. Digital technologies and the Internet allow me to be more innovative when developing ideas or plans for classes.

56. I spend the following hours using digital technology each day – on average.

Less than 10 mins from 10 min up to one hour one or two hours two or three hours four to six hours six to eight hours eight to ten hours more than 10 hours uncertain

57. I have a high level of digital literacy.

58. Circle your preferred area(s) of teaching expertise.

[Eng - Sci – Maths - Hums- LOTE - ICT – PE/Health – RE - Art – Music (other)_________________]

59. Circle your gender.

[Male ----- Female]

Please add any comments about questions or the issues raised:

Student Survey Statements

Definitions:

Digital Literacy – Digital literacy is the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers

Digital Technologies – all computerised or computer-aided devices eg: laptops, desktop computers, mobile phones, digital cameras, interactive whiteboards, tablets, readers etc..

Social Networking – interactive Web sites where users can post photos, messages and chat with others e.g.: Facebook, MySpace, Bebo etc.

Web 2.0 technologies – website that allows its users to interact with other users or to change website content e.g.: Youtube, Flickr, social networking sites, blogs, wikis, forums etc.

Attitude to use of digital technologies

1. Teachers often have difficulties in using digital technologies in the classroom.

2. Teachers can become dependent on using digital technologies.

3. I am aware of occasional misuse of digital technology by other students in the classroom.

4. I think students often by-pass my school's Internet filter.

5. Teachers should limit their use of digital technologies.

6. I tend to write more when asked to complete an assignment using digital technologies.

7. I work more efficiently when using digital technologies.

8. Many students waste time when using the Internet.

9. What percentage of your teachers do you estimate have a high-level of digital literacy?

[0 ----- 20 ------ 40 ------ 60 ------ 80+]

Digital Technology at home

10. I enjoy using the Internet at home.

11. Most of my digital literacy has developed through my use at home.

12. Friends and/or relatives often assist me in improving my digital literacy.

13. Digital Literacy is best developed at home rather than at school.

14. Digital technologies at home can be a major distraction.

Training in digital literacy

15. I would like to obtain more training in digital technologies.

16. I am enthusiastic about obtaining a high-level of digital literacy.

17. Digital literacy helps to protect myself and other students when on the Internet.

18. I would like teachers to obtain more training in digital technologies.

19. I am enthusiastic about teachers obtaining a high-level of digital literacy.

20. I would like to find out more about using digital technology for entertainment.

Digital Technologies in the classroom

21. I would like to encourage teachers to use digital technologies in the classroom.

22. Most of my teachers encourage me to use digital technology in the classroom.

23. Some students get bored in class if they are not using digital technologies.

24. I am less productive when I use digital technologies in the classroom, rather than pen/paper.

25. The quality of my homework assignments and presentations is better when I use digital technologies.

26. I find teachers with low levels of digital literacy need support when they use digital technologies in the classroom.

27. Teachers with a low level of digital literacy are more likely to waste time on using digital technologies in education/classroom.

28. I would like teachers to publish their writing on the Internet. (e.g.: on blogs, wikis, webpages, forums, Facebook etc.)

29. I would rather work with pen and paper in the classroom than with digital technologies.

30. I generally focus on school work when I use digital technologies in the classroom.

31. Digital technologies are well-suited to group projects.

32. Which area(s) of study make the most use of digital technologies? (One class per week or more frequently.)

[Eng - Sci – Maths - Hums- LOTE - ICT – PE/Health – RE - Art – Music (other)________________]

33. Digital technologies enhance cooperation in the classroom between students.

34. I like to learn by discovery, using digital technologies.

35. Please rate your self-perceived ability to use digital technologies in education/classroom situation.

Poorly skilled Poor to moderate skills Moderately skilled Moderate to high skills Highly skilled Uncertain

Attitudes to digital technologies and digital literacy

36. As an educational resource the Internet is:

Too unreliable very effective for research essential in schools of great risk to students needing guidance by teachers of poor quality of excellent quality of average quality

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41. Video Games offer new ways of developing digital literacy.

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43. Digital technology detracts from more important educational activities.

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45. I think it is important for schools to explore student self-expression using digital technologies.

46. Students should be encouraged to use new technologies in schools.

47. There are many risks involved with using Web 2.0 technologies (e.g.: Facebook, Youtube, Flickr) in education.

My digital Literacy

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|--------------------|--------------------|--------------------|--------------------|

0 1 2-3 4-5 >5

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50. Youtube or other Web video is used in my classes (by myself or my students):

Not at all less than once a month At least once every two weeks At least once every week Every day or more frequently Uncertain

51. I find the use of digital technologies challenging.

52. I feel confident in using digital technologies in my classes.

53. I use digital technologies to enhance my learning:

Not at all less than once a month At least once every two weeks At least once every week Every day or more frequently Uncertain

54. I have found that I have become more creative in using digital technologies.

55. Digital technologies and the Internet allow me to be more innovative when developing ideas or plans for assignments.

56. I spend the following hours using digital technologies each day – on average.

Less than 10 mins from 10 min up to one hour one or two hours two or three hours four to six hours six to eight hours eight to ten hours more than 10 hours uncertain

57. I have a high level of digital literacy.

58. Circle your preferred area(s) of study.

[Eng - Sci – Maths - Hums- LOTE - ICT – PE/Health – RE - Art – Music (other)________________]

59. Circle your gender. [Male __ Female]

Please add any comments about questions or the issues raised:

Appendix 2. Literal Wording of Interview Structure

Greeting …. (to interviewee)

Thank you for your time.

I am actually hoping we can just have a good conversation about what you think about how technology is impacting on schools and education now. And of course your school and yourself will not be identifiable in any of what I write – so I would like you to be as open as possible and feel comfortable about talking openly to me.

Do you mind if I record the audio …

A. Lets start by talking about how technology has changed over the years you have been teaching – afterall, for most of us the Internet is only a few years old in its present form ……. And now students have phones on the web … how rapid is change happening in your school and life ?

B. how do schools that you know about cope with the demands of training teachers (and even students) in the use of digital technology in schools and education …

C. Do you think people use and learn about technology more effectively now at home than at school …. Especially kids …?

D. Who are the innovators in your school that you know about and what are they doing in their use of technology … do they let kids publish their stuff online ... do they use collaboration ... or outside communication?

E. The media talks a lot about the huge risks in kids using new technology – like mobile phones, iPads and laptops or gaming in the bedroom – and facebook and meeting predators – what do you think …?

F. People talk about school as “walled gardens”: and the Internet has challenged that ... Does your school block the Internet and social networking for classroom use – how effective is it? Do kids still use it …. Outside …… what do other school do?

G. While we are on that topic – how does your school make informed decisions about innovative and new uses of technology … is there a process … or a team involved?

H. Where do you think we will be in five or ten years with technology – will we still operate in the same way in classrooms … will there be more group work and adoption of modern “pedagogies” like constructivism …

Appendix 3. Themes and Wording of Interview Questions

Themes	Interview Question
Past and present experiences with digital technology and digital literacy. (Research question 1)	Let's start by talking about how technology has changed over the years you have been teaching, after all, for most of us the Internet is only a few years old in its present form; and now students have phones on the web, how rapid is change happening in your school and life ? How have you coped with the demands?
Access to DT, training, learning and PD. (Research question 3)	How do schools that you know about cope with the demands of training teachers, and even students, in the use of digital technology in schools and education. Do you have access to the training and technology that you feel you need?
Disconnects at School vs Home –access difficulties to DT and acquisition of digital literacy. (Research question 2)	Do you think people use and learn about technology more effectively now at home than at school, especially kids, can they access school (digital) materials from home? Can they use the equipment they need at school?
Best practice: Innovation and best practice in using digital technologies in schools (Research question 3 – advanced uses and training in Digital technologies)	Who are the innovators in your school that you know about and what are they doing in their use of technology? Do they let kids publish their stuff online, do they use collaboration, or outside communication?
Disconnects and difficulties in relative access to digital technologies in schools (Research question 2)	People talk about school as "walled gardens": and the Internet has challenged that ... Does your school block the Internet and social networking for classroom use – how effective is it? Do kids still use it …. Outside …… what do other schools do?

	Schools put in place a great many rules in the offline environment that are intended to keep them safe, or to encourage particular behaviours. In other words, the school is not a "natural" social environment and nor should it necessarily be. How does this manifest when it comes to online media and information technology in classrooms?"
Disconnects: Mobile Technologies – Security and Online Risks and Dangers filters and fears (Research question 2)	The media talks a lot about the huge risks in kids using new technology – like mobile phones, iPads and laptops or gaming in the bedroom – and Facebook and meeting predators – what do you think …? Should we be using these in schools?
DT Decision-making – decision-making processes and digital technology teams. (Research question 4)	While we are on that topic – how does your school make informed decisions about innovative and new uses of technology … is there a process … or a team involved?
Change in uses of digital technologies in schools – possible future predictions (Research question 4 and further research)	Where do you think we will be in five or ten years with technology – will we still operate in the same way in classrooms … will there be more group work and adoption of modern "pedagogies" like constructivism.

Appendix 4. Software Summary in Interviewee Schools

Software	Research Comments	Interviewee	School Type
Microsoft Office software	This is one of the main provided software suites	All except Terry	All types
E-mail, browsing and calendar software	Basic Web access and communications software was available in all schools	All	All
Apple software, Pages etc.	Only two of the teachers interviewed used Apple laptops	Terry, Kellie	Independent coeducational schools
Tablet Apps	Provided to students by the schools or installed by students and teachers	Carolyn, Adrian, Terry, Kellie	Independent male School, Catholic coeducational school, Independent female school
Smart phone software	Schools with BYOD the need to use office applications that can be downloaded on to smart phones	Rory, Kellie	Governments coeducational school Independent coeducational school
Adobe creative suite/cloud	One of the more complex and expensive software suites used for artistic and creative purposes	Michelle, Robert, Samantha, Ilja	Three Independent coeducational schools, one Catholic male School
Open source and free software	Several interviewees indicated that free software available online could be used instead of expensive suites like the Adobe suite. All interviewees	All	All

	indicated they would like to download and trial new software		
Digital video Editing Software	Every school is using some video editing software whether it be basic software available on an iPad, Microsoft movie maker or more advanced software used in senior media classes like Adobe Premier Pro, After Effects	All	All
Video Communications software	These users specifically mentioned the use of skype or videoconferencing software by students. Adrian and Samantha wished they could use it.	Ingrid, Terry, Kellie,	Independent coeducational school, Independent female school
Display technology and interactive software	There was discussion on the use of specialist display technology software by several interviewees. There was mention of algebra and survey tools with "instant feedback"	All schools have some capability	All
Gaming and personal software	BYOD schools allow personal software to be installed. No interviewee school used games for curriculum purposes. Laptop schools prevent student installation of software.	Kellie, Rory, Terry	
Digital texts	Ebooks, etexts are used in many schools to replace or support senior textbooks. This is often the reason tablets are introduced into schools and BYOD	Ingrid, Kellie, Rory, Robert, Carolyn, Lauren	

Mind-mapping software	Is used in several schools to plan essays and projects and for critical thinking and logical thought	Ingrid, Robert, Adrian	
Computer programming software	Used in schools that taught computer programming	Ingrid, Adrian, Rory, Michelle	

Appendix 5. Consent and Permission Instruments

School and Educator Consent Information Statement

Project Title:
Digital Education – Comparison in Attitudes

Investigators

[Personal Contact Information Redacted]

Timeframe for Project
The survey will take place in 2010. The research project is due for completion by 2012.

Introduction to Project and Invitation to Participate

Digital technologies are important in schools, yet there has been little research into how digital technologies impact on the student-teacher relationship. The aim of this research is to better understand how students and teachers perceive their own and each others 'digital literacy' and whether Information Communication Technology (ICTs) are considered to be useful in the classroom. Is there is a disconnect between digitally literate students and digitally challenged educators? How does this influence classroom practices? Although this research will focus on independent schools with laptop programs, the study has broader implications in that many students are now obtaining laptop computers for use in all schools, not just private schools.

We are inviting three schools to participate in this research, which will involve a survey of Year 10 students, as well as Science and Humanities Year 10 teachers. Your school as been selected as it is one of the few independent schools in Victoria that has implemented a laptop program.

By working with us you will be assisting us to understand the difficulties surrounding technological change in schools, towards the development of the 'classroom of the future'. Participation in this research is entirely voluntary and the surveys are to be undertaken anonymously. We will ensure that survey responses respect the privacy of the participants and will not be viewed by school administrators, students or teachers.

However, we will ensure that the results of the survey are made available to you in the form of a written report (before the project's completion in 2012).

What this project is about and why it is being undertaken

This research project is tied to a <Thesis> by Research, which is being conducted within the Swinburne Institute for Social Research. This Thesis student, David Dawson, is supervised by <redacted>. David is a fully-qualified and practicing teacher with 25 years experience. David is the recipient of a Menzies Fellowship from the Wesley College Institute for Innovation in Education, which provides him with time release from his teaching work in order to conduct this research. The Wesley College Institute for Innovation in Education was launched in July 2005 by the Founding Patron, Sir Gustav Nossal. The Institute, which is separate from the school, generates ideas in education and builds capacities of people and organisations for the benefit of students, teachers, the educational community and society at large.

The research will be based on a survey of three independent Victorian schools, all of which have implemented a laptop program. Students and teachers in Year 10 will participate in the study. By understanding the relationships between these groups and their impact on learning, the research will help inform decisions concerning classroom and home technologies and teacher training.

Project and researcher interests

This project is being undertaken to satisfy the requirements for a David Dawson's <PhD> qualification, which will result in a 50,000 word thesis. Articles are likely to be published and presentations made to academic and professional forums, for example, the Victorian Information Technology Teacher's Association and the Australian Council for Educational Research. A report for the Wesley College Institute (and possibly general distribution) will be published in by 2011.

What participation will involve

Participants will be provided with an online survey of around 40-50 questions, using a five-point scale, to be accompanied by text boxes where opinions can be given – although this is voluntary. It should take less than one hour to complete the survey. David Dawson will be present when the survey is filled out by students, along with a teacher from your school. Teachers will fill out the survey separately from students. The teacher will not be allowed to see students' responses and David Dawson will be on hand to assist with any survey questions/difficulties.

Participant rights and interests – Risks & Benefits

The research is of negligible risk in that there is no foreseeable risk or discomfort to the participants other than inconvenience.

This study is not seeking to uncover any personal information and participants will remain anonymous throughout. The surveys will be filled-out anonymously, and the results will not be accessible by fellow teachers, students, superiors or managers.

Participants will have the opportunity to provide anonymous information about the use of digital technology at school and at home. They will also be able to express their attitudes about use of digital technology generally.

A number of long-term benefits will flow from the study. These may be used to inform government and non-government schools of the possible benefits hazards and/or shortcomings of a laptop program. This is particularly pertinent under the Rudd government's one laptop per student program - in years 9 to 12 in Australian schools – via the National Secondary School Computer Fund.

Participant rights and interests – Free Consent/Withdrawal from Participation

Your school is invited to participate in this research study because you have a laptop computer program. All students in year 10 at your school are being asked to participate, as well as some teachers of year 10 (Science and Humanities teachers). Participation in this research study is entirely voluntary. By filling out the attached consent form you are giving consent for your school to participate.

Student and teacher participants will be able to withdraw from this study at any time without question or explanation. Parents will be given the opportunity to withdraw students from the research study prior to the research being commenced. A letter will be sent to all parents of Year 10 students, informing them about the research and giving them the opportunity to withdraw their child from the research by contacting the school directly.

Participant rights and interests – Privacy & Confidentiality

Confidentiality will be protected by the following measures: data files will be burnt onto CD. CDs will be retained in a locked cabinet for at least five years after the publication of results. Following this they will be handed to a professional confidential document disposal company.

Secure arrangements have been made with Swinburne Institute for Social Research for data access, collection, use, retention and/or disposal, consistent with Swinburne's Policy on the Conduct of Research. No personal information about participants will be stored in relation to the data - complying with mandatory Information Privacy Principles/etc.

See also Swinburne's Privacy Policy http://policies.swinburne.edu.au/ppdonline/

Signed consent forms will be stored separately to any data collected, and will only be able to be access by researchers. No data matching will be possible and no detailed personal information stored.

Research output

Wesley College Institute for Innovation in Education – presentations; VITTA Annual Conference, Infonet – VITTA Journal, Australian Journal of Education, M.A Thesis.

Participants will be given the opportunity to request findings, articles and outcomes of the research study.

Further information about the project – who to contact

If you would like further information about the project, please do not hesitate to contact:

[Personal contact information redacted]

Concerns/complaints about the project:

This project has been approved by or on behalf of Swinburne's Human Research Ethics Committee (SUHREC) in line with the *National Statement on Ethical Conduct in Human Research*. If you have any concerns or complaints about the conduct of this project, you can contact:

Research Ethics Officer, Swinburne Research

[Contact information redacted]

Parent Information Statement

Project Title:
Digital Education – Comparison in Attitudes

Investigators

[Personal contact information redacted]

Timeframe for Project

The survey will take place in 2010. The research project is due for completion by 2012.

Introduction to Project and Invitation to Participate
Digital technologies are important in schools, yet there has been little research into how digital technologies impact on the student-teacher relationship. The aim of this research is to better understand how students and teachers perceive their own and each others 'digital literacy' and whether Information Communication Technology (ICTs) are useful in the classroom. Is there is a disconnect between digitally literate students and digitally challenged educators? How does this influence classroom practices? Although this research will focus on independent schools with laptop programs, the study has broader implications in that many students are now obtaining laptop computers for use in all schools, not just private schools.

By working with us and undertaking this survey you will be assisting us to understand the difficulties surrounding technological change in schools, towards the development of the 'classroom of the future'. Participation in this research is entirely voluntary and the surveys are to be undertaken anonymously. No survey responses will be able to be viewed by school administrators or teachers.

What this project is about and why it is being undertaken

This research project is tied to a <Thesis> by Research, which is being conducted within the Swinburne Institute for Social Research. This <Thesis> student, David Dawson, is supervised by <redacted> David is a fully-qualified and practicing teacher with 25 years experience. David is the recipient of a Menzies Fellowship from the Wesley College Institute for Innovation in Education, which provides him with time release from his teaching work in order to conduct this research. The Wesley College Institute for Innovation in Education was launched in July 2005 by the Founding Patron, Sir Gustav Nossal. The Institute, which is separate from the school, generates ideas in education and builds capacities of people and organisations for the benefit of students, teachers, the educational community and society at large.

The research will be based on a survey of three independent Victorian schools, all of which have implemented a laptop program. Students and teachers in Year 10 will participate in the study. By understanding the relationships between these groups and their impact on learning, the research will help inform decisions concerning classroom and home technologies and teacher training.

Project and researcher interests

This project is being undertaken to satisfy the requirements for David Dawson's … thesis. Articles are likely to be published and presentations made to academic and professional forums, for example, the Victorian Information Technology Teacher's Association and the Australian Council for Educational Research. A report for the Wesley College Institute (and possibly general distribution) will be published ....

What participation will involve

Participants will be provided with an online survey of around 40-50 questions, using a five-point scale, to be accompanied by text boxes where opinions can be given – although this is voluntary. It should take less than one hour to complete the survey. David Dawson will be present when the survey is filled out by students, along with a teacher from your school. Teachers will fill out the survey separately from students. The teacher will not be allowed to see students' responses and David Dawson will be on hand to assist with any survey questions/difficulties.

Participant rights and interests – Risks & Benefits

The research is of negligible risk in that there is no foreseeable risk or discomfort to the participants other than inconvenience.

This study is not seeking to uncover any personal information and participants will remain anonymous throughout. The surveys will be filled-out anonymously, and the results will not be accessible by fellow teachers, students, superiors or managers.

Participants will have the opportunity to provide anonymous information about the use of digital technology at school and at home. They will also be able to express their attitudes about use of digital technology generally.

A number of long-term benefits will flow from the study. These may be used to inform government and non-government schools of the possible benefits hazards and/or shortcomings of a laptop program. This is particularly pertinent under the Rudd government's one laptop per student program - in years 9 to 12 in Australian schools – via the National Secondary School Computer Fund.

Participant rights and interests – Free Consent/Withdrawal from Participation

You are being invited to be involved in this research study because you are in a laptop computer program at your school. All students in year 10 at your school are being asked to participate, as well as some teachers of year 10 (Science and Humanities teachers).

Participation in this research study is entirely voluntary. Your decision whether or not to participate will have no bearing on your results or treatment at school.

If you decide to participate you will be provided with access to the website where the survey is found and data is being collated. By filling out the attached consent form you are giving your consent to participate.

Participants will be able to withdraw from this study at any time without question or explanation. Parents will be given the opportunity to withdraw students from the research study prior to the research being commenced. A letter will be sent to all parents of Year 10 students, informing them about the research and giving them the opportunity to withdraw their child from the research.

Participant rights and interests – Privacy & Confidentiality

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Research Ethics Officer, Swinburne Research

[Contact information redacted]

Information for Parents

Your son/daughter's school has agreed to participate in this project and they have been provided with the above information. If for any reason you wish to withdraw your son/daughter from participation, please sign below and return this document to your school or contact one of the researchers involved.

If you agree to the participation of the student no action is required as the student will sign a consent form.

As guardian/parent of ____________________________ Form Group: ______________

I wish to withdraw him/her from this research study.

Name: _______________________ Signature: ____________________ Date: ________

Student Consent Information Statement

Project Title:
Digital Education – Comparison in Attitudes

[Personal contact information redacted]

Timeframe for Project
The survey will take place in 2010. The research project is due for completion by 2012.

Introduction to Project and Invitation to Participate

Digital technologies are important in schools, yet there has been little research into how digital technologies impact on the student-teacher relationship. The aim of this research is to better understand how students and teachers perceive their own and each others 'digital literacy' and whether Information Communication Technology (ICTs) are useful in the classroom. Is there is a disconnect between digitally literate students and digitally challenged educators? How does this influence classroom practices? Although this research will focus on independent schools with laptop programs, the study has broader implications in that many students are now obtaining laptop computers for use in all schools, not just private schools.

By working with us and undertaking this survey you will be assisting us to understand the difficulties surrounding technological change in schools, towards the development of the 'classroom of the future'. Participation in this research is entirely voluntary and the surveys are to be undertaken anonymously. No survey responses will be able to be viewed by school administrators or teachers.

What this project is about and why it is being undertaken

This research project is tied to a <Thesis> by Research, which is being conducted within the Swinburne Institute for Social Research. This … student, David Dawson, is supervised by <redacted>. David is a fully-qualified and practicing teacher with 25 years experience. David is the recipient of a Menzies Fellowship from the Wesley College Institute for Innovation in Education, which provides him with time release from his teaching work in order to conduct this research. The Wesley College Institute for Innovation in Education was launched in July 2005 by the Founding Patron, Sir Gustav Nossal. The Institute, which is separate from the school, generates ideas in education and builds capacities of people and organisations for the benefit of students, teachers, the educational community and society at large.

The research will be based on a survey of three independent Victorian schools, all of which have implemented a laptop program. Students and teachers in Year 10 will participate in the study. By understanding the relationships between these groups and their impact on learning, the research will help inform decisions concerning classroom and home technologies and teacher training.

Project and researcher interests

This project is being undertaken to satisfy the requirements for David Dawson's … thesis. Articles are likely to be published and presentations made to academic and professional forums, for example, the Victorian Information Technology Teacher's Association and the Australian Council for Educational Research. A report for the Wesley College Institute (and possibly general distribution) will be published in by 2011.

What participation will involve

Participants will be provided with an online survey of around 40-50 questions, using a five-point scale, to be accompanied by text boxes where opinions can be given – although this is voluntary. It should take less than one hour to complete the survey. David Dawson will be present when the survey is filled out by students, along with a teacher from your school. Teachers will fill out the survey separately from students. The teacher will not be allowed to see students' responses and David Dawson will be on hand to assist with any survey questions/difficulties.

Participant rights and interests – Risks & Benefits

The research is of negligible risk in that there is no foreseeable risk or discomfort to the participants other than inconvenience.

This study is not seeking to uncover any personal information and participants will remain anonymous throughout. The surveys will be filled-out anonymously, and the results will not be accessible by fellow teachers, students, superiors or managers.

Participants will have the opportunity to provide anonymous information about the use of digital technology at school and at home. They will also be able to express their attitudes about use of digital technology generally.

A number of long-term benefits will flow from the study. These may be used to inform government and non-government schools of the possible benefits hazards and/or shortcomings of a laptop program. This is particularly pertinent under the Rudd government's one laptop per student program - in years 9 to 12 in Australian schools – via the National Secondary School Computer Fund.

Participant rights and interests – Free Consent/Withdrawal from Participation

You are being invited to be involved in this research study because you are in a laptop computer program at your school. All students in year 10 at your school are being asked to participate, as well as some teachers of year 10 (Science and Humanities teachers).

Participation in this research study is entirely voluntary. Your decision whether or not to participate will have no bearing on your results or treatment at school.

If you decide to participate you will be provided with access to the website where the survey is found and data is being collated. By filling out the attached consent form you are giving your consent to participate.

Participants will be able to withdraw from this study at any time without question or explanation. Parents will be given the opportunity to withdraw students from the research study prior to the research being commenced. A letter will be sent to all parents of Year 10 students, informing them about the research and giving them the opportunity to withdraw their child from the research.

Participant rights and interests – Privacy & Confidentiality

Confidentiality will be protected by the following measures: data files will be burnt onto CD. CDs will be retained in a locked cabinet for at least five years after the publication of results. Following this they will be handed to a professional confidential document disposal company.

Secure arrangements have been made with Swinburne Institute for Social Research for data access, collection, use, retention and/or disposal, consistent with Swinburne's Policy on the Conduct of

Research. No personal information about participants will be stored in relation to the data - complying with mandatory Information Privacy Principles/etc.

See also Swinburne's Privacy Policy http://policies.swinburne.edu.au/ppdonline/

Signed consent forms will be stored separately to any data collected, and will only be able to be access by researchers. No data matching will be possible and no detailed personal information stored.

Research output

Wesley College Institute for Innovation in Education – presentations; VITTA Annual Conference, Infonet – VITTA Journal, Australian Journal of Education, M.A Thesis.
Participants will be given the opportunity to request findings, articles and outcomes of the research study.

Further information about the project – who to contact

If you would like further information about the project, please do not hesitate to contact:

[Personal contact information redacted]

Concerns/complaints about the project:

This project has been approved by or on behalf of Swinburne's Human Research Ethics Committee (SUHREC) in line with the *National Statement on Ethical Conduct in Human Research*. If you have any concerns or complaints about the conduct of this project, you can contact:

Research Ethics Officer, Swinburne Research

[Contact details redacted]

Survey Consent Forms

Swinburne University of Technology

Project Title: Digital Education – Comparison in Attitudes

Principal Investigator(s): Ellie Rennie, David Dawson

Consent Form for Educators and Students

1. I consent to participate in the project named above. I have been provided a copy of the project consent information statement to which this consent form relates and any questions I have asked have been answered to my satisfaction.

2. ***In relation to this project, please circle your response to the following:***
   - I agree to complete questionnaires asking me about
     Digital literacy and digital technology **Yes** **No**
   - I agree to make myself available for further information if required **Yes** **No**

3. I acknowledge that:
   (a) my participation is voluntary and that I am free to withdraw from the project at any time without explanation;
   (b) the Swinburne project is for the purpose of research and not for profit;
   (c) any identifiable information about me which is gathered in the course of and as the result of my participating in this project will be (i) collected and retained for the purpose of this project and (ii) accessed and analysed by the researcher(s) for the purpose of conducting this project;
   (d) my anonymity is preserved and I will not be identified in publications or otherwise without my express written consent.

By signing this document I agree to participate in this project.

Name of Participant: ……………………………………………………………………………

Signature & Date: ……………………………………………………………

Swinburne University of Technology

Project Title: Digital Education – Comparison in Attitudes

Principal Investigator(s): Ellie Rennie, David Dawson

Consent Form for School Administrator

1. On behalf of: ………………………………………………… (organisation name)

   I hereby authorise the following official(s)/employee(s)/agent(s) to participate in the project in a representative capacity, the project's particulars having been satisfactorily explained to me:

   Name of representative(s): ……………………………………………..…………

2. ***In relation to this project, please circle your response to the following:***
   - I agree that s/he can complete questionnaires about

     Digital literacy and digital technology **Yes** **No**

3. ***Please circle your response to the following:***
   - I give my permission for the organisation to be named in any publication arising from the research. **Yes** **No**
   - I give my permission for named researcher(s) to access information in relation to the **number** of year 10 students and their gender. **Yes** **No**
   - I give my permission for named researcher(s) to access information in relation to the **number** of teachers of Science and Humanities. **Yes** **No**

4. I acknowledge that the data collected for the Swinburne project will be used for research purposes and not for direct profit; research purposes may include publishable / peer reviewed outcomes.

Name of Person of Authority and Position: …………………………………………………………

Signature & Date: …………………………..……………………………

Interviewee Information and Consent Instrument

Digital Education – Attitudes to Digital Innovations

Administrator / Educator Consent Information Statement

Investigators

[Personal contact information redacted]

Introduction to Project and Invitation to Participate

Digital technologies are important in schools, yet there has been little research into how digital technologies impact on the student-teacher and teacher-administrator relationships. The aim of this research is to better understand how students, teachers and administrators perceive their own and each others digital literacy and possible innovative uses of digital technology in classrooms. By undertaking this interview you will be assisting us to understand the difficulties surrounding decision-making about technological change in schools.

What this project is about and why it is being undertaken

This research project is tied to a PhD by Research, which is being conducted within the Swinburne Institute for Social Research by David Dawson. David is a fully-qualified and practicing teacher with 25 years experience.

The research will be based on a survey of students and educators from three independent Victorian schools, all of which have implemented a laptop program. This is to be followed by a series of interviews with educators and administrators.

Project and researcher interests

This project is being undertaken to satisfy the requirements for David Dawson's PhD qualification. Articles are likely to be published and presentations made to academic and professional forums.

What participation will involve

Participants will be undertaking an interview of approximately 10 questions. It should take approximately 30 minutes to complete the interview. David Dawson will record and transcribe this interview.

Participant rights and interests – Risks & Benefits

This study is not seeking to uncover any personal information and participants will remain anonymous subsequent to the actual interview. The recorded interview will be transcribed and no personally identifying data will be used or published. This process will ensure anonymity, and the results will not be accessible by fellow teachers, superiors or managers.

Participants will have the opportunity to provide anonymous information about the use of digital technology at school and at home. They will also be able to express their opinions about decision-making processes regarding digital technology use in schools.

A number of long-term benefits will flow from the study. These may be used to inform government and non-government schools of the possible benefits, hazards and/or shortcomings of a laptop program. School administrators and educators will also be able to be informed about the most effective decision making processes to enable innovative classroom use of digital technology.

Participant rights and interests – Free Consent/Withdrawal from Participation

You are being invited to be involved in this research study because you are an ICT leader, digitally literate educator or school administrator.

Participation in this research study is entirely voluntary. By filling out the attached consent form you are giving your consent to participate.

You be able to withdraw from this study at any time without question or explanation.

Participant rights and interests – Privacy & Confidentiality

Signed consent forms will be stored separately to any data collected, and will only be able to be access by researchers. No data matching will be possible and no detailed personal information stored. You and your school will not be able to be identified from any data or data analysis arising from this interview.

See also Swinburne's Privacy Policy http://policies.swinburne.edu.au/ppdonline/

Research output

ICT Annual Conferences, PhD Thesis, Post-graduate research conferences, peer reviewed journals.

Participants will be given the opportunity to request findings, articles and outcomes of the research study.

Further information about the project – who to contact

If you would like further information about the project, please do not hesitate to contact the above researchers.

Concerns/complaints about the project:

This project has been approved by or on behalf of Swinburne's Human Research Ethics Committee (SUHREC) in line with the *National Statement on Ethical Conduct in Human Research*. If you have any concerns or complaints about the conduct of this project, you can contact:

Research Ethics Officer, Swinburne Research

[Contact information redacted]

Contact Details Form

Digital Education – Attitudes to Digital Innovations

Contact Details Form: Administrators and Educators (interviews)

Swinburne University of Technology

Principal Investigator(s): Dr. Llewellyn Mann, David Dawson

Brief Project Outline and Invitation to Participate

Digital technologies are important in schools, yet there has been little research into how digital technologies impact on the student-teacher and teacher-administrator relationships. The aim of this research is to better understand how students, teachers and administrators perceive their own and each others digital literacy and possible innovative uses of digital technology in classrooms. By undertaking this interview you will be assisting us to understand the difficulties surrounding decision making about technological change in schools.

Please provide your contact details below for David to contact you to organise an interview time and place (eg: Swinburne/Skype etc.) and to send you the **Administrator / Educator Information Statement and Consent Form.**

Name: ____

School/Business: _____________________________________

Email: ____

Phone: ____

Role(s): **Administrator** ❑ **ICT Specialist** ❑ **Skilled User** ❑

IT/Network Administrator ❑ **Other** ❑________________

Type of School:

Co-educational ❑ **Boys Only** ❑ **Girls Only** ❑

Government ❑ **Independent** ❑ **Catholic** ❑ **Other** ❑ __________

Years: **P-12** ❑ **7-10** ❑ **7-12** ❑ **Other** ❑ __________

NOTE: No personal details on this form will be associated with your interview responses so that your anonymity will be preserved.

David Dawson

[Personal contact information redacted]

Consent Form for Educators

Swinburne University of Technology

Project Title: Digital Education – Attitudes to Digital Innovations

Principal Investigator(s): Llewellyn Mann, David Dawson

1. I consent to participate in the project named above. I have been provided a copy of the project consent information statement to which this consent form relates and any questions I have asked have been answered to my satisfaction.

2. ***In relation to this project, please circle your response to the following:***
   - I agree to be interviewed in regard to:

   Attitudes to digital literacy and uses of digital technology in schools **Yes** **No**

3. I acknowledge that:
   (a) my participation is voluntary and that I am free to withdraw from the project at any time without explanation;
   (b) the Swinburne project is for the purpose of research and not for profit;
   (c) any identifiable information about me which is gathered in the course of and as the result of my participating in this project will be (i) collected and securely retained for the purpose of this project (ii) accessed and analysed by the researcher(s) for the purpose of conducting this project and iii) not identify myself or my place of employment in any way
   (d) my anonymity is preserved and I will not be identified in publications or otherwise.

By signing this document I agree to be interviewed for this project.

Name of Participant: ………………………………………………………………………………

Signature & Date: ……………………………………………………………

Appendix 6. Ethics Documents

Final SUHREC Ethics Report

SWINBURNE UNIVERSITY OF TECHNOLOGY

SWINBURNE RESEARCH

Human Research Ethics

Progress/Final/HDR Student - Report Form

DATE OF REPORT: 07/09/2016
REPORTING PERIOD: 31/12/2013 to 06/09/2016

SECTION A: PROJECT DETAILS

SUHREC Project No:	2010/008
Project Title:	Digital Education – Comparison in Attitudes
Chief Investigator/ Supervisor:	**Dr Llewelyn Mann**
Faculty/Div:	
Current Approved Duration:	31/12/2013 to 06/02/2016
Student Investigators:	David G Dawson
Co-Investigators:	Dr Therese Keane

If there are any corrections or further details needed to the above, please clarify below.

NB If there are personnel changes not previously notified, please check C2 as applicable

SECTION B: PROGRESS SUMMARY

B1 Status of the Project (as at the date of this report)

Please check [*double-click*] one or more of the following:

PROGRESS REPORT

- ☐ Data collection/access yet to commence [Explain below then go to B3 then Sect D]
- ☐ Data collection/access commenced/continuing [Explain below then go to B2 →]

FINAL REPORT re HIGHER DEGREE RESEARCH STUDENT COMPONENT ONLY*

(**To be completed when a project is still continuing but the HDR student has completed their component of the project. Explain/complete rest of form as appropriate(B2 to D) to demonstrate ethical acceptability of the project to date or continuing.*)

- ☒ For thesis submission and examination purposes only

Name of relevant student: David Dawson *ID number of student:* 7100027

FINAL REPORT

- ☒ Data collection/access completed [Explain below then go to Sect C →]
- ☐ Project Abandoned before data collection/access [Explain below then go to Sect D]
- ☐ Project abandoned during or after data collection/access [Explain below then go to Sect C →]
- ☐ Other

SUHREC Standard Progress/Final/End of HDR - Report Form (v May 2015) Page 1 of 5

Please provide a brief explanation as to the project status indicated, including any delays.

Project continuing – as thesis is being prepared. Data collection has completed. All data has been collected and analysed.

B2 Participants

How many participants have been recruited to date? 431

B3 Given any delays or other factor (as per B1 above), **do you need an extension of ethics clearance without any other modification to the project?**

☒ No ☐ YES. If YES, please give the new date for end of data collection/access:

dd / mm / yyyy

NB information given below re changes may mean a simple extension of ethics clearance cannot be given and a separate ethics clearance application process for modifications needs to be followed.

SECTION C: CONDUCT OF PROJECT

C1 Compliance with the approved protocol

Has the project been conducted in line with the approved protocol, including standard and any special conditions of ethics clearance?

☒ Yes ☐ NO

If NO, please provide a brief explanation.

C2 Project / Protocol Modifications / Additions

Please check [*double-click*] one or more of the following if there are any:

☐ Changes/additions to project investigators (including students) and personnel accessing identifiable info

☐ Changes/additions re project personnel deriving a personal benefit from the research

☐ Changes/additions to the research protocol (title, aims, procedures, measures, sampling, etc)

☐ Changes/additions to the consent instruments/arrangements (including re personnel)

☐ Changes/additions to the recruitment material/methods

☐ Changes/additions to participant sampling or numbers

☐ Changes/additions to project resourcing (financing or otherwise)

☐ Other changes/additions

Have any of the above changes been put for ethical review?

☐ NO ☐ Yes

If No, please briefly explain the situation, including any separate submission(s) for ethics clearance for the modification(s) indicated. NB This form cannot be used for modification requests. Information on applying for ethics clearance for any modification(s) can be found here:

C3 Project incidents

Have there been any incidents that affected the conduct of the project or which have impacted adversely on participants and/or the researchers?

☒ NO ☐ YES

If YES, please provide a brief explanation including with respect to any reporting to Swinburne or other authority:

Level of impact of incident:
Would any of the incidents related above be considered serious?
[Serious adverse events (SAEs) include, eg, harm or distress to individuals or groups, loss of significant or sensitive data, breach of confidentiality.]

☐ NO ☐ YES

If YES, please provide a brief explanation including with respect to any reporting to Swinburne or other authority, where appropriate attaching a copy of the report(s):

C4 Issues or experiences of ethical significance?

Have there been any issues or experiences which have been or remain of ethical significance, especially as regards the ethical conduct of the project and/or project outcomes, including any actual or potential conflicts of interest not identified previously or formal complaints received/processed?

☒ NO ☐ YES

If yes, please briefly explain.

C5 Project Outcomes (as at the date of this report)

Please check all of the following:

Compensatory payments made or prizes awarded and records kept	☐ Yes	☐ No	☒ n/a
Student thesis/theses submitted for examination	☐ Yes	☒ No	☐ n/a
Results have been published or presented	☐ Yes	☒ No	☐ n/a
Results are to be published or presented	☒ Yes	☐ No	☐ n/a
A lay summary of the project outcomes is given below^	☒ Yes	☐ No	☐ n/a
Project outcomes have been made available to participants	☐ Yes	☒ No	☐ n/a
Project outcomes are to be made available to participants	☒ Yes	☐ No	☐ n/a
Other	☐ Yes	☐ No	☒ n/a

If Yes or No, please provide a brief explanation as to the items checked as appropriate:

The thesis is currently being written and planned for submission by July 2017. All data collection and handling has finished. Participants were given the option to contact the research team if they desired feedback. They will be given an opportunity to view the completed thesis.

^Brief lay summary of project outcomes (not more than ¼ page):

Surveys were conducted with 421 participants and 10 interviews were completed in line with the approved protocol. The results indicate that there are significant differences in attitudes between various groups of educators and students. Decision making has been confirmed to be

a relevant factor in limitations in the use of digital technologies.

C6 Study Materials/Documents

Please check one or more of the following:

☒ Project documents/material securely stored for the minimum period

☐ Project material to be made available for future research/other researchers. If so, in what form?

Briefly explain what storage or archiving has occurred, including the location(s) and length of secure storage as well as intended secure data disposal arrangements:

Are research material retention and disposal arrangements in line with what was outlined in the approved project protocol? ☐ NO ☒ YES

If NO, please explain why.

C7 Project Audits

Please check one or more of the following:

☒ Project self-audit(s) have been conducted during or at conclusion of project

[Click here for a self-audit tool]

☐ Swinburne audit(s) have been conducted during or following completion of the project

☐ External audit(s) have been conducted during or following completion of the project

Please provide a brief explanation as to any audits conducted:

Self-audit was conducted between the student investigator and the CI.

SECTION D: DECLARATION BY CHIEF INVESTIGATOR/SUPERVISOR

DECLARATION BY CHIEF INVESTIGATOR(s)/STUDENT SUPERVISOR(s)

I declare that the above report accurately reflects the outcome or progress of the project to date

I acknowledge that an internal Swinburne or external audit may be conducted on the conduct of the project and as regards secure data retention/disposal.

Signature & Date: 8/9/16

Name of Signatory & Position: Hew Mann ADLE FSET -

Student Investigator(s) (where possible)

I agree with the above declaration signed by the Chief Investigator/Supervisor

Signature & Date: 8/9/16

Name of Student: DAVID G. DAWSON

Emails of Ethics Approvals

From: Astrid Nordmann
Sent: Thursday, 9 April 2015 10:18 AM
To: Llewellyn Mann <lmann@swin.edu.au>
Cc: Ellie Rennie <erennie@swin.edu.au>; RES Ethics <resethics@swin.edu.au>; Therese Keane <tkeane@swin.edu.au>
Subject: SUHREC Project 2010/008 Ethics Clearance for Modification/Extension (3)

To: Dr Llewellyn Mann, FSET
cc. Ellie Rennie, Therese Keane

Dear Llew,

SUHREC Project 2010/008 Digital Education - Comparison in Attitudes Dr Llewellyn Mann, Dr Therese Keane Approved Duration: 31 December 2013; extended to 06 February 2016 [Modified November 2011, Modified May 2012]; Modified April 2015.]

I refer to your e-mail of 30 March 2015 in which you requested a modification to the project by changing the research team (addition of Llew Mann and Therese Keane; removal of Ellie Rennie and Catherine Lang), and extending the project to 06 February 2016. The documentation was reviewed by a SUHREC delegate.

I am pleased to advise that, as modified to date, the project/protocol may continue in line with standard ethics clearance conditions previously communicated and reprinted below.

Please contact me if you have any queries about on-going ethics clearance, citing the SUHREC project number.   Copies of clearance emails should be retained as part of project record-keeping.

As before, best wishes for the project.

Kind regards,
Astrid Nordmann

Dr Astrid Nordmann
Research Ethics Officer
Swinburne Research (H68)
Swinburne University of Technology
PO Box 218, Hawthorn, VIC 3122
Tel: +613 9214 3845
Fax: +613 9214 5267
Email: anordmann@swin.edu.au

From: Resethics [mailto:Resethics@groupwise.swin.edu.au]
Sent: Thursday, 24 May 2012 12:58 PM
To: Ellie Rennie; david.dawson@wesleycollege.net
Cc: Robyn Watson; Catherine Lang
Subject: SUHREC Project 2010/008 Ethics Clearance for Modification/Extension (2)

To: Dr Ellie Rennie/Mr David Dawson, FLSS

Dear Ellie and David

SUHREC Project 2010/008 Digital Education - Comparison in Attitudes
Dr Ellie Rennie, FLSS; Mr David Dawson, Assoc Prof Catherine Lang (FICT)
Approved Duration Extended to 31 December 2013 [Modified November 2011, Modified May 2012]

Thank you for the progress report for the above project, as per your email of 16 May 2012 with attachments, which included a request to modify the project given the course upgrade. The report and request were put to a SUHREC delegate for attention.

I am pleased to advise that, as modified to date, the project may continue in line with standard ethics clearance conditions previously communicated and copied below. An extension to the ethics clearance has here been given to cover human research activity to end of 2013. (I note an apparent discrepancy with the previous modification approval which kept the original end date despite the request to cover an additional supervisor in November 2011. This matter can be deemed to be clarified by the present clearance and in light of your progress report.)

Please contact the Research Ethics Office if you have any queries about on-going ethics clearance, citing the SUHREC project number. Copies of clearance emails should be retained as part of project record-keeping.

As before, best wishes for the project.

Keith Wilkins
Secretary, SUHREC
****
Keith Wilkins
Research Ethics Officer
Swinburne Research (H68)
Swinburne University of Technology
P O Box 218
HAWTHORN VIC 3122
Tel +61 3 9214 5218

Ann Gaeth 28/11/2011 11:43 AM

Dear Dr Rennie and Mr Dawson,

SUHREC Project 2010/008 Digital Education - Comparison in Attitudes
Dr Ellie Rennie FLSS Mr David Dawson
Approved Duration: 07/02/2011 To 31/08/2011 [Modified November 2011]

I refer to your email of 23 November 2011 in which you requested to change your supervisor as approved by Prof Pam Green, Director of Graduate Studies. Your request was put to a delegate(s) of SUHREC.

I am pleased to advise that, as submitted to date, the modified project/protocol may continue in line with standard ethics clearance conditions previously communicated and copied below.

Please contact me if you have any queries about on-going ethics clearance, citing the SUHREC project number. Copies of clearance emails should be retained as part of project record-keeping.

As before, best wishes for the project.

Ann Gaeth
for Keith Wilkins

Secretary, SUHREC

Ann Gaeth 7/02/2011 1:10 PM >>>
To: Dr Ellie Rennie/Mr David Dawson, FLSS

Dear Dr Rennie and Mr Dawson,

SUHREC Project 2010/008 Digital Education - Comparison in Attitudes
Dr Ellie Rennie FLSS Mr David Dawson
Approved Duration: 07/02/2011 To 31/08/2011 [Adjusted]

I refer to the ethical review of the above project protocol undertaken by Swinburne's Human Research Ethics Committee (SUHREC). Your response to the review, as emailed on 3 February 2011 with attachments, were put to a SUHREC delegate for consideration.

I am pleased to advise that, as submitted to date, the project has approval to proceed in line with standard on-going ethics clearance conditions here outlined.

- All human research activity undertaken under Swinburne auspices must conform to Swinburne and external regulatory standards, including the National Statement on Ethical Conduct in Human Research and with respect to secure data use, retention and disposal.

- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions, including research and consent procedures or instruments approved. Any change in chief investigator/supervisor requires timely notification and SUHREC endorsement.

- The above project has been approved as submitted for ethical review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/ clearance. SUHREC must be notified immediately or as soon as possible thereafter of (a) any serious or unexpected adverse effects on participants and any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethical acceptability of the project.

- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project.

- A duly authorised external or internal audit of the project may be undertaken at any time.

Please contact the Research Ethics Office if you have any queries about on-going ethics clearance, citing the SUHREC project number. Please retain a copy of this clearance email as part of project record-keeping.

Best wishes for the project.

Yours sincerely

Ann Gaeth for
Keith Wilkins
Secretary, SUHREC