One-to-one laptop program: Effect on boys' education

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CHAPTER 2. Literature Review

2.1 Chapter Overview

This chapter provides a summary of the literature which informs the study. The main aim of this chapter is to position the research within an existing body of knowledge, and provide a background for the ensuing chapters of the thesis. The research is concerned with the way in which teachers and male students use laptops for educational purposes. In terms of possible impacts on learning and achievement, the study focused on specific literacy and numeracy outcomes over time. Furthermore, the research sought to build new information about learning with mobile devices, with a specific lens on boys’ education. With an emphasis on junior and middle school experiences, factors such as the implementation differences between these two settings contribute to the possible opportunities for mobile learning in schools (Traxler & Vosloo, 2014).

Where possible, the literature review focuses on recent studies of 1:1 laptop initiatives in educational contexts. With a thesis focus on boys’ education in junior (primary) and middle (secondary) school contexts, there are limited research studies that fit these criteria. Therefore, a broad range of literature with a specific significance for the study is reviewed (see Table 2.1).
### Table 2.1
**Focus of the Literature Review**

<table>
<thead>
<tr>
<th>Literature</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background of 1:1 laptop programs.</td>
<td>Context of 1:1 laptop research with a focus on junior and middle school implementations.</td>
</tr>
<tr>
<td>Teacher use of laptops.</td>
<td>How teachers use laptops or mobile devices for teaching and learning. Optimal use of ICT.</td>
</tr>
<tr>
<td>Student use of laptops.</td>
<td>How students use laptops or mobile devices for learning.</td>
</tr>
<tr>
<td>Parent perceptions.</td>
<td>The impact of 1:1 learning on families.</td>
</tr>
</tbody>
</table>

This chapter focuses on how teachers and students use laptops for teaching and learning. The literature review investigates the complexities attached to such programs such as the possible impacts of 1:1 laptop programs, parent perceptions, and frameworks that have been used to measure ICT use. With over 20 years of increasing evidence suggesting ubiquitous computing access through the use of portable digital devices for learning has been broadly successful (Newhouse, 2014), there still remains an interest in how 1:1 programs influence learning. Optimising the potential of 1:1 programs in schools involves understanding how teachers and students use laptops for teaching and learning, and creating some alignment of expectations between school, teachers, students and parents. Prior to discussing the literature as outlined in Table 2.1, it is worthwhile to reflect on why systems and schools consider 1:1 laptop programs so attractive.

### 2.2 Background of 1:1 Laptop Programs

Laptop programs have had a relatively long incubation period, beginning in 1989 in schools in the United States and Australia (Johnstone, 2003). There is a
belief that in 1989 the Methodist Ladies College in Melbourne, Australia, provided the earliest example of a one device per student program in the world (Bebell, 2005). Since then, mobile devices have become more compact, powerful and affordable, enabling 1:1 programs to expand in schools across the globe (Cox, 2013). Empirical research into the effectiveness of 1:1 laptop initiatives is both timely and potentially valuable to those who are considering how to best harness the use of 1:1 laptops particularly with an ICT agenda embraced by governments and schools across the world.

With the proliferation of 1:1 mobile devices for learning, there still appears to be a lack of common agreement about what constitutes ‘1:1 computing’ (Richardson et al., 2013, p. 5). In principle, the characteristics of 1:1 computing include 24-hour, seven-days-a-week access to an ICT device supported by the school, ultimately offering students ubiquitous access to ICT (Valiente, 2010). In this study, the 1:1 laptop program is characterised by a school-supported and student-owned laptop per student. Whilst some laptop programs provide school-owned laptops on a rotational basis, this research deals with student-owned laptops. It is proposed that the potential for learning might be greater when students use the same device at school and at home, as this enables greater familiarity and the ability for students to customise the device to their needs. Research suggests that incorporating laptops within an educational program can open up new avenues of teaching, potentially broadening students’ learning experiences (Oliver & Corn, 2008; Weston & Bain, 2010).

However, there are also legitimate concerns over the effectiveness of 1:1 laptop environments which, in many cases, are grounded in a generational struggle over what constitutes effective educational use (Lei & Zhao, 2008). Laptop education can be powerful on a number of levels including access to information, enhanced communication, and greater options for student creativity in terms of students accessing information on demand. However, the success of the implementation depends upon the circumstances of individual schools and the implementation model and framework adopted by the teachers and the school (O'Donovan, 2009).

Investigation into 1:1 programs is increasing and much of this research has been based on large-scale school laptop programs across the USA. The adoption of 1:1 initiatives has been widespread as was the case in the state of Maine, where the implementation of 1:1 programs began in 2001 (Bebell, 2005). In 2002, Henrico
County Public Schools in the State of Virginia embarked on what was the largest scale 1:1 initiative in the United States, providing over 25,000 laptops to teachers and students in years six through to twelve. Students, teachers and parents described the initiative as a positive addition to learning and teaching, with noticeable improvements in student-teacher and school-home interaction, and an increase in autonomous learning (Zucker & McGhee, 2005). Bebell and Kay (2010) report there have been few educational initiatives as widespread and as costly as the addition of computers for learning in American classrooms. Technology in learning environments has been used as an intellectual partner in the development of knowledge for learning through active participation in schools (Jonassen, 2008; Jonassen, Peck, & Willson, 1999). A report into large 1:1 school laptop programs, both state and district, in the United States, conducted by the Abell-Foundation (2008) came to the following conclusions: personal laptop use lead to gains; student engagement in learning increased; both students and teachers improved their ICT skills; and, the success of the program is dependant on an active educational community.

From an international perspective, governments across the world have continued to support the view that teachers need to be ICT literate in a digital world. As discussed in Chapter One, from a Western Australian perspective, in 1993 a private girls school in Perth, Western Australia, was one of the first schools to implement a 1:1 laptop program, with children owning their own laptops. The initial results of this implementation revealed devices were used sparingly and in general the results were not impressive (Newhouse & Rennie, 2001). However, after the 2003 decision by the Minister for Education (Carpenter, 2003) to implement a portable notebook program in the Western Australian public school system, Newhouse (2005) was able to build on his previous research about student access to portable devices. Newhouse’s new research consisted of a three-year evaluation of a student notebook program in a Western Australian secondary school. Results indicated widespread and consistent use of ICT by both students and teachers for learning and subsequently, Newhouse (2008b, p. 22) reported:

The outcomes of this project when added to evidence from similar projects throughout Australia and in many locations internationally provide a basis to consider widespread implementation of notebooks in secondary education.
This view supported the establishment of the Digital Education Revolution (DER) in Australia in 2007, which allocated funding in 2008 for the National Secondary Schools Computer Fund. The aim of the DER was to contribute to meaningful change and prepare students for further education and training to live and work in a digital world. An outlay of $2.4 billion over six years (2008 to 2013) provided new ICT equipment for secondary schools with students in years nine to twelve. The underlying aim was to provide these students with access to a 1:1 device to further improve their learning through ICT (DEEWR, 2009).

Similarly, current rates of 1:1 initiatives continue to increase across Europe. For example, the European Schoolnet comprises a network of 30 European Ministries of Education where almost 20% of year four students are in 1:1 classes in Denmark, Ireland and Poland, with a European Union (EU) mean of eight per cent. In relation to year eight students, there are more students who are in 1:1 classes, with an EU average of 21 per cent (European-Schoolnet, 2013). This growth is noted in the literature (Biagi & Loi, 2013; Bocconi et al., 2013; Hatakka et al., 2013) which deals with educational experiences of the use of laptops or mobile devices for learning.

However, despite the continued implementation of 1:1 initiatives throughout schools, advocates and critics continue to discuss the use of laptops for teaching and learning (Bebell & O'Dwyer, 2010; Cuban, 2001; Peck & Sprenger, 2008). Nevertheless, research-based evidence about the educational benefits of 1:1 laptop teaching and learning programs has continued to grow (Donovan, Green, & Hartley, 2010; Hatakka et al., 2013; Lei & Zhao, 2008; Newhouse, 2008b; Penuel, 2006). How students learn with laptops has been a catalyst for previous and current research into whether or not 1:1 laptop programs have improved educational outcomes or academic achievement (Hunley et al., 2005; Romeo & Walker, 2002). Studies and evaluations, such as of the largest 1:1 laptop initiative in the United States, Maine’s state-wide program (Goodwin, 2011) and more recently of a three-year study in a male-only middle school in South Korea, found little effect on student achievement (Won Hur & Oh, 2012). This does little to abate the apprehension of educators and policy makers wanting to invest in such programs where the focus on educational results remains a priority (Bebell & O'Dwyer, 2010).
One of the traits of a 1:1 laptop program is that students are capable of taking laptops to and from school with relative ease, incorporating the capacity for students to collaborate and work anytime, anywhere, commonly referred to as mobile learning (Kearney, Schuck, Burden, & Aubusson, 2012). An example of this approach was implemented between 1996 and 1999 by the Microsoft Corporation and Toshiba America Information Systems. These two IT corporations launched the ‘Anywhere, Anytime Learning Program’ across 29 schools across the United States. Students and teachers were provided with devices set-up with Microsoft Windows and Microsoft Office software, enabling exploration of how to best use these devices for teaching and learning. This approach was a precursor for other schools to consider 1:1 laptop programs, often found across the United States for the purpose of providing rich digital educational experiences for students (Rockman, Walker, & Chessler, 2000).

Schools introduce laptops for learning with a range of intentions. Stager (2006) outlined the following reasons why schools may choose to implement 1:1 laptop programs: (a) taking the lead in innovating and seeking to revolutionise their approach to learning, (b) using the implementation of laptop programs as a marketing approach to promoting the school, and (c) following other schools’ lead despite not clearly understanding how a 1:1 laptop program fits into their educational program. Dawson, Cavanaugh, and Ritzhaupt (2008) shared a similar view and reported that the implementation of 1:1 programs can also be aimed at stimulating the educational program, force change within a school, change the school culture or add a new medium to an existing program. Additionally, in most cases 1:1 programs may be implemented for reasons such as providing greater access to technology and the Web, and making the introduction more of a technology-based approach without understanding the needs of staff or how they learn (Salomon & Perkins, 2005). In making these decisions school leadership plays an important role in formulating the rationale for implementing a particular 1:1 approach. Research by Newhouse (2012, p. 6) highlighted the critical importance of leadership in a school in the use of ICT, and the subsequent impact on teaching and learning:

…the notion that successful integration of ICT in a school will require teachers having a sense of ownership of the vision and strategic plans and then being provided with adequate support for implementation. The principal and leadership team at a school needs to foster a vision, belief and commitment for ICT use across the school but then needs to involve a wider range of personnel in decision-making and policy-making.
In terms of school improvement, Zucker (2009) argued that a 1:1 laptop program in itself is unlikely to make a weak school into a strong one. Schools are required to focus on high-quality teaching, an effective curriculum, and an extensive and reasoned evaluation of 1:1 laptop programs (Penuel, 2006).

Adding to the 1:1 agenda, schools are faced with a rapidly changing world, and the role of ICT in current teaching and learning prompts consideration of change (Jordan, 2011). With a focused approach to learning, student and teacher collaboration and staff professional development on the use of laptops for learning can all be integral to enabling a successful implementation, therefore possibly improving meaningful student learning (Keengwe et al., 2012). With ownership of their own laptop, a 1:1 laptop program enables students to access a range of software or applications to complete learning tasks (Holmes, 2008), and the ability to access a range of digital online learning resources (e.g., Khan Academy, iTunesU, Mathletics).

Personal computing offers opportunities for many children to learn (Boyle, 2001). It is not about the laptop making the difference, but more so enabling new ways for teaching and learning (Dunleavy et al., 2007). In Australia, 1:1 laptop programs prior to the DER appeared in the early 1990’s in some Victorian public schools and John Willcock College in Geraldton, Western Australia, and also in private schools. This trend has increased due to the affordability of devices which has enabled schools to consider and implement 1:1 initiatives (Albion, 1999; NSWDET, 2009). Therefore, the role of school leadership becomes integral to guiding a school community in determining a path of 1:1 adoption that will ultimately lead to a fundamental shift of teaching and learning.

2.3 Possible Impacts of 1:1 Laptop Programs

There has been widespread research into the impact of ICT use on achievement (Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Lei & Zhao, 2007; Selwyn & Husen, 2010), mainly with the use of desktop computers at school that also applies to 1:1. Additionally, there may be other positive impacts due to the portable nature of mobile devices for learning (Newhouse, 2014). In most cases 1:1 initiatives are introduced by schools to assist students with their learning, with an overall aim of
improved student achievement. The literature indicates that the most significant gains resulting from 1:1 laptop programs concern student improvement in written skills (Bebell & Kay, 2010; Gulek & Demirtas, 2005; Silvernail & Gritter, 2005). One of the main reasons for this gain is said to be students regularly using their laptops to write and edit their writing, with a transfer from primarily pen and paper experiences. Silvernail (2007) reported that five years after the implementation of the Maine 1:1 program writing scores in the Maine Educational Assessment (MEA) had improved. However, after four years of research into the effects of the Texas Assessment of Knowledge and Skills (TAKS), differences in writing scores were not statistically significant (Shapley et al., 2009). Since the introduction of the first statewide 1:1 initiative in the United States, the Maine and Technology Initiative (MLTI) in 2001, there has been little evidence to suggest that overall academic outcomes have changed significantly. Silvernail and Gritter (2005) found that the overall performance on the Eighth Grade Maine Education Assessments (MEA) had not changed since the inception of the MLTI.

Numerous large-scale studies (Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Dawson et al., 2008) have been undertaken to determine the impact of 1:1 programs on student outcomes on standardised tests, with little evidence to suggest any significant change. Goodwin (2011) noted that state assessment programs do not typically measure the 21st century technology skills (e.g., complex thinking, learning and communication skills) that 1:1 laptop programs promote. It is this predicament which continues to generate interest in how schools gauge whether such initiatives have an impact on learning or what is required to gain higher levels of achievement. A study of 997 schools across the United States by Greaves, Hayes, Wilson, and Gielniak (2010) identified key implementation factors linked to educational success. Examples of these key factors were: students using technology daily for online collaboration; integration of technology in core curriculum areas; the use of online formative assessments; and, gauging whether literacy or numeracy outcomes have changed over time. Furthermore, Weston and Bain (2010) maintained that 1:1 programs require an alignment with an improved pedagogical approach, with a focus on improved educational practices, to have an impact on learning outcomes. The extent to which these can be considered in terms of assessment was addressed in the next section.
2.3.1 Assessment: Literacy and numeracy

Since the onset of the technology penetration in schools in the United States, reading and mathematics test scores at the high school level are no higher than what they were 30 years ago (Grimes & Warschauer, 2008). According to Cuban (2006), there was no link between students having access to a 1:1 program and improved test scores. However, in contrast studies, such as that by Lei and Zhao (2007), links were found relating to the access of a 1:1 program and improved test scores.

Using standardised tests scores in isolation as a tool to measure the effectiveness of a 1:1 laptop program may prove to be a narrow approach. Aspects such as information literacy, problem solving, communication skills, and ICT capabilities are not well reflected in current standardised testing programs (Grimes & Warschauer, 2008). Although, standardised testing might be a crude instrument, it nevertheless plays an important role in measuring student improvement in key learning areas because of the associated reliability of the assessment (Perso, 2011; Suhr, Hernandez, Grimes, & Warschauer, 2010).

From an Australian perspective, national standardised testing was introduced in 2008 by way of the National Assessment Program for Literacy and Numeracy (NAPLAN), with an emphasis on writing, reading, spelling, grammar, punctuation and numeracy for students in years three, five, seven and nine. The testing under this program takes place each year at the same time across the nation. The data provides policy makers, school communities and parents with information concerning student performance and greater accountability in order to improve teaching and learning (Belcastro & Boon, 2012; Wildy & Clark, 2012).

NAPLAN is similar to the Maine Education Assessment (MEA) conducted in the US state of Maine where the use of laptops is common for learning. Middle school students are required to answer questions, predominantly multiple-choice, and do not test digital literacies. These digital literacies are commonly referred to as 21st century skills (Silverman, 2005), and discussed in further detail in section 2.4.3. Put simply, 1:1 laptop initiatives focus on a range of skills and capabilities that are difficult to measure with standardised testing methods. Holcomb’s (2009, p. 54) highlighted skills that are “critical and inherent to a 1:1 initiative do not necessarily
align with today’s standardized assessments.” Therefore, the use of standardised tests in isolation to monitor school improvement in schools with 1:1 laptop programs is problematic. High stakes testing agendas require schools to operate in environments where test scores are often tied to funding models. While standardised testing in OECD countries is commonplace, Morris (2011, p. 21) discussed some of its associated concerns:

…the literature also reiterates that there are a number of limitations to standardized tests which weaken the capacity to achieve their purpose. Primarily, standardized tests are limited in scope both in terms of the breadth of their reach and in terms of their depth of assessment.

The literature suggests that evaluating 1:1 laptop programs with a sole focus on standardised testing results is limited and, researchers continue to search for accurate measures of student achievement in schools with 1:1 laptop programs. In terms of this study, there was no single instructional method advocated by teachers in implementing ICT on literacy and numeracy contexts. Therefore, there could be a range of factors that could impact upon literacy and numeracy outcomes.

In their examination of a technology-rich environment, O’Dwyer et al. (2008) argued that normal methods of assessment of student performance may not be effective when technology is used. Therefore, the possibility of using 1:1 laptop devices for assessment is another area of interest for the educational community. Research conducted by Hattie and Brown (2008, p. 198) into technology for school-based assessment of learning in New Zealand revealed that:

Teachers are now asking for onscreen testing to save paper and data entry work, parents want access to the reports about their children, teachers want more flexibility in test creation, others have asked for computer adaptive testing so that less time is spent testing and more time is spent teaching.

Apprehension about eAssessment, commonly known as computer-based testing (CBT), and traditional paper and pencil testing is raised by Newhouse (2013) as computer-based testing models in schools are beginning to emerge, and are not common in high-stakes testing. The meta-analysis of testing mode effects on reading scores by Wang, Jiao, Young, Brooks, and Olsen (2008) revealed that grade level, type of test and computer delivery method had no impact on test scores. Opportunities for schools who have, or intend to introduce, 1:1 initiatives exist to invest time into using laptops as part of the assessment program.
The potential of CBT continues to gain attention in educational circles; however, as Redecker and Johannessen (2013, p. 90) noted, the role of policy is integral to a paradigm shift in the use and deployment of ICT in assessment.

Policy plays an important role in mediating change that can enable a paradigm shift in eAssessment which is embedded in the complex field of ICT in education.

Such a policy shift could serve as a chance for schools and also policy makers to adopt meaningful CBT in education. Introducing CBT in a 1:1 laptop setting might be another strategy to engage students through the provision of faster forms of feedback. Improving the ‘turnaround’ of feedback by teachers could advance learning, as feedback is one of the most powerful influences on learning (Hattie, 2009).

2.3.2 Student engagement in learning

Abbott (2014, p. 1) defined student engagement, “as the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education.” While there is mixed evidence for academic outcomes, the introduction of 1:1 initiatives has resulted in increased levels of engagement in learning (Bebell, 2005; Keengwe et al., 2012; Mouza, 2008; Shapley et al., 2009; Won Hur & Oh, 2012; Zucker & McGhee, 2005). Suhr et al. (2010) found this was the case in their research into laptops and fourth-grade literacy as it became apparent students enjoyed using laptops for learning. Similar findings were also reported by Bebell and Kay (2010) who uncovered high levels of engagement since the inception of the 1:1 laptop program in the Berkshire Wireless Learning Initiative. Improvements in engagement levels provide a powerful rationale for the introduction of 1:1 implementations. However, the novelty effect of computers may decrease over time, as suggested by Clark (1985), and ultimately the initially higher engagement levels may reduce.

With increased engagement in learning, laptops have also been responsible for a boost in student motivation (Dunleavy et al., 2007). Both learner engagement and motivation are important in a student’s life and have been shown to have a
positive effect on learning. This positive outcome has provided justification for schools to introduce 1:1 learning.

2.3.3 Concerns over student laptop use

One of the major concerns about laptop use is the potential for students to be distracted from learning (Malamud & Pop-Eleches, 2011). The opportunity for students to access and be distracted by inappropriate content, social media and online games in 1:1 environments becomes more prevalent and is concerning for parents and teachers. Hatakka et al. (2013, p. 106) reached the following conclusion about the distractive nature of an individualistic approach when using laptops for learning:

...the decrease in teachers’ ability to observe what is going on together with the more individualistic approach to learning have caused problems for students. Distractions from social media and computer games have been difficult to control and the students have had to handle the responsibilities on their own.

Another concern is the notion of the impact associated with excessive computer use when playing addictive online games or using social media, and the detrimental effect it may have on the physical and mental well-being of a student. On the other hand, this increased access to ICT may enhance the student’s knowledge and skills in using ICT. The topic of digital gaming is discussed in the next section as it is of significance for this study, especially since there is an indication that boys are more likely to spend more time gaming than girls (Lenhart et al., 2008).

2.3.4 Digital gaming

Digital games have been around in one form or another for almost 50 years. However, recent advances in multimedia, coupled with improvements in the speed of the Internet and the emergence of competitive/cooperative experiences through multiplayer technologies, have resulted in an exponential growth of the popularity of games. Lenhart et al. (2008) reported that 97 per cent of teens in the United States play some type of digital game on a regular basis. A measure of the growing attractiveness of computer games for younger children in Australia can be found in the Growing up in Australia project, initiated in 2004 by the Australian Federal Government Department of Families, Housing, Community Services and Indigenous Affairs, the Australian Institute of Family Studies and the Australian Bureau of Statistics (DFHCSIA, 2008).
The Growing up in Australia project is a longitudinal study (2004-2018) that tracks two cohorts of families from around Australia on a biannual basis: an Infant Cohort comprising families with children 0-1 years as at 2004 (n=5,107), and a Child Cohort comprising families with children 4-5 years as at 2004 (n=4,983). In 2008, parents from the Child Cohort were asked whether their then 8-9 year olds (a) had a computer at home, and (b) played games on this computer. It was found that 90% of children had a computer and between 93% and 97% played computer games (DFHCSIA, 2013). Using data from the same study, Sweetser, Johnson, Ozdowska, and Wyeth (2012) found that the mean time using the computer/playing video games per week for children at age eight to nine was two hours and twenty-three minutes. The time steadily increased to two hours fifty-two minutes at age nine to ten (2009 data) and three hours thirteen minutes at age 10-11 (2010 data).

The playing of digital games has received a good deal of attention in recent scholarly literature (Erenli, 2013; Gee, 2012; Hess & Gunter, 2013b; Klopfer, Sheldon, Perry, & Chen, 2012). However, arriving at a suitable definition of digital gaming in education is tricky. At the one extreme, simple drill and practice questions or a roll of a simulated dice, activated by an individual using keystrokes, stimulating no feedback and completed in a matter of seconds, can embody the essential characteristics of a game. At the other extreme, multiple participants engaging in a range of sophisticated, multimedia-rich, immersive activities, involving complex and intelligent feedback over long periods of time might best describe an educational gaming experience. There are also subtle differences between digital games and simulations in terms of how they attempt to situate participants in virtual and real worlds (Sauvé, Renaud, Kaufman, & Marquis, 2007). This study views the construct of digital games in their broadest sense as far as the activity is concerned, but gauges the value of digital games in terms of the cognitive, affective or psycho-motor change (Anderson & Krathwohl, 2001) that emerges from engaging with the games.

There is disagreement across educational and health literatures on the appropriateness and impact of digital technologies on children’s development (McCarrick & Li, 2007). Gee (2005b) highlighted the potential of digital games as motivational learning machines with the capacity to engage learners in new and different ways. Others (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005) see exciting possibilities for digital games to increase participation in education and
promote active citizenship. A number of recent empirical studies (Bai, Pan, Hirumi, & Kebritchi, 2012; Hess & Gunter, 2013b; Ke, 2008; Miller & Robertson, 2011) discerned significant learning gains through the use of digital games. Thomas and Seely Brown (2011) put a persuasive case for using digital games for people to better connect with each other and hone collaborative skills.

Finally, emergent studies in health sciences (Lieberman et al., 2011) see the potential for active play video gaming (exergaming) to improve the quality of life and social cohesion. Equally, though, there are good reasons reported why digital games have not been taken up in the classroom. Young et al. (2012) identified six reasons: inflexibility of the curriculum, negative effects of gaming, students’ lack of readiness, lack of supporting materials, fixed class schedules and limited budgets. The perceived negative effects of gaming have been a particular focus in adolescent studies, and health and clinical psychology, much of which contends that gaming may have serious implications for child health, behaviour and emotional development (Brady & Matthews, 2006), social harmony (Sheese & Graziano, 2005) and academic performance (Chan & Rabinowitz, 2006).

Clearly the debate about the benefits and risks of gaming is far from over despite successive NMC Horizon reports (2012, 2013) giving game-based learning a two to three year time to adoption horizon. This study seeks to advance the debate by situating digital games in a tangible school context. As Selwyn (2011, p. 120) noted:

Anyone seeking to gain a clear understanding of schools in the digital age must be able to focus their attention on the network of social relations that surrounds and envelopes the use of digital technologies in schools. Social constructions of school digital technology are...very different from the visions of technology use that tend to be promoted within much of the educational technology literature.

The “social relations” to which Selwyn refers can constitute relations between a wide variety of stakeholders including students, teachers, parents, school leaders and local/national policy makers. This study provides a snapshot of how gaming was defined and negotiated within one school setting over a three-year period between 2010 and 2012.

The contest of ideas about the benefits and risks of gaming is set in a tangible context where moment-by-moment decisions are made by students, teachers, parents and school managers, many of which impact on the academic and social
development of the school students and the morale of the staff. These decisions are sometimes grounded in confused or even erroneous perceptions of what constitutes an educational experience within a digital game, how educational value is determined, and the pre-conditions required for expending the time and energy to embed digital games into the learning fabric of the classroom. Teachers are often encouraged to innovate with ICT, which includes using their discretion to determine whether a digital game has educational value. However, they are also expected to exercise a duty of care in ensuring that students are provided with a safe and secure online environment in which to engage in on-task, curriculum-related learning (Bate, Macnish, & Males, 2014; Selwyn, 2014).

2.4 Teacher Use of Laptops

Teachers have a significant role in teaching students essential skills to become digitally literate and competent in the 21st century (Fransson & Holmberg, 2012). According to Kereluik, Mishra, and Koehler (2011), teachers are challenged to scrutinise the use of technology for learning carefully, with a specific pedagogical value for the learner. There is a range of literature reporting positive impacts of 1:1 laptop programs particularly on teaching and learning (Bebell & O'Dwyer, 2010; Gulek & Demirtas, 2005; Zucker & McGhee, 2005).

One of the common obstacles to teacher use of ICT in the classroom is their own lack of knowledge about or expertise in using laptops for learning (Donovan, Green, & Hansen, 2011; Oliver, 2010). Teachers with experience in the use of laptops for learning are more likely to acquire new skills efficiently than those who have had minimal experience of laptops for learning (Cowie et al., 2011; Groff & Mouza, 2008). Since the introduction of 1:1 initiatives, laptops have been able to provide more flexible and accessible opportunities for teachers, providing them with access to a range of tools (e.g., software) and resources (e.g., online instruments) that are available at both school and home.

Without a well articulated and supported vision of technology integration by teachers, adding new technologies may have a minimal effect on changing teachers’ pedagogy and their technology use with students (Clausen, Britten, & Ring, 2008). Newhouse’s (2008b) research into how teachers in a regional Public (state) school in
Western Australia used 1:1 devices found that many teachers began to facilitate students’ computer use by concentrating on learning outcomes involving research, investigation and the presentation of information. Similarly, Warschauer’s (2008) two-year study of the use of 1:1 laptops related to literacy practices in kindergarten to year 10 (K-10) schools in California and Maine in the United States, established that when teachers used laptops for learning it provided a support for a mix of classroom topics, which promoted the construction of improved knowledge. Additionally, Warschauer noted an increase in student participation in a wide range of writing activities, analysis of reading and the use of media production software. Finally, Warschauer observed how students gained control of reading on the page as well as the screen.

An advocate of critical reflection about 1:1 laptop programs, Cuban (2003) stated that there had been a lot of unrealistic expectations placed on 1:1 laptop programs and was unequivocal in his view that the teacher is the central figure when using laptops for learning. Liang et al. (2005) research into design perspectives of 1:1 digital classrooms argued that for a 1:1 computing program to have an impact on learning, it must enhance three types of classroom activities: teacher directed instruction, small group learning and individual learning.

An increasing number of studies have shown that since the start of laptop education, teaching and learning dynamics have enabled greater flexibility for the integration of ICT use. Teachers have commonly reported using laptops to access vast amounts of information on demand via the Internet, direct students to inquiry-based learning, and facilitate learning with a shift from a ‘sage on the stage’ model to more of a ‘guide on the side’ approach (Corkeron, 2000; Mas Nida Md, Moses, & Luan, 2009; Rutledge et al., 2007). There are also suggestions that access to laptops facilitates new ways of teaching and learning as well as more interdisciplinary approaches that value cooperative learning (Dunleavy et al., 2007; Fairman, 2004). Providing a laptop to every child is achievable; however, the challenging task is helping teachers develop the expertise required to harness the power of technology (Albion, 1999) as often their beliefs can influence the extent of laptop use in classrooms (Ertmer, 2005; Fransson & Holmberg, 2012). As a result, the notion of constructivism has had a more noticeable impact on teachers since the arrival of 1:1 laptop initiatives (Rockman et al., 2000).
Constructivism is a theory of epistemology which posits that knowledge is generated through experience and is grounded in the learner’s base of skills and knowledge (Piaget, 1952). Wilson and Cole (1991) and Jonassen, Davidson, Collins, Campbell, and Haag (1995) defined constructivist learning environments as ones that engage learners to work together in knowledge construction through collaborative activities. These environments embed learning in a meaningful context through reflection on what has been absorbed through discussion with other learners in pursuit of their learning goals. Studies of 1:1 implementations have found teachers using constructivist instructional practices with greater regularity since the introduction of laptops, notwithstanding the variability of laptop assimilation into their curriculum (Bebell, 2005; Silverman, 2005).

Windschitl and Sahl (2002) concluded that the challenge goes beyond the lack of teachers’ technology skills and involves critical issues related to teachers’ pedagogy and beliefs about technology. Teachers are now challenged to thoughtfully guide student learning within information environments that are richer and more complex than traditional print media, presenting high quality and challenging learning opportunities for both themselves and their students (Leu et al., 2004). The expectation for teachers to acquire knowledge and skills in 1:1 classrooms becomes amplified. Therefore, it can be difficult for teachers to keep pace with ICT and find personal time in a crowded school context to learn more about the possibilities of using laptops within their own classes (Unwin, 2007).

2.4.1 Teacher perceptions of students using laptops

Another factor linked to the use of ICT by teachers is their perceptions towards using ICT. Higher levels of confidence transfers to higher rates of ICT use for teaching (Ainley, Eveleigh, Freeman, & O’Malley, 2010). Interestingly, research by Pegler, Kolleywn, and Crichton (2010) into teachers’ ICT use found there was no evidence that younger teachers are better users of ICT than older colleagues for school-related purposes. There is no evidence of a generational divide concerning teacher adoption of ICT.

Research by Falba, Grove, Anderson and Putney (2001) provided insights into how to minimise any fear of the laptop, teacher motivation and interest in
technology, and how to develop technology skills and build teacher confidence. Teachers require quality professional development that is on-going, accountable and realistic in expectation, and is pedagogically productive in terms of teaching in the digital age (Kerans, 2007; O'Donovan, 2009). According to Jordan (2011), teachers need to improve their skillset to identify changes to their teaching and enhance their capacity to respond to learners’ needs and increase learning outcomes.

Lowther, Ross and Morrison’s (2001) research into the provision of laptops to fifth- and sixth-grade students in Tennessee in the United States showed that laptop classes were taught differently to classes without laptops. Nearly all the teachers taking part in the study believed that they were being impacted in ways that promoted active learning and technology applications because students had continual access to technology. Rizzo (2002) noted that positive changes in the learning environment brought about by technology are more evolutionary than revolutionary. As teachers use more technology in their classrooms to support their teaching, teachers and students can work as teams and engage in reflective, collegial patterns of work (Trinidad, 2005). Russell, Bebell and Higgins’ (2004) research into technology use in fourth- and fifth-grade classrooms in Massachusetts in the United States also revealed that technology use by students and their teachers was higher in 1:1 classrooms compared with shared computer classrooms. However, Clausen et al. (2008) concluded that when factoring in the differences between observed instructional practices and infrastructure, a clear agenda and vision of technology integration was required if there was to be an effect on teaching practice.

The Laptops for Teacher Evaluation (Cowie et al., 2011), funded by the Ministry of Education in New Zealand to evaluate the impact of laptops on teachers, found that teachers used laptops for administration, communication, lesson preparation and planning, collaboration and classroom use. Bate, Macnish, and Males (2012a) in reporting initial findings pertaining to the current research, found teachers were positive about the use of laptops to improve learning in their classes. Additionally, teachers were implementing new ideas and experimenting with a range of applications and programs for learning. The research also suggested the need for specific strategies to highlight the potential use of laptops for learning through a visionary ICT agenda. This would involve the whole school community mainly in
the benefits of on demand resources and the opportunities for students to use ICT creatively.

### 2.4.2 Optimal use of ICT for learning

With the adoption of 1:1 mobile devices into schools throughout the world becoming more standard, teachers are being called upon to use ICT effectively. Figures from European countries indicate that the take-up of 1:1 initiatives has continued to surge. A recent survey of schools analysing thirty-one 1:1 initiatives from 19 European countries involving 17.5 million students uncovered the need for pedagogy to incorporate 21st century learning, and to embrace more formative types of assessment taking account of ICT competencies (Wastiau et al., 2013).

In 1999 the then Federal Department of Education and Training, and, since 2013, known as the Federal Department of Education, conducted a survey on the technology skills of students, teachers and principals from all educational sectors across Australia. The study revealed that teachers’ skill levels varied depending on the size of the school and the level of ICT support from the school or the system connected to the school. From a professional development standpoint, the report also showed that teachers were more likely to attend school-based professional development delivered in small groups over a shorter, condensed format. Approximately 15 years later, there are parallels to be drawn from more recent research. The continued development and adoption of required skillsets outlined by the Australian Curriculum Assessment and Reporting Authority (ACARA) (2013), Australian Institute for Teaching and School Leadership (AITSL) (2012) and the United Nations ICT Competency Framework for Teachers (UNESCO) (2011) identify the importance for teachers to continue their improvement as ICT educators, both nationally and internationally. Although, as outlined by Inan and Lowther (2010), a range of factors influence teacher acceptance of technology for learning; some of these are confidence, knowledge and the value of technology to support learning.

Positive views of technology use for learning are one of the main reasons why teachers use technology across all subject areas (Ertmer, 2005; Inan & Lowther, 2010; Miranda & Russell, 2011; Morris, 2010). With the diffusion of technology in
classrooms well established in schools, the need for professional support becomes central for effective integration of technology. Pegrum, Oakley, and Faulkner (2013) in their research into mobile learning in schools emphasised four themes related to professional development for teachers: (a) bracketed time for professional development; (b) a focus on pedagogy ahead of technology professional development is essential; (c) targeted and contextualised professional development is most effective; and (d) building a professional community of practice/professional development network as a platform for professional development and encouraging collaboration.

Effective professional development programs recognise that the teachers’ interests and needs must be considered (Stover, Kissel, Haag, & Shoniker, 2011). The conclusions reached so far are largely consistent with those reached by Ainley et al. (2010, p. 6) who suggested a range of factors associated with the pedagogical use of ICT:

The use of ICT is greater when teachers have a higher level of or confidence with ICT, when teachers have participated in ICT-related professional development, and when there are fewer contextual obstacles (infrastructure, digital learning resources, ICT access).

Research by Cavanaugh et al. (2011) into 47 K-12 schools in 11 Florida school districts in the United States focused on how laptop computing changed teacher processes and found that teachers required access to exemplary teaching methods in 1:1 environments. This emphasis was seen to be an effective way of enhancing staff professional development to assist teacher understanding of effective technology ‘infused’ teaching and learning. Teachers who use ICT effectively consider content-specific knowledge together with pedagogical knowledge and technological knowledge, centring on the important issues of how ICT is put to use in classrooms (Judson, 2006; Mishra & Koehler, 2006). This ability to instil knowledge through content, pedagogy and technology is needed when considering how to use laptops for learning in the classroom and is sometimes overshadowed by other issues related to 1:1 implementations (e.g., network and connectivity problems, type of device, maintenance). The School that is the focus of this research had a dedicated ICT team to manage network connectivity, problems and overall functionalities of 1:1 devices.
Teachers who use laptops well embrace content-specific knowledge with pedagogical knowledge as seen in the Technological Pedagogical and Content Knowledge (TPACK) framework developed by Mishra and Koehler (2006). The framework continues to be used extensively (Agyei & Keengwe, 2014; Fransson & Holmberg, 2012; Kabakci Yurdakul & Coklar, 2014; Maeng, Mulvey, Smetana, & Bell, 2013; McGrath, Karabas, & Willis, 2011; Pamuk, 2012) to understand how teachers successfully integrate ICT in their teaching and highlights the importance of the role of the teacher. Teachers are required to have the necessary technological knowledge and skills to incorporate ICT in their teaching to develop students’ ICT skills and learning experiences. Larkin and Finger’s (2011) study of year seven classrooms in Australia implementing 1:1 laptop programs, revealed that teachers benefited from a 1:1 program where they had well developed technological knowledge. In an attempt to assist teachers, Harris, Mishra, and Koehler (2009) developed a taxonomy of activity types (content specific-driven pedagogical strategies with specific and compatible technologies) that targeted particular content areas for teachers. These activity types are similar to Shulman’s (2005, p. 54) signature pedagogies:

They implicitly define what counts as knowledge in a field and how things become known. They define how knowledge is analysed, criticized, accepted, or discarded. They define the functions of expertise in a field, the locus of authority, and the privileges of rank and standing.

Therefore, selecting, configuring and applying appropriate ICT approaches for the benefit of student learning is necessary. Teachers who are unable to identify the uses of ICT for learning are less likely to embrace the use of it for teaching. Subsequently, the variability between teacher ‘take-up’ of ICT use for learning can be wide-ranging, depending on teacher confidence and feelings of being prepared within their own subject matter experience (Roschelle & Pea, 2002; Van Acker, van Buuren, Kreijns, & Vermeulen, 2013).

In determining the impact or success of a 1:1 implementation, findings from past research reveals that teachers’ attitudes and beliefs about the function of ICT within the curriculum can influence how computers are used for learning (Ertmer, 2005; Hennessy, Ruthven, & Brindley, 2005; Lam & Tong, 2012). However, embedded in schools is a mismatch of how contemporary teachers conceptualise ICT
for learning and how they use ICT in learning. The role of the teacher is central to harnessing the potential of learning with laptops, subsequently determining the impact of technology use by both teachers and students (Bebb & O'Dwyer, 2010).

2.4.3 A 21st century balanced approach to learning

There is an abundance of educational literature about the features of 21st century learning (e.g., Griffin, McGaw, & Care, 2011; Kaufman, 2013; Larson & Miller, 2011; Lemley, Schumacher, & Vesey, 2014). The following key skills are often listed for preparing students for the future: information literacy, collaboration, communication, problem solving, creativity and innovation, and ethical use of ICT (ACARA, 2010a). Additionally, all of these skills can play a role in subject-specific contexts in 1:1 schools seeking to provide student-centred learning opportunities. According to Gunn and Hollingsworth (2013, p. 202), the shift in teaching and learning has become more evident with the introduction of computers in schools over the last three decades:

The traditional methods of instructing students are no longer sufficient. Memorization, repetition, and basic comprehension are lower-order skills that were once useful but are now considered insufficient when compared to higher-order skills, such as critical and creative thinking, elaboration and evaluation.

While contemporary students in 1:1 initiatives engage in digital media on a daily basis, the importance for teachers to adjust to the 21st century educational environment has increased. Teachers are required to develop forms of ICT provision leading to opportunities to transform learning for students, where students are required to be good problem solvers and knowledge builders (Bereiter & Scardamalia, 2006). This approach presents challenges for teachers who may find it difficult to engage skills or features of ICT that are relevant and meaningful within the classroom. Research by Grunwald and Eduventures (2010, p. 5) into 21st century learning, which included 1,000 educators (783 teachers and 274 principals or assistants) in the United States found a common debate about technology and 21st century skills, demanding a balanced approach:

The debates over technology and 21st century skills share common themes. Both revolve around the balance between the traditional and the new, between research based and emerging practices, between playing it safe and choosing to try different approaches. Both debates center on results: Does integrating technology or 21st century skills (or both) distract from or enhance critical educational outcomes?
Research by Larkin and Finger (2011) into 1:1 computing in Australian schools reported that primary school teachers were using laptops for learning about 40% of the available time in their classrooms. Selwyn, Potter, and Cranmer (2009, p. 928) reported that ICT use by primary school students in Britain was often “perfunctory and unspectacular” within the school setting. Therefore, to optimise the use of ICT and benefit student learning, schools are required to rethink the pedagogy critically. This entails ensuring ICT use encapsulates the learning requirements of the 21st century digital age (Beetham & Sharpe, 2013), yet still preserves a balance between traditional and new approaches to teaching and learning.

2.4.4 Differentiation for teaching and learning

Differentiation of instruction is not new; however, it continues to be discussed in schools where, for example, the number of students who are not achieving the highest level of literacy is still an issue (Watts-Taffe et al., 2013). Ultimately the aim of a differentiated classroom is for all students to be engaged in instruction and participating in their own learning (Morgan, 2014). The potential for laptops or mobile devices to be used as a tool for differentiated learning opens up a range of approaches for teachers through a technology-assisted pedagogy. A focus on communication, inquiry and collaboration in the development of meaningful teaching and learning settings are considered to be significant (Dreher, 2012). Students in a 1:1 classroom do not have to rely solely on a teacher for instruction, with increased access to the Internet enabling access to online resources or applications. This approach provides opportunities for differentiation to occur by engaging students in work that may be more autonomous rather than relying completely on teacher instruction (Owen et al., 2005).

2.4.5 Managing distractions and online safety

Managing distractions in 1:1 environments is particularly challenging for teachers (Bate et al., 2012a; Corkeron, 2000; Dunleavy et al., 2007). The ability of students to multitask and the temptation to play games and use social media have emerged as themes in classrooms using mobile devices to support learning (Waterston, 2011). Both play a part in the distracting characteristics of laptop instruction in classrooms where classroom management problems may arise (Owen...
The potential lure and excitement of laptop software and the Internet may expose students to the distractions associated with using technology initially. However, over time it appears the attraction of the device diminishes, as shown in the longitudinal study conducted by Lei (2010), where levels of distraction and off-task activity were reduced to more acceptable levels in the second year of the study.

With the provision of greater access to the Internet for students, schools are often required to consider their obligation in terms of providing a safe network for their users. For example, the use of Facebook and Twitter have been linked to increasing instances of cyber-bullying. Network safety and the policing of inappropriate behaviour on school and student-owned ICT is a topic of contention, particularly in negotiating boundaries and responsibilities between home and school (Erdogan et al., 2010; Riva, 2011). However, given that even children from primary schools are now provided with powerful Internet-ready devices in order to research and collaborate with others, negotiating boundaries and responsibilities is both timely and crucial. The School at the centre of the research had an acceptable use policy for laptops and mobile phones. As with the Australian curriculum, the majority of European schools view online safety as part of the curriculum as a priority in both primary and secondary schools, as seen in a summary report of education on online safety in schools in Europe (Rangelov, 2010).

There is a growing trend towards students’ use of the Internet to gain greater meaning from what they learn in the classroom (Katyal, 2010). Effective teaching and learning includes establishing routines and procedures for classroom management (Hart, 2010) whether this is in teacher- or student-centred settings. In an ICT-rich environment, the potential for off-task behaviour might be magnified by the availability of the device. Schools are now challenged to provide a safe and secure network, and constantly monitor how networks are being used. Whilst there is an abundance of information and products available to help parents provide a safe ICT environment at home (Hinduja & Patchin, 2010; Liau, Khoo, & Ang, 2008; Lin, Lin, & Wu, 2009), school systems, school districts and schools tend to have more eclectic approaches to student safety and security.

Anastasiades and Vitalaki (2011) and DeFranco (2011), suggested that there are few evaluative studies focusing on teachers’ involvement in Internet safety and
acceptable ICT use both in and outside of the classroom. Clear guidelines, policies and consequences are important in ensuring that the expectations of school leaders, teachers, students and parents are consistent. However, there is a dissonance, identified by Prensky (2005) between how Generation Z (people born after the millennial generation – post the year 2000) students perceive ICT and the more traditional conceptions held by older school leaders, teachers and parents. Hsu (2010) suggested that there is an urgent need to support the generation of school leaders, parents and teachers who are caught in the digital divide and trying to learn on the run.

Findings from research by Gibb, Fergusson, and Horwood (2008) into gender differences in the educational achievements of individuals under the age of 25 suggest that male achievement could be raised by improving classroom behaviour. There is limited literature setting out specific strategies for improving boys’ use of ICT in 1:1 classrooms, and this may well be an area for further research as schools are often seeking approaches or solutions to enhance teaching and learning. The next section of the literature review examines how both junior and middle school students use laptops through a discussion of (a) specific laptop uses by students and (b) the implications of these developments for boys’ education.

2.5 Student Laptop Use: Junior and Middle School Experiences

Grimes and Warschauer’s (2008) research into laptop use in a cross-section from kindergarten to year eight found that laptops were used daily for language, arts, science and social studies, though less frequently for mathematics. One of the main points about the introduction of 1:1 laptop programs is for students to be able to use laptops for learning, collaborate and work anytime, anywhere (Stager, 2006). Subsequently, Lei (2012) categorised laptop use into four distinct areas for students, applying a similar ICT use framework as developed by Bruce and Levin (1997). Table 2.2 provides examples of these laptop uses.
Table 2.2
Lei’s (2012) Four Categorised Laptop Use Areas

<table>
<thead>
<tr>
<th>ICT Use</th>
<th>Examples of Laptop Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning</td>
<td>Taking notes using software such as Pages, Microsoft Word, searching the Internet, learning specific subject content, online discussion;</td>
</tr>
<tr>
<td>Communication</td>
<td>Communication with teachers via email, communication with friends using email, Facebook, Skype, instant messaging or other social-networking websites or Web 2.0 tools.</td>
</tr>
<tr>
<td>Expression and construction</td>
<td>Designing web sites, writing.</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Playing online games, role-playing in a posting forum.</td>
</tr>
</tbody>
</table>

Similarly, the New South Wales Department of Education review of 1:1 computing programs (NSWDET, 2009) showed writing and research were the most common uses of laptops by students. Research by Suhr et al. (2010) into fourth grade students who were using laptops for literacy lessons revealed that they used Notebooks in their classes to conduct Internet searches for research, used a word processing package to create written documents, created presentations using a suite of software, and completed tests or online quizzes set by teachers.

With increased Internet access, student use of laptops for communication and research has continued to rise in schools adopting 1:1 laptop programs (Bebell & Kay, 2010; Lei & Zhao, 2008; Suhr et al., 2010). Students can contact teachers through email, and communicate about tests, assignments or school related matters. However, when students interact amongst themselves, social media platforms such as Facebook are regularly used. This method of communication appears to be widely embraced by students; however, school leaders are reluctant to use and communicate with students via social media as some believe they are passing trends or do not have the time or energy to invest in them (Porterfield & Carnes, 2012). The reluctance by teachers to use Web 2.0 tools (e.g. instant messaging, blogs, YouTube, Edmodo, WordPress, Prezi, Twitter) to assist students to deepen their learning to another level is due to a range of reasons as Luckin et al. (2009, p. 102) explained:

… schools often offer teachers limited scope to incorporate them, with other requirements taking precedence, such as e-safety, privacy, hierarchical organisation
and infrastructure, set bodies of knowledge, assessment, and a long standing pedagogical tradition that favours the individual over the group, the text over the modalities, and the enclosed environment over the open. This puts teachers in a difficult position.

According to Dowell, Burgess, and Cavanaugh (2009) and Johnson (2010), common uses of the Internet by young adolescents and young children were for social interaction, sharing of ideas, creating, photography, blogging, online gaming and for school work. These common Internet uses and types of access by students can also have a range of concerns or risks attached to these online behaviours. The following list by Lazarinis (2010) provides examples of some of the online risks students may face if given unrestricted, unsupervised access to the Internet: adult content, paedophilia and sexual harassment, cyberbullying, offensive language and online gaming. Other studies (Livingstone, Haddon, Görzig, & Ólafsson, 2012; Thornburgh & Lin, 2002) have also reported that students who spend time on the Internet are exposed to sexual and violent content, including the danger of unsafe meetings with unknown persons.

From a boy’s perspective, gaming and online video content are fascinating (Simons, de Vet, Brug, Seidell, & Chinapaw, 2014). Accessibility of pornographic content is wide-spread and research by Wallmyr and Welin (2006) into young people’s attitudes towards pornography found that the 15-year-old male group had the highest rate of access to pornography. With increased levels of ICT use, the capacity for students to encounter situations where inappropriate content is readily available increases. The literature therefore stresses the importance for schools to develop age-specific approaches in terms of Internet safety when using laptops for learning, and the importance of parents educating and monitoring Internet use at home.

In developing age-specific approaches, teachers are placed in a challenging situation as to if and how to use Web 2.0 tools to inspire or transform ICT use for students. According to Fewkes and McCabe (2012, p. 97), secondary school students in Canada using Facebook for learning found that, “giving students a little more freedom and trust in a less controlled environment may be the key.” However, Selwyn, Boraschi, and Özkula (2009) argued that teachers needed to be cautious of introducing popular digital practices into classrooms in the hope of transforming
technology practices within formal education. Instead, Selwyn, Boraschi, and Özkula suggested placing a greater emphasis of dialogue with students about the possible educational benefits of using ICT at school.

Educational literature on 1:1 laptop use by students reports increased use of software tools for creative purposes (e.g. documents, assignments, webpages, multimedia, timelines) (Bebell & Kay, 2010; Lei & Zhao, 2008; Mouza, 2008). Laptops have the potential to entice students to write as Mouza (2008) reported, with students in 1:1 classes preferring to write with laptops using word processing software. Therefore, it is quite possible that with increased access to computers, as is the case in 1:1 programs, student motivation for writing has the potential to increase. More recently research by Biagi and Loi (2013), based on the Programme for International Student Assessment (PISA) 2009 results, confirms that there were four different groups of ICT activities captured by 15-year old students at home and school. The four groups included: gaming activities, collaboration and communication activities, information management and technical operations, and the creation of content and knowledge and problem solving activities.

How students use laptops or mobile devices varies depending on the setting, time of day and specific reason, such as for school-related work or personal use. Correspondingly, teachers and parents have varying perceptions of how students should be using 1:1 devices for learning (Bate, Macnish, & Males, 2012b). Reasons for schools implementing 1:1 initiatives, as discussed above, can range from broadening the learning experience, adjusting to the 21st century environment or improving overall access to ICT. With this understanding, schools are encouraged to adopt ICT-rich approaches. How the chosen device may assist students to learn within a classroom and school context becomes important in terms of a school-ICT strategic understanding of its vision (long term goals) and its mission (aims). Schools often adopt correct use policies, guidelines and frameworks emphasising that the chosen device is a powerful learning tool that should be used accordingly (Bonifaz & Zucker, 2004). For example, schools may stipulate the following: no access to social media, games, inappropriate web content or pirated music or video. Contravention of these guidelines, usually, leads to some form of sanction. However, students still find staying on task difficult, depending on the lesson, as the temptation to use social media or play games is often too enticing.
Research by Hatakka et al. (2013) into student laptop use in Swedish schools revealed that when students were provided more choice about how to use their laptops, some students found it difficult to stay on task. In terms of self-regulation, students who were high-achieving and motivated towards learning were less likely to be distracted by the temptations (e.g., accessing social media sites, gaming) on offer when using a laptop.

These age patterns could help inform schools to determine a year level entry for introducing a device. Considering when, in terms of a school year level, it is appropriate for a student to have access to a 1:1 device is an issue on which researchers have been largely silent, despite this potentially being of significant assistance to educators. In pinpointing these differences, the next section will address boys’ education.

2.5.1 Boys’ education

Boys’ education has been a significant focus within schools across Australia, in particular the relative underachievement of boys over the last 20 years (Hodgetts, 2008). Boys’ underachievement is not a new occurrence (Cohen, 1988; Epstein et al., 1998) and internationally, recent literature about the gender differences in primary and secondary education continues to uncover consistent findings about boys underachieving (Voyer & Voyer, 2014). In the Netherlands, research by Driessen and van Langen (2013) discovered minimal differences in effect size in the subject areas of Mathematics or English. However, the position of boys’ educational level and behaviour was much more unfavourable than that of girls. In the case of the United Kingdom, a lower percentage of boys were meeting appropriate age achievement scores administered nationally, and girls’ written skills were at higher levels than those of boys (Bourke & Adams, 2011). In Canada, girls continue to outperform boys on high stakes literacy tests, national assessment programs and the Program for International Student Assessment (PISA) (Watson & Kehler, 2012).

Differentiating for boys is critical as the learning needs are wide-ranging, and most boys are visual learners (Wilkes, 2006). It seems that boys have a natural affinity with computers and thus can be viewed as having a more confident approach to using computers than girls (Schaumburg, 2001). In 2005, the Australian Federal
Government engaged James Cook University and the Curriculum Corporation to develop and trial professional learning materials for teachers working with boys in the compulsory years of schooling called the Success for Boys Professional Learning Program (DEST, 2006). Between 2006 to 2007, Success for Boys Professional Learning Program provided schools with funding to take up professional learning in boys’ education and incorporate it in their daily practice. The Success for Boys Professional Learning Program focussed on effective literacy teaching and the use of ICT as a means of improving boys’ engagement with active learning as the key intervention areas of particular benefit to boys. Computers, therefore, continue to play a significant part in learning, and can be integral to helping boys who experience learning difficulties (Lei & Zhao, 2008).

Lei and Zhao (2008) highlighted that re-engagement in learning can be achieved through the interactive nature of laptops, and the availability of rapid feedback that enables students to form new knowledge and enhance their understanding. A laptop can be seen as a useful tool for literacy development for boys who may underachieve and struggle to learn. Some boys do not like writing, but they are more likely to involve themselves in such a task if computers are involved (Sokal & Katz, 2008; Wilkes, 2006). Additionally, as digital technology has become more visible in the lives of students across the world, using mobile technology to motivate and engage boys in literacy learning has become another approach used by teachers (Brosseuk, 2014).

Learning needs to be motivational and connected. Separating lifestyle and learning might be fraught with danger, as most children enjoy games and simulations which inadvertently seem to capture more boys than girls (Prensky, 2001). Using ICT where possible across all tasks, from information gathering to the publication of boys’ work, is seen as a valuable conduit for boys to engage in learning. Whitely (1997) conducted a meta-analysis of 82 studies that revealed boys had more positive attitudes towards computers than girls. Additionally, it is acknowledged that girls are generally better listeners than boys, and hear more of what is said in conversation, while boys tend to hear less and often ask for clear evidence to support claims, or use methods to support their understanding (Gurian, 2011). The use of laptops by boys is an area of relevance to see if such a tool can support or enhance boys’ ability to organise their thoughts and assist their learning.
Rowe and Rowe (2002) proposed a range of strategies for supporting the learning needs of boys after their inquiry into boys’ education in Australia. Some examples of these were: a clear focus on supporting literacy; differentiated curriculum that is highly structured; less group work and more teacher directed work; and, methods for assessing underachievement. These strategies are also supported by MacDonald, Saunders, and Benfield (1999) who conducted research into boys’ achievement, progress, motivation and participation in the United Kingdom. Additionally, boys’ learning is directly affected by: family influence outside of the school environment; school environment and culture; peer groups; and gender concepts on attitudes and behaviour (Lingard, Martino, Mills, & Bahr, 2002). Building partnerships across the school community could be viewed as an important feature for enhancing learning for boys.

2.5.2 Characteristics of effective teachers

The report *Quality matters - revitalising teaching: Critical times, critical choices*, written for teachers by Ramsay (2000), stated that, according to the students, they wanted their teachers to know and understand what they were teaching, treat each student individually, make learning central to what happens in a classroom, and manage distractions that prevent learning. Research conducted by the National Foundation of Educational Research in the United Kingdom, investigating boys’ underachievement (MacDonald et al., 1999), constructed a similar set of characteristics of a ‘good’ teacher from the pupils’ perspective. These characteristics include high expectations, gives praise, is enthusiastic and fair, and helps students when help is required.

According to Hattie (2009), teacher and student relationships directly influence students’ attitude and achievement. Integral to these influences is the role of parent support of students to enable the best possible education. Consequently, it is too one-dimensional to view boys as a homogenous group where all issues apply equally and the guidance of an able teacher is vital. Boys consider a good teacher as one that affirms, listens and respects all students, and importantly, allows them the opportunity to self-regulate and learn from their mistakes (Slade, 2001).
The implementation of 1:1 laptop programs, as reported in the literature, should support the characteristics of effective teaching as described above. Laptops and mobile devices provide options and approaches for boys to engage in a curriculum with relevance and one that is tailored to the needs of a 21st century student. Lingard et al. (2002) reported that boys are drawn to intellectually stimulating work connected to an aspect of their lives and respond to opportunities with intellectual rigour. Flexible learning settings, such as a 1:1 laptop environment that adopts student-directed approaches, have the potential to engage boys in teacher-facilitated environments.

2.6 Parent Perceptions

In terms of the success of 1:1 initiatives, Stidham (2008) proposed that a philosophical foundation must be established where the buy-in of administration and parents is important. Parents may struggle to understand how laptops are used for learning. Parents’ perceptions of how laptops are used for learning are often expressed with references to what learning was like for them without laptops. Parents’ attachment to conventional approaches of learning with books, pen and paper is often a barrier in 1:1 schools, as parents do not always feel secure with the use of technology (Lei, 2012). It is quite possible, as Zucker and McGhee (2005) revealed, that in some instances teachers avoid using laptops for learning due to their individual preference for using hard copy textbooks and methods more familiar to them from their own experiences which is congruent with the view of some parents.

All of these factors add to the challenges of adopting a community approach and in particular the ‘buy in’ by parents involved in 1:1 programs. This challenge of involving parents was demonstrated in the research by Shapley et al. (2009) into 21 1:1 laptop schools in the state of Texas in the Unites States, where 71% of schools reported only partial parental and community support after four years of the implementation. Parental support of 1:1 initiatives is important as parents can guide their children with appropriate laptop use whilst assisting in the learning process (Spires, Oliver, & Corn, 2012).

After the completion of a three year study about Internet safety involving parents, students, teachers and health care providers in K to 12 schools in the United
States, Moreno, Egan, Bare, Young, and Cox (2013) concluded that a collaborative effort between schools and parents is required to provide consistent education about safety in the digital world. There was agreement amongst all the stakeholders that teaching Internet safety at a young age (between five and eight years of age) and identifying parents as one of the primary teachers of the topic of Internet safety was crucial (Chang, 2010). This view highlights the importance for schools to work collaboratively with parents when using mobile devices for learning.

There is often debate about the increased use of technology and its effect on families, though there is limited research into how technology is used at home (Huisman, Edwards, & Catapano, 2012). Parents can find it difficult to understand what their children may be doing when using laptops at home, creating a source of anxiety and concern (Shepherd, Arnold, & Gibbs, 2006). The use of social media by children in primary and high school is common, and often the dilemma for parents is how to restrict or monitor Internet use at home (Huisman, 2014; Liau et al., 2008). The establishment of E-sites around the world for ICT safety has become more widespread, helping to provide information and strategies to parents about the latest technologies and types of Internet use (Reed, 2008; Wang, Bianchi, & Raley, 2005).

### 2.7 The Framework for Understanding Student and Teacher Use of Laptops: Measuring Change

The view of learning adopted in this study is defined by the pragmatic view of Dewey (1943) who believed students’ interests should involve them in an active curriculum where teachers are responsible for guiding their students in real-life tasks and challenges. However, applying a framework which is consistent with contemporary literature about child-centred learning (Piaget, 1950), the relationship between children’s learning and cognitive development (Vygotsky, 1978), and learning with ICT (Jonassen et al., 1999) is complex. More recently, Newhouse and Clarkson (2008, p. 141) have proposed applying ‘Learning Environment Attributes’ (LEA) in the evaluation of the impact of ICT on learning in school, and importantly to enable schools to record progress in the meaningful use of ICT:

> Learning environments are constructed by the participants and are thus dependent on their beliefs and actions, particularly the underlying pedagogical philosophy of the teacher. Therefore there is considerable variation in the ways ICT may be effectively...
incorporated within a learning environment, and there is no suggestion that a particular option is preferable (i.e. there is no one optimal way of using ICT to teach calculus to a 16 year old).

Often it is difficult for schools and educators to comprehend how to use ICT for learning. The New ICT Supporting Schooling (NISS) framework developed in Australia (Newhouse, 2008a) to provide teachers and schools with a focus on improved student learning through the use of ICT has five dimensions. These dimensions include Student Characteristics, Learning Environment Attributes (LEA), Teacher Professional ICT Attributes, School ICT Capacity, and School Environment. Similar to the research by Newhouse and Clarkson (2008), one of the targeted areas for the current study is concerned with how teachers use laptops from an LEA dimension. The LEA is of value to the study as the focus is on improved student learning through the use of ICT. The LEA dimension of the NISS framework provides teachers and school leaders the opportunity to reflect on the impact of ICT use within a learning environment, to assist teachers in planning to integrate ICT, and to record progress in improving learning with the use of ICT. The five dimensions of the NISS framework with the intended outcomes and components are further elaborated in Table 2.3.
Table 2.3

*New ICT Supporting Schooling (NISS) Framework (Newhouse, 2008a, p. 4)*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Intended outcome of dimension</th>
<th>Components of Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>Through the use of ICT, students develop levels of capability, increased learner engagement, and achievement of higher-order learning goals.</td>
<td>ICT capability, engagement, achievement of learning outcomes.</td>
</tr>
<tr>
<td>Learning Environment</td>
<td>ICT is used to support teaching to provide learning environments that are centred on learner, knowledge, assessment and the community.</td>
<td>LEA attributes as shown in Table 2.4.</td>
</tr>
<tr>
<td>Attributes (LEA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher</td>
<td>Successful integration of ICT, exploiting the characteristics of constructivist learning environments, and contribution of relevant learning communities.</td>
<td>Vision and contribution, integration and use, capabilities and feeling.</td>
</tr>
<tr>
<td>professional ICT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>attributes</td>
<td>Sound support by the school in terms of relevant software required supporting the curriculum.</td>
<td>Hardware, connectivity, software, technical support, digital resource material.</td>
</tr>
<tr>
<td>School ICT capacity</td>
<td>A shared community-based vision to support the use of ICT to learn, work and live successfully in a knowledge-based, global society.</td>
<td>Leadership and planning, curriculum organisation, curriculum support, community connection, accountability.</td>
</tr>
<tr>
<td>School</td>
<td></td>
<td></td>
</tr>
<tr>
<td>environment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analysis of the Learning Environment Attributes from Table 2.3 are derived from a measure developed by Newhouse and Clarkson (2008b), called the LOPA (Learning Outcome Pedagogy Attributes) which comprised the following scale: no evidence, developing, routine and comprehensive. A description of these attributes is provided in Table 2.4.
Table 2.4  
**Description of the Learning Environment Attributes (LEA): Adapted from (Newhouse & Clarkson, 2008, p. 143)**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build knowledge through investigating reality</td>
<td>Students investigate real-world issues using a suite of tools to analyse, interpret and present information, building a broad understanding of the topic.</td>
</tr>
<tr>
<td>Promote active learning and authentic assessment</td>
<td>Students are actively involved in their learning. Assessment derives from this learning.</td>
</tr>
<tr>
<td>Engage students by motivation and challenge</td>
<td>Learning experiences engage, motivate and challenge students individually.</td>
</tr>
<tr>
<td>Tools to increase student productivity</td>
<td>Students are supported for maximum productivity with a range of repetitive tasks.</td>
</tr>
<tr>
<td>Scaffolding to support higher order thinking</td>
<td>Students knowledge and skills are scaffolded in the development of higher order learning such as application, analysis and synthesis.</td>
</tr>
<tr>
<td>Increase learner independence</td>
<td>Allowing students to progress at their own pace through the provision of diverse learning experiences.</td>
</tr>
<tr>
<td>Increase collaboration and cooperation</td>
<td>Students are supported to work collaboratively and cooperatively in different learning communities.</td>
</tr>
<tr>
<td>Tailor learning to the learner or develop individualised learning pathways</td>
<td>Students are provided with a differentiated experience geared to their own learning needs.</td>
</tr>
<tr>
<td>Overcome physical disabilities</td>
<td>Students with physical disabilities are afforded similar opportunities to other students.</td>
</tr>
</tbody>
</table>

Education and pedagogy, in the context of this research is defined as an experimental, child-centred process, where learning is active, and achievements are fluid and moving and changing daily (Dewey, 1943). Therefore in defining pedagogy it is essential to outline how ICT is used by teachers. The use of technology by teachers has changed with its growing complexity and penetration within schools (Bebell, O'Dwyer, Russell, & Hoffaman, 2010). It further highlights the need for teachers to have a robust understanding of how to teach in 1:1 environments and know the curriculum for their students. Shulman (1986) and Mishra and Koehler (2006) discussed that effective teachers must know the subject matter of what is to be taught under the curriculum for effective instructional processes within the classroom.
Additionally, Puente\'s (2006) Substitution, Augmentation, Modification, Redefinition (SAMR) model assists teachers to consider design and integration of digital learning experiences by utilising technology from enhancement to transformational learning experiences. This research model is currently promoted in government schools in Western Australia (DETWA, 2014) and other educational settings as a framework in assisting more meaningful use of mobile devices within learning. The model is aimed at assisting technology adoption and possible enhancement for teaching and learning.

However, Bruce and Levin\’s (1997) educational technology taxonomy with its four categories of media for inquiry, media for communication, media for construction and media for expression (see Figure 2.1), based on the ordinary instincts of a child as proposed by Dewey (1943), provides the research with a useful framework to analyse student and teacher technology use for learning. This framework underpinned the research conducted by Lei and Zhao (2008) who modified the framework to take into account student use of technologies in their research into the impact of 1:1 laptop learning in a Midwestern middle school in the United States.

A more recent framework for understanding student use of ICT is the ICT capability learning continuum. The ICT capability learning continuum has been

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**Figure 2.1.** Bruce and Levin\’s (1997, pp. 85-86) framework for classifying ICT.
selected to guide this study. The ICT capability learning continuum classifies uses of educational technology with the inclusion of the operational and ethical uses of technology and provides the foundation for an understanding of how students and teachers use technology for teaching and learning for this study. This framework is further supported by the Statements of Learning for Information and Communication Technologies (MCEETYA, 2006) in an Australian context. In Australia, ICT is represented in two ways in the Australian Curriculum (ACARA, 2013): through the ICT capability that applies across all learning areas and with the Technologies curriculum through digital technologies. The ICT capability learning continuum is organised into five interrelated elements as seen in Figure 2.2.

![Figure 2.2. ICT capability learning continuum (ACARA, 2010a, p. 5).](image)

At the time of development, the ICT capability continuum was based on international research and includes reference to the ICT curriculum from England, and the National Education Technology Standards for students developed by the International Society for Technology in Education that represent the capability with six sets of standards (ACARA, 2010a; MCEETYA, 2006). From an Australian
perspective, the Australian Council for Educational Research had also identified a progression in research associated with the National Assessment Program – ICT Literacy (ACARA, 2014). Table 2.5 sets out the ICT capability as found in the Australian Curriculum with the five interrelated elements (as shown in Figure 2.2) elaborated.

**Table 2.5**  
*Organising Elements for How Students use ICT Developed by ACARA (2010a, pp. 5-6) and MCEETYA (2006, pp. 4-5)*

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
</table>
| Applying social and ethical protocols and practices when using ICT | Recognise intellectual property.  
Apply digital information security practices.  
Apply personal security protocols.  
Identify the impacts of ICT in society. |
| Investigating with ICT                        | Define and plan information searches.  
Locate, generate and access data and information.  
Select and evaluate data and information. |
| Creating with ICT                             | Generate ideas, plans and processes.  
Generate solutions to challenges and learning area tasks. |
| Communicating with ICT                        | Collaborate, share and exchange.  
Understand computer-mediated communications. |
| Managing and operating with ICT               | Select and use hardware and software.  
Understand ICT systems.  
Manage digital data. |

The five interrelated ICT elements are grounded in the belief that technologies such as laptops are tools enabling students to complete set tasks, and problem solve. Teachers are, therefore, required to design tasks for students with opportunities to use laptops as a powerful technological tool, aiding learning. How teachers determine the application of the elements could provide important indications on how they see learning taking place in a 1:1 laptop setting. For example, teachers who have a strong reliance on laptop use for investigating with ICT might foster a narrow approach to how laptops could be used for learning, failing to take into account the four other elements.

This chapter thus far has considered an extensive set of literature from past 1:1 laptop implementations, teacher use of laptops for teaching and learning, how
students use laptops or mobile devices in both a school and home environment, and how these have had an impact on student achievement and engagement for learning. The conclusions thus far are largely consistent with those reached by Weston and Bain (2010, p. 14) who suggested that there are a range of factors that can affect the potential of 1:1 laptop programs, and the need for understanding the benefits of 1:1 computing can offer:

The widespread availability of laptop computers can be a driver for more expansive efforts that must happen in order for schools to meet the educational needs for all students. School communities, by adopting a self-organising vision, could contribute to the arrival of a new paradigm for all education.

Jonassen’s (2008) continuing research into using ICT as a cognitive tool to enhance meaningful student learning is supported by Ertmer and Ottenbreit-Leftwich (2013) who share a similar view that integrating technology should focus on supporting teachers and students in real-world technology-supported learning environments. The literature suggests that 1:1 laptop programs should take a holistic approach to learning (Lei & Zhao, 2008; Newhouse, 2014; Weston & Bain, 2010). These include students, teachers and leaders all working together, and ensuring that sustained change is everyone’s responsibility (Fullan, 2001). As shown in Figure 2.3, teachers, students, leaders and national/state policy are the key cogs in harnessing the potential of laptops for learning.
The metaphor of ‘cogs working in unison’ forms the basis of the theoretical framework that informs the study. As discussed above, the implementation of 1:1 laptop programs is often focused on providing students with a personalised approach to learning. With this focus, there is an expectation students are required to be ethical users of ICT, responsible for their learning and aware of the importance of the skill of self-regulation (Cohen, 2012). The idea of metacognitive skills or the awareness of one’s own knowledge and self-regulation have been identified in educational literature as a desired trait for a successful learner. In the Melbourne Declaration on Educational Goals for Young Australians (MCEETYA, 2008, p. 8) successful learners are required to “develop their capacity to learn and play an active part in their own learning.” According to Zimmerman (1998), self-regulation is a self-management process in which students convert their mental ability to academic skill for attaining their goals. The research comparing self-regulation models conducted by Puustinen and Pulkkinen (2001) emphasised self-regulation as an important factor in the learning process in a behavioural, cognitive and motivational manner. When young boys are provided with a laptop for the first time, the potential to be tempted or distracted by many of the features of a mobile device often becomes a reality.
Additionally, children who have limited self-regulatory skills are at a disadvantage compared to those who have a superior skill at regulating their behaviour (Piotrowski, Lapierre, & Linebarger, 2013).

Lingard, Mills, and Hayes (2000) proposed a framework for thinking about an appropriate environment for engaging students in higher-order learning and problem solving activities that is based upon providing a supportive classroom environment. Creating an effective classroom experience when using laptops could be viewed as a priority. McMahon’s (2009) investigation into higher-order thinking skills in a 1:1 laptop school in a Western Australia secondary school suggested that for students to develop such skills, they need to integrate technology across all learning areas, enabling the attainment of higher levels of cognition.

2.8 Conclusion

The literature has shown that 1:1 laptop programs have a range of impacts on teachers, students, parents and ultimately, school communities. Over time, the classroom environment has changed, and teachers have shifted towards constructivist learning, where an increase in student-centred activities, collaboration and differentiation have played a part in engaging and motivating learning for boys. Research has also found that since the inception of 1:1 laptop programs, inappropriate use of laptops in classrooms has become a major topic of discussion (e.g., digital gaming). Research into the effectiveness of 1:1 program as measured by standardised testing has been inconclusive as to whether 1:1 laptop programs have had any impact, either positive or negative on improved academic skills. One to one laptop programs can fundamentally change teaching and learning approaches. However, the complexity of 1:1 teaching and learning is exemplified by the need for more creative assessment approaches to determine the real impacts of 1:1 laptop programs.

This chapter has reviewed the literature about 1:1 laptop programs by discussing the roles of teachers, students, parents and schools when implementing 1:1 initiatives. It proposes a ‘framework of pedagogical evaluation’ in terms of an overall broad context, encompassing a range of factors required to harness the
potential of 1:1 mobile devices for learning. Table 2.6 presents the concepts proposed to respond to the study’s research questions.

Table 2.6  
Mapping of Conceptual Ideas to the Study’s Research Questions

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Frameworks</th>
<th>Reference in this chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How do boys utilise their personal laptops?</td>
<td>Student use</td>
<td>Figure 2.2 and Figure 2.1 (ACARA, 2010a; Bruce &amp; Levin, 1997)</td>
</tr>
<tr>
<td>2. How are teachers engaging laptop technology for educational purposes?</td>
<td>Teacher use</td>
<td>Figure 2.2 and Figure 2.1 (ACARA, 2010a; Bruce &amp; Levin, 1997; Harris et al., 2009; Newhouse &amp; Clarkson, 2008; Shulman, 2005)</td>
</tr>
<tr>
<td>3. What educational impact if any, did the 1:1 laptop program have on literacy and numeracy outcomes?</td>
<td>Student literacy and numeracy outcomes. NAPLAN analysis. Maximising the impact of ICT use. (Newhouse, 2008a) (ACARA, 2014)</td>
<td>Table 2.3 and Table 2.4</td>
</tr>
<tr>
<td>4. What differences can be identified between junior and middle school</td>
<td>All</td>
<td>Figure 2.2 and Figure 2.1</td>
</tr>
<tr>
<td>5. What implications do the findings from research questions 1, 2, 3 and 4 have for future inclusion of one to one laptop or mobile learning devices in schools?</td>
<td>All</td>
<td>Figure 2.3</td>
</tr>
</tbody>
</table>

This research aims to provide an improved and current high-level understanding of how male students use laptops for learning. It does not aim to deliver all the answers to the questions related to the effects of 1:1 mobile devices on student learning mentioned in the literature. However, in answering the study’s research questions, this thesis aims to generate new knowledge and make a positive contribution to the growing literature base on 1:1 laptop implementations.

The next chapter will present the methodology that supports the research.