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

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CHAPTER 1. Introduction

1.1 Introduction to the Research

Use of Information and Communications Technology (ICT) within education continues to develop at a rapid rate, and the introduction of portable digital devices to support learning has led to an increased interest in this area. This chapter outlines the research and provides a setting for the study, together with its purpose and objectives. This chapter also highlights the importance of the study within the framework of recent research in the area of laptop integration into education, with a specific focus on boys’ education. Finally, to conclude this chapter, there is a short synopsis of the structure of the thesis.

The 1:1 laptop program in this research is characterised by a school-supported, and student-owned, laptop for each student. With the potential for the same device to be used both at school and at home, a laptop opens up opportunities for student familiarity, and optimises device portability. Incorporating a laptop within a school educational program potentially opens up new avenues of teaching and possibly broadens learning experiences (Newhouse, 2014). Penuel (2006) identified three major characteristics of a 1:1 laptop program: (a) the provision of a laptop for each individual student imaged with a range of software and applications; (b) facilitating access to the Internet via a wireless network; and (c) a focus on using laptops for educationally related purposes.

One-to-one laptop programs began over 20 years ago in schools (Johnstone, 2003). Research has not been able to keep up with the exponential growth of 1:1 laptop initiatives (Warschauer, 2006), although considerable discussion of these programs has occurred. For example, Penuel (2006) located 30 implementation and outcome studies of 1:1 laptop programs with a specific focus on wireless connectivity to access the Internet in schools. These studies focused on the implementation of 1:1 initiatives and the associated potential impacts. Findings from the implementation studies provided some signposts for success. However, Bebell and O’Dwyer (2010) and Weston and Bain (2010) suggested that 1:1 laptop research
has focussed mainly on the implementation process and whether or not “it works”, without sufficient evidence of the impact on the student experience, teacher effectiveness and parent involvement.

Some of the key critiques of research identified by the Organisation for Economic Co-operation and Development (OECD) Directorate for Education (Valiente, 2010) were:

- a lack of consistent evidence from monitoring and evaluations of 1:1 laptop initiatives;
- most of the evaluations are descriptive about the implementation without a measure of how devices are used in classrooms; and
- more knowledge between implementation characteristics and academic gains is required.

The OECD study is pertinent to this research, which has a particular emphasis on providing a deeper understanding of teaching and learning practices that emerge in the 1:1 laptop classroom. Laptop use can prove to be a powerful partner in the learning process, yet 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). With debate about the cost, the educational benefit, or impact, and effect of 1:1 laptop programs, the emergence of other 1:1 devices like iPads, the literature indicates an urgent requirement for further research into how to best harness 1:1 environments for the benefit of student learning (Borja, 2006; Jaillet, 2004; Lei & Zhao, 2008; O'Dwyer, Russell, Bebell, & Seeley, 2008; Schatter, 1999).

This research differentiates itself from past research in that its focus is on boys’ education and its design is longitudinal. Firstly, it focuses solely on boys, specifically looking at how boys utilise their personal laptops for learning in both a junior (primary) and middle (secondary) school setting. Boys’ education has received attention over the past decade, in particular in Australia where enquiries into issues associated with boys learning have led to better understandings about how boys’ learn differently from girls (Collins, Batten, Ainley, & Getty, 1996; Collins, Kenway, & McLeod, 2000; Hyde, 2005). Research such as the Boys’ Education Lighthouse Schools project (BELS) (DEEWR, 2007) which sought insight into how
to better support boys in their learning has contributed to this literature. Furthermore, it was widely recognised that there are specific learning differences between males and females (McCoy, Heafner, Burdick, & Nagle, 2001; Merisuo-Storm, 2006; Watson & Kehler, 2012). Some prominent differences included a greater number of boys than girls identified as “at-risk” in literacy (Epstein, Mac an Ghaill, & Rowan, 2002; Rowe & Rowe, 2002); boys reporting fewer positive experiences and enjoyment of schooling (Trent & Slade, 2001); boys becoming disconnected in their schooling (McConaghy, 2006); and boys becoming easily distracted and less motivated if lessons are inappropriately designed (Collins et al., 1996; Gresham & Gibson-Langford, 2012).

This longitudinal research targets the following key areas in relation to educational outcomes:

• types of laptop uses for teaching and learning focussing on operational, inquiry, communication, creativity and ethical dimensions;
• how boys use laptops to embrace 21st Century learning opportunities;
• self regulation and reflective aspects to learning; and
• impact of effective leadership, planning and evaluation.

Secondly, a number of research studies (Cavanaugh, Dawson, & Ritzhaupt, 2011; Dunleavy & Heinecke, 2007; Silvernail & Gritter, 2005) focus on the effectiveness of laptop programs and explore the extent to which there is educational improvement. However, as Lei and Zhao (2008) indicate, there is a need for further longitudinal empirical research to identify the long-term impacts of 1:1 programs. Further, there is also a need to explore and develop assessment practices at the institutional level and beyond that evaluate student learning with digital technologies (Beetham & Sharpe, 2013; Bocconi, Kampylis, & Punie, 2013; Newhouse, 2013).

This research is presented as an in-depth longitudinal case study, which covers a three year time span and proposes a method of inquiry that searches for evidence of long term impacts on the student experience, teacher effectiveness and parent involvement. The research seeks to make an applied and theoretical contribution to the existing knowledge base, providing a new knowledge that is both analytical and explanatory.
1.2 Purpose of the Study

This research engaged and tracked 196 male students and their families and 52 teachers for a three year period as they progressed through a boys’ school. It aimed to contribute new knowledge on how schools may consider implementing or refining an initiative such as a 1:1 program in relation to boys’ education. This study used mixed methods (Tashakkori & Teddlie, 2010) to build new knowledge about the possible impact laptops have in the education of boys. Distinctly focused on the education of boys, the objectives of the research centred on:

- student use of laptops for learning;
- teachers’ pedagogy and use of ICT for 21\textsuperscript{st} century learning;
- implementation differences between a junior and middle school;
- capturing parental perceptions of the 1:1 laptop program; and
- possible outcomes on learning with an emphasis on literacy and numeracy.

In order to reach these objectives, five overarching research questions were structured to guide the study. Table 1.1 presents the research questions.

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<th>Research Questions Guiding the Study</th>
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<td><strong>Research questions</strong></td>
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<tr>
<td>1. How do boys utilise their personal laptops?</td>
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<td>2. How are teachers engaging laptop technology for educational purposes?</td>
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<td>3. What educational impact, if any, did the 1:1 laptop program have on literacy and numeracy outcomes?</td>
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<td>4. What differences can be identified between junior and middle school implementation experiences in regard to research questions 1, 2 and 3?</td>
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<td>5. What implications do the findings from research questions 1, 2, 3 and 4 have for the future inclusion of one to one laptop or mobile learning devices in schools?</td>
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The views of parents was seen to provide a more comprehensive narrative of the implementation, particularly adding value to research questions 1, 3 and 4.
1.3 Context of the Research

The School involved in this research had an enrolment of approximately 1140 male students, enrolled in Year Four through to Year Twelve. There was a residential component attached to the School, which had some 204 boarding students. These students were predominantly from rural and regional settings with a small percentage (5%) of international students. The School had a total staff of 220, of whom 102 were teachers. This research focused on the student participants who were in Year Five (Junior School) and Year Seven (Middle School) at the inception of the research. Commencing in 2010, the School implemented a 1:1 laptop program. This program started with two year groups: Year Five (56 students: aged 10 to 11 years) and Year Seven (136 students: aged 12 to 13 years). Each student was required to purchase or lease an Apple MacBook laptop for use at the School each day. Students were required to take their laptop home each day and were allowed to use them for leisure and social purposes.

1.4 Background to the Study

The background to the study comprised the following: 1:1 laptop programs, features of the 1:1 implementation, policy background, the Australian Curriculum, boys’ education, and how laptops are used for teaching and learning.

1.4.1 One-to-one laptop programs

Research based evidence available about the educational benefits of 1:1 laptop teaching and learning programs has continued to grow in recent years (Broussard, Hebert, Welch, & VanMetre, 2014; Penuel, 2006; Rosen & Beck-Hill, 2012). In reviewing the implementation of laptop programs in Canada, the United States and Australia, Alberta Education (2006) found that students from kindergarten to year 12 attained 21st century skills, improved writing, increased the quantity and quality of work, and increased motivation. There is no one single definition of what 21st century skills are; however, there is an understanding that 21st century skills focus on complex thinking, learning and communication skills, and are more difficult to teach compared to rote skills (Saavedra & Opfer, 2012). Other outcomes included improved attendance, increased teacher motivation, positive changes in teaching and
learning environments, increased parental and community involvement and improved home-school communication. However, the study also found that there had been a lack of appropriate professional learning and technical support, sustainability, increased costs, lack of vision, leadership, planning and evaluation, as well as an increase in costs and sometimes competing educational priorities. The study concluded that successful 1:1 laptop programs tend to take a holistic approach by involving the whole school community.

Recent research about the introduction of 1:1 laptop programs recognises higher levels of engagement in learning (Bebell, 2005; Keengwe, Schnellert, & Mills, 2012; Won Hur & Oh, 2012); increased use of laptops for writing (Grimes & Warschauer, 2008; Penuel, 2006); the use of laptops for cooperative learning (Dunleavy, Dexter, & Heinecke, 2007; Fairman, 2004); and improved ICT integration for teachers (Cowie, Jones, & Harlow, 2011; Russell, Bebell, & Higgins, 2004; Rutledge, Duran, & Carroll-Miranda, 2007). However, there still appears to be mixed results in terms of academic achievement, with a call for more research into the impact of 1:1 laptops on teaching and learning (Lei & Zhao, 2008; Russell et al., 2004).

1.4.2 Features of the 1:1 implementation

There are a number of different questions or decisions that school leaders may address in choosing a 1:1 laptop implementation strategy. These all played a role in decision-making processes at the School:

- What is the educational value of having a 1:1 laptop program?
- Should the School target a specific year or year levels within a school or implement a program across all year levels?
- Should the program be School funded or parent funded?
- Is it a take home or leave the laptop at school program?
- What type of device and operating platform would best serve the needs of students?

The study tracked the implementation of a 1:1 initiative at one school. Prior to the implementation, the School gathered input from teachers and community members regarding how best to adopt a 1:1 laptop program. After this consultation, it
was decided by the School that there were a range of reasons for implementing a 1:1 laptop program including that:

- it was thought that it provides a student-centred and rich educational experience for the 21st century;
- it was seen to actively engage boys in the learning process;
- it was perceived an effective and efficient way of supporting each boy’s learning journey;
- it provides students with complete ownership of their learning device and control over their own learning environment;
- it connects education at the case study school with today’s technological world; and
- it enhances accessibility to programs that increase the development of knowledge and educational opportunities.

The laptop implementation involved Year Five and Year Seven students simultaneously. The School believed that introducing the laptop program in both junior and middle school would provide opportunities to develop and improve the laptop program over time. Parents of the students at the School were also consulted about the 1:1 laptop program and the financial approach of funding such a program. It was decided a parent-funded, school-supported, take home 1:1 laptop program would best serve the needs of families and the students.

Choosing the technical platform was a significant decision for the School. After visiting nine schools across Australia, the Apple Macintosh platform was chosen as the device best suited for the needs of the students. A central factor of the decision was the inbuilt feature known as parental controls within the Apple Macintosh operating system, allowing parents the ability to access time limiting settings and analytics on features such as Web use. The School was concerned about the possible distractions or impact the 1:1 program may have on student learning or families. Therefore, the School believed the parental controls could help parents regulate the use of the laptop at home if required.
1.4.3 **Policy background: Australia**

Western Australia has a long history of 1:1 laptop implementation perspectives. In 1993 a private school in Perth, Presbyterian Ladies’ College, was one of the first schools in Australia to implement a 1:1 laptop program, with children owning their own laptops. In 2003, the then State Minister for Education in Western Australia (Carpenter, 2003) made the decision to implement a State-funded laptop program in the public schooling system at John Willcock College in Geraldton (Newhouse, 2008b). The provision of one laptop per student and teacher played an important role in informing the case study School with information about the range of factors that should be considered when planning a move towards 1:1 laptop provision.

From a national perspective, in 2008 the Australian Government officially launched the Digital Education Revolution (DER) and allocated funding of $2.4 billion for the DER initiative. This funding was set aside for the National Secondary School Computer Fund (NSSCF). The fund provided for new or upgraded ICT, with the goal of providing a 1:1 computer to student ratio for all school students in Years Nine to Twelve. This funding clearly indicated the large scale economic support for digital learning technologies (DEEWR, 2009). With a change of government in 2013, funding of the DER came to a close leaving many school communities (public, private and independent) with mixed views about the effectiveness of the DER. Further, the incoming government was focused on other priorities in compulsory education, particularly in relation to a fair and equitable funding model. This shift resulted to some extent in a financial and policy vacuum for the ongoing support of 1:1 computer initiatives.

1.4.4 **Australian Curriculum**

Further to these changes to the digital landscape in education, Australian schools have also been in the middle of the introduction of a national curriculum. Since the onset of the Australian Curriculum (ACARA, 2013), ICT has remained at the forefront of one of the seven general capabilities for learning, which include literacy, numeracy, ICT, critical and creative thinking, personal and social capability, ethical understanding and intercultural understanding.
There are five key organising elements recognised for teaching and learning with ICT: applying social and ethical protocols and practices when using ICT, investigating with ICT, creating with ICT, communicating with ICT, and managing and operating ICT. These five interrelated elements were based on the Statements of Learning for ICT developed by the Australian Ministerial Council for Employment, Education and Training and Youth Affairs (ACARA, 2010a; MCEETYA, 2006). These organising elements provide Australian teachers and students an established framework on how to use ICT for teaching and learning. However, research reveals the types of uses for which laptops are used in classrooms can vary and result in debatable educational outcomes (Bate, 2010b; Goodwin, 2011; Larkin, 2012; Macnish & Trinidad, 2005; Weston & Bain, 2010). The current research can contribute to resolving this uncertainty by presenting an in-depth case study comprising of perceptions of students, parents and teachers along with observations and robust artifacts such the National Assessment Program for Literacy and Numeracy (NAPLAN).

1.4.5 Boys’ education

Boys’ education has attracted a good deal of attention in educational literature within schools across Australia and internationally (Bleach, 1998; Cresswell, Rowe, & Withers, 2002; DEST, 2006; Epstein, Elwood, Hey, & Maw, 1998). As recognised by Hodgetts (2008), the notion of underachievement is a prominent area of concern with girls consistently outperforming boys in standardised assessments in literacy, and boys more likely to have diagnosed learning difficulties. Continual improvement of education for students, and in particular for boys, depends on a tailor-made curriculum actively looking to engage and improve learning for boys. Differentiated learning for boys is vital, and recognising that boys have more than one learning style is crucial for catering for a wide range of abilities. As identified by Santangelo and Tomlinson (2012), teachers must teach in ways that demonstrate the differences in learners and maximising their capabilities. For example, this can be done by varying the difficulty of a task, determining the area of interest for the student or understanding the students’ learning preferences (Algozzine & Anderson, 2007). Schaumburg (2001) claimed that boys have a natural affinity with computers and arguably a more confident approach than girls in using computers for learning.
Additionally, boys generally prefer mathematical, logical, spatial and hands-on approaches to learning (Butz, 2003). A 1:1 laptop program is one approach that can differentiate teaching and learning and respond to individual learning styles. Therefore, the research is concerned with finding out if a 1:1 laptop program promotes a greater depth of learning and if better outcomes emerge for boys, particularly in literacy and numeracy.

In 2005, the Australian Federal Government engaged James Cook University and the Curriculum Corporation to develop and trial a professional learning program for teachers working with boys in the compulsory years of schooling. Between 2006 and 2007 this program, called Success for Boys, provided schools with funding to take up professional learning in boys’ education and incorporate it in their daily practice. The program focused on the following key intervention areas: effective literacy teaching; the use of ICT as a means of improving boys’ engagement with active learning; giving boys mentoring opportunities from both within and beyond the school; and supporting Indigenous boys (DEST, 2006). In the final report by DEEWR (2008) titled “Evaluation of the Success for Boys Program” the findings revealed teachers identified ICT as a tool for improving engagement for boys, particularly those at risk within the classroom.

Computers continue to be used for learning, and can have a role in helping boys who experience difficulties with learning (Gurian, 2011). Lei and Zhao (2008) highlighted that re-engagement of such students can be achieved through the interactive nature of laptops and the availability of rapid feedback, which enables students to form new knowledge and enhance their understanding. Wilkes (2006) believed 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 and so it is possible that they might involve themselves in writing tasks with the multimedia capabilities of computers.

When considering the advantages and disadvantages of a 1:1 laptop program with reference to boys’ education, important issues should be addressed to ascertain the impact on student learning outcomes. According to Prensky (2001) students are not in need of improved content, but of dynamic teaching approaches that promote greater understanding and 21st century learning skills. The use of ICT allows
students to transfer skills in different contexts, promoting opportunities to reflect on their thinking, and practise addressing their misunderstandings, and collaborate with their peers (Saavedra & Opfer, 2012). Learning needs to be motivational and connected, and in order to learn, students require authenticity and relevance to what is taught. According to Hennessy and Murphy (1999) this authenticity and relevance, involves situations that are real for students, to their lives, and to situations they may face in their future workplaces. Therefore, separating lifestyles and learning for boys might be considered an ineffective practice. For example, research on children and digital games has shown boys are more likely to play digital games and simulations than girls (Aarsand, 2010). Therefore, it may be possible to leverage off this interest in digital games by presenting educational activities and content using a gaming metaphor or indeed games themselves.

Using ICT wherever possible, across all tasks, from information gathering to the publication of a boy’s work, may be a valuable conduit for boys to engage in learning. Research by McCoy, Burdick and Nagle of male and female students’ computer use and attitudes in a technology-rich environment (2001, p.5) revealed:

Comparison of use category scores by gender found differences for males and females. When the data was analysed further the only difference was that males used their computer for games and music. Attitudes towards computers were positive, and were not different for males and females, but the males rated their computer expertise higher than females.

Using 1:1 laptops for games and music is risky as these activities may not be deemed as appropriate in the context of daily education, and possibly a distraction for learning. The manner in which laptops are managed for learning can depend on the views of teachers and parents, and also student attitudes towards learning (Erdogan et al., 2010). However, the researcher was interested in developing a deeper understanding of laptop use, and therefore knowledge on how to manage risks such as distraction may be invaluable.

1.4.6 Using laptops for teaching and learning

The implementation of 1:1 laptop education can have an impact on the teaching and learning dynamics in the classroom (Corkeron, 2000; Donovan & Green, 2010; Goodwin, 2011). The use of laptops is wide-ranging, as teachers have a great deal of freedom in terms of teaching and learning (Dunleavy et al., 2007;
Judson, 2006). There are indications that access to laptops, facilitates the implementation of inquiry based methods, as opposed to memorisation and practice, as well as more interdisciplinary approaches that value cooperative learning (Fairman, 2004). However, recent research has also highlighted various teacher concerns regarding laptop use for learning, or the distractions faced (Donovan, Hartley, & Strudler, 2007; Hatakka, Anderson, & Grönlund, 2013); the added value of such programs (Goodwin, 2011); difficulties in multi-tasking (Sana, Weston, & Cepeda, 2013); and the impacts on student achievement (Gulek & Demirtas, 2005).

Examples of specific concerns are:

- the personal impact for teachers about how laptops are used for teaching and learning;
- how to meet the needs of the students when using laptops;
- the impacts of 1:1 laptops on educational attainment;
- the possible distractions faced when multi-tasking and learning; and
- the pressures of meeting content driven expectations within subjects in preparation for assessments.

In light of these concerns, a common challenge is helping teachers develop the expertise required to harness the power of 1:1 opportunities (Stanhope & Corn, 2014). This challenge goes beyond the lack of teachers’ ICT skills and involves critical issues related to teachers’ pedagogy and beliefs towards ICT use (Windschitl & Sahl, 2002). Being aware of one’s pedagogical approach and beliefs towards ICT use then challenges teachers to thoughtfully guide student learning within digital environments, which are potentially richer and more complex than traditional print media, presenting high quality and challenging learning opportunities for both themselves and their students (Leu, Kinzer, Coiro, & Cammack, 2004). This research recognised the significance of communicating how laptops are used within a framework for teaching and learning and the potential for transformational ICT use by students and teachers.

1.5 Significance of the Study

The primary aim of this research was to investigate the implementation of a 1:1 laptop program and how this may affect the education of boys. Some of the factors
believed to be important in the implementation of a laptop program were: student and teacher laptop use (Grimes & Warschauer, 2008); monitoring the educational impact on student achievement (Muir, Knezek, & Christensen, 2004); and student motivation and engagement (Russell et al., 2004). Other factors include identifying key differences or similarities in junior and middle school implementation experiences (Warschauer, 2005) and providing meaningful professional support for all staff involved in 1:1 programs, in order to maximise the potential of software for enhancing student learning (Owen, Farsali, Knezek, & Christensen, 2005).

Clarification and consideration of these factors will inform educational literature, and provide a road map for schools wishing to implement 1:1 learning, particularly in boys’ education.

This research aimed to fill a vacuum in the literature by specifically focusing on boys’ education and how boys use laptops for learning. According to Bebell (2005), Roschelle (2003) and Hatakka et al. (2013), further research is needed to provide a deeper understanding of the learning processes with the implementation of a 1:1 laptop program and how laptops are optimised in teaching and learning environments. Bennet, Karl, and Kervin (2008) advocate teachers, administrators, policymakers and parents have every right to demand evidence and to expect that requests for change be based on well-founded and supported arguments. For a 1:1 program to have success in a school, a clear direction is required by all the participants involved to facilitate worthwhile change. Therefore, it is important for policy, research and leadership to cooperatively work together in ways to successfully implement ICT for learning in schools (Voogt, Knezek, Cox, Knezek, & ten Brummelhuis, 2013). With limited research and literature in the area of laptop use by boys, it is anticipated that this study will add to existing knowledge about 1:1 laptop programs and the effect on boys’ education.

From a methodological standpoint, the research adopted a mixed methods approach (Tashakkori & Teddlie, 1998) and was guided by a pragmatic paradigm where areas of interest can be studied embracing methods that are appropriate. Qualitative and quantitative data are combined to construct a set of findings that are intended to give descriptive and measured understandings into the ways laptops are used for learning and the effects laptops have on learning for boys. This thesis collected evidence using mixed methods to enhance the explanatory potential of the
research taking into account the broad and increasing amount of literature on 1:1 laptop and mobile device programs.

Through the dissemination of key findings from a case study school over a three year period, this research provides guidances for boys’ schools or coeducational schools on a national or international level. It aimed to take account of, and where appropriate develop, the existing conceptual frameworks that have contributed to a deeper understanding of the complex relationships between learning and technology. These included:

- how ICT is used for teaching and learning (ACARA, 2010a; Bruce & Levin, 1997; MCEETYA, 2006);
- using learning attributes to evaluate the impact of ICT (Newhouse & Clarkson, 2008);
- effective methods of ICT integration for learning (Mishra & Koehler, 2006); and
- understanding the characteristic forms of teaching and learning in specific content areas - signature pedagogies (Shulman, 2005).

An explanation of these frameworks including how they are relevant to this study is provided in Chapter Two of the thesis.

1.6 Organisation of the Study

This thesis contains nine chapters. Chapter One has provided a context and background for the study and stated its purpose and significance. Chapter Two has two distinct areas of focus. Firstly, it presents a review of the literature of 1:1 laptop programs, teacher and student use of laptops, and the possible impacts of 1:1 laptop programs. Secondly, it provides a theoretical framework as a lens for understanding the study, from its methodology through to its interpretations and discussions of findings. Chapter Three provides an explanation of the research methodology engaged for this study. An explanatory framework is used involving consideration of both qualitative and quantitative data sources as part of the mixed methods approach. Chapters Four to Seven present the data and identify a number of key themes that have emerged from the study. Chapter Four details findings in relation to teachers’
experiences. Chapter Five focuses on findings associated with boys’ laptop use. Chapter Six presents the findings from parent perceptions. Then Chapter Seven highlights findings as they pertain to student performance in literacy and numeracy. Chapter Eight elaborates on the inferences made in the findings. Finally, Chapter Nine concludes this thesis and presents the limitations of the study and possibilities for further research and scholarship into 1:1 laptop implementations.

Chapter Two will now review the literature that has informed this study.