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

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CHAPTER 8. Discussion

8.1 Chapter Overview

The purpose of this discussion chapter is to present the main themes from the four findings chapters and to set these within a contemporary research context as defined by the literature review. Four research questions directed the study that investigated how students utilised their laptops, teacher engagement with the laptop technology for learning, the educational impacts on literacy and numeracy outcomes and the implementation differences in a junior and a middle school setting. This chapter focuses on addressing research question five: “What implications do the findings from research questions 1, 2, 3 and 4 have for the future inclusion of 1:1 initiatives in schools?” The chapter endeavours to discuss the findings, acknowledging broader settings seeking to address the “so what?” that should guide both applied and theoretical research.

8.2 Key Findings

The study involved a sample of male students, from one school, their teachers and parents. However, the research questions, which investigated how students and teachers used laptops, offer an authentic account for the broader educational community.

The study adopted a mixed methods approach, which combined qualitative and quantitative techniques. This approach helped to ensure that the research questions were adequately addressed. The research aimed to investigate a 1:1 laptop program in a naturalistic setting as a longitudinal case study. The study sought to be gauged in relation to its credibility, transferability, dependability and confirmability (Trochim & Donnelly, 2006). The key findings of the study taking into account the five research questions are summarised in Table 8.1 to Table 8.5.
Table 8.1  
**Key Findings Relating to Research Question One**

1. How do boys utilise their laptops for learning?

- Students reported greater independence in learning with the use of laptops.
- Students used laptops creatively to develop documents, animations, digital artifacts, visual graphics, movies and presentations.
- Students used email as their preferred communication tool for school, whilst Skype and Facebook were used for communication purposes outside of school.
- Students used email as the preferred mode of electronic communication with teachers.
- Students exhibited a reliance on the Web to inquire.
- Students expressed a reluctant attitude towards accepting help from parents, believing they had an inferior skillset.
- Students indicated there had been a positive change in learning. They felt a greater sense of engagement and motivation towards learning. Teacher participants agreed that this was the case, although they maintained a need for balance in using ICT.
- Students expressed that using laptops made learning enjoyable, provided an efficient way to learn, and improved their ability to access a greater amount of information for learning.
- Students showed a higher level of proficiency in using ICT by the end of the study.

In confronting research question one the study revealed that students from both cohorts enjoyed using laptops for learning. Regardless of the possible distractions attached to using a laptop for learning, learner engagement, independence and ICT proficiency all increased. Students were reluctant to ask for parent help when using laptops, which is consistent with the identified theme of parent alienation. Furthermore, students articulated that the effectiveness of a 1:1 laptop program depended on how teachers used laptops to facilitate learning when teaching and managing a classroom of boys. Students believed a teacher needed to be active, engaging and have good classroom management skills in a 1:1 laptop environment.
Table 8.2

Key Findings Relating to Research Question Two

2. How are teachers engaging laptop technology for educational purposes?

- Teachers indicated students used laptops predominantly for managing and operating, investigating and creating with ICT.
- Teachers used a range of assessment methods when using laptops, including word processed documents, assignments, essays, investigations, presentations and a shift by the third year of the study to the use of subject area online assessments. Overall, high stakes summative tests were completed by pen and paper.
- Teachers facilitated an environment where students used laptops between 10-50% of lesson time by the third year of the study.
- Observations suggested teachers used laptops sparingly to tailor or differentiate learning for their students. This finding was in conflict with the views expressed in teacher interviews, where participants claimed to configure tailored and differentiated environments for their students.
- Teachers’ self-reported use of laptops as a scaffolding tool to support higher order thinking declined marginally as the study progressed. However, teachers continued to recognise the importance of integrating higher order thinking skills into their lessons.
- Teacher and student contact for learning post-school hours increased over the period of the research mainly through email communication.
- Digital gaming as innovative practice for teaching and learning was minimal. Teachers used web-based simulations in preference to online games.
- The ICT skills of teachers improved over the study, and they became increasingly comfortable using laptops to facilitate learning. In particular, improvement was demonstrated with the increased and varied use of the School portal.
- Teachers used laptops to increase learner independence.
- Teachers sensed collaboration and cooperation were important but resisted using ICT communication tools.

Teachers predominantly used laptops to promote student investigation and creativity. Since the introduction of the 1:1 laptop program, teachers believed there was less cooperation and collaboration in their classes. Laptops have been shown to be powerful tools (Keengwe et al., 2012) and providing each student with a laptop, presented students the ability to ‘fend for themselves’ and work independently. Teacher ICT proficiency increased in the areas of word processing, email, Internet, and spreadsheets. Overall, teachers were reluctant to embrace Web 2.0 technologies for teaching and learning, partly due to the systemic requirements such as the curriculum and also the fear of the unknown.
Table 8.3  
*Key Findings Relating to Research Question Three*

3. What educational impact if any, did the 1:1 laptop program have on literacy and numeracy outcomes?

- There were no statistically significant differences in mean scores in any category when comparing Cohort A to the pre-laptop cohort.
- Pooling the four areas of Spelling, Grammar and Punctuation, Reading and Numeracy for Cohort A, did not show a statistically significant difference, compared to the 2008 to 2010 pre-laptop cohort.
- The reduction in mean score for Cohort B between 2010 to 2012 in the area of Grammar and Punctuation was statistically significant (ANOVA, p < 0.01).
- Pooling the four areas of Spelling, Grammar and Punctuation, Reading and Numeracy for Cohort B, showed a statistically significant decrease in NAPLAN performance compared to the pre-laptop cohort (ANOVA, p < 0.01).

As mentioned in Chapter Seven, these results should be treated with some caution as the level of use of laptops varied between subjects and the overall aim of NAPLAN is to inform macro- rather than micro- level change initiatives. Therefore, correlating the data with increases to learning is challenging and underlines the need to prudently understand the contexts and nuances of specific cohorts in terms of performance.
Table 8.4  
**Key Findings Relating to Research Question Four**

4. What differences can be identified between junior and middle school experiences in regards to questions 1, 2 and 3?

- As Cohort A transitioned through the School the level of distraction fluctuated, whereas Cohort B reported the need to focus and stay on task reducing the reported level of distraction.
- Cohort A reported an enthusiastic outlook towards education and higher satisfaction levels compared to Cohort B, consistent with the views of Johnson and Holdway (2007) who believe primary school students have higher satisfaction levels.
- Laptop use for Cohort A marginally decreased from the first year to the second year before increasing in the third year recording similar usage rates as Cohort B. Laptop use for Cohort B increased gradually over time.
- Cohort B reported using the laptop as a management tool, whereas participants from Cohort A generally did not refer to the laptop as a management tool.
- Cohort B was more reluctant to ask for help and exhibited less of a tendency to involve their parents in their academic life.
- Laptops were used for assignments, homework, digital design and visual graphics at a higher level of skill in Cohort B compared to Cohort A.
- Cohort A preferred using asynchronous (e.g., email) forms of communication, whereas, Cohort B preferred using synchronous (e.g., Skype) methods of communication with their peers when using laptops.
- A higher proportion of students from Cohort B used social media (e.g., Facebook), compared to Cohort A.
- A single teacher environment such as a primary school compared to a secondary school appears to reduce the potential of the amount of unacceptable ICT use as noted between the cohorts.
- Parents from Cohort A were more positive about the 1:1 laptop program than parents from Cohort B.

Largely, the findings suggest that introducing a 1:1 laptop program in the junior school year group compared to a middle school environment could return better results. Although levels of distraction reduced for Cohort B, the first year of a middle school student is demanding in terms of the academic and social pressures attached to the transition from a junior school to a middle school environment. Similarly, teachers in single teacher environments such as a junior school, were able to demonstrate greater consistency in the way in which laptops were used for teaching and learning, and managing distractions.
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?

- Using high stakes testing to gauge change in literacy and numeracy performance including drawing inferences into how ICT contributed to these changes, should be supplemented by other measures embracing 21st Century learning.
- A school-wide approach towards targeted and structured professional learning emerged as a theme for improving teaching and learning with laptops. This professional learning specifically focussed on how teachers use laptops for collaboration, cooperation and differentiation.
- Teachers reported classroom dynamics since the onset of the 1:1 laptop program due to the potential for distraction had placed them on a steep learning curve.
- Teachers reported that they needed to develop their required knowledge and skills in using ICT for a smooth implementation of a 1:1 laptop program.
- Teachers shared a concern over the possible distractions associated with the use of a laptop and emphasised the need for rules and routines within a classroom. This concern prompted the School to implement a suite of changes to deter students from playing games, thus minimising distractions.
- Schools should consider the use of monitoring devices, implementing clear acceptable use frameworks, informing teachers of strategies of how to teach in a 1:1 class, and working with both the students and parents about the expectations of using laptops.
- Students reported the effectiveness of the 1:1 laptop program was related to how effective teachers were in delivering their planned lesson.
- Students believed an effective teacher in a 1:1 classroom needed to be mobile and active, engaging in delivery and not afraid to discipline students for contravening the Acceptable Use Framework.
- Students considered teachers who delivered a style of education tailored to their needs were essential in increasing their chances of learning.
- Students, teachers and parents believed a balanced approach for teaching and learning with the use of laptops was necessary.
- Parent perceptions of the 1:1 laptop program in the first year and the second year suggested a concern in relation to the impact of 1:1 laptops on learning. By the third year of the study, parents had softened in their view. However, parents remained cautious about an overreliance on the use of laptops mainly due to pen and paper approaches to assessment.

There was a good deal of variability in how laptops were used in the classroom. This variability was mainly grounded in subject area traditions, teacher beliefs and teacher skills sets. The necessity to support teachers was pronounced in terms of how to use laptops for, collaboration, cooperation, differentiation and higher order learning tasks. Additionally, managing distractions in 1:1 laptop classrooms...
was another area in which the School addressed from both a professional learning and management perspective. Generally, parents remained cautious about the benefits of laptops for learning and some found it challenging to understand how laptops furthered learning. Finally, students believed those teachers who embraced the 1:1 laptop program, by being active and mobile in the classroom, and were engaging, provided good learning experiences.

8.3 Paradoxes

The findings articulated in the preceding four chapters are both encouraging and challenging. Every finding that corroborates the successful implementation of the 1:1 laptop program at the School accompanies something that is problematic. A useful way in which to critically evaluate the 1:1 laptop program, therefore, is to unpack some of the contradictions revealed through the findings. This approach will enable the research to both affirm the successes of the 1:1 implementation and confront the challenges. The contradictions are presented as the following five paradoxes.

a) Paradox one - Autonomy and systemic dependency of schools: The study revealed that teachers at the School had a good deal of autonomy in which to optimise the use of laptops for learning. Further, the School provided a high-quality computer network, an array of ICT hardware and software, and a well staffed ICT support system. However, the School is situated in an educational system that has entrenched measures of success and drivers for change. Performance is typically measured by a narrow set of indicators based upon student performance in standardised tests. Collection of other data on incidental learning outcomes (e.g., digital literacy, problem solving skills) would provide greater texture and richness in gauging the success of educational change initiatives, particularly those involving ICT. A comprehensive evaluation process is crucial to the proper management of educational change initiatives (Bernhardt, 2014; Darling-Hammond, 2012).

b) Paradox two - Engagement and seduction of students: While students and staff noted increases in engagement and motivation, there was also a greater potential for 1:1 devices to exacerbate student distraction. Further, while the 1:1 laptop program created an environment of student independence and arguably a
greater level of self-direction, there were noticeable deficits in the use of 1:1 devices for communication between students. These deficits include using ICT to build and share knowledge and collaborate in groups. Finding an appropriate balance on when and how to use laptops is an ongoing challenge for teachers.

c) Paradox three - Hopes and fears of Web 2.0: The introduction of the 1:1 laptop program at the School was designed to enhance opportunities to communicate and connect via 21st century learning. However, the study found that collaboration and cooperation in classes actually decreased over the three years. Embracing Web 2.0 technologies requires a level of pedagogical knowledge that is typically not part of the skill set of graduating or experienced teachers. Although it is acknowledged many universities explore Web 2.0 technologies in their pre-service training, there is little evidence at the School of enthusiasm of Web 2.0 in teaching and learning.

d) Paradox four - Transformative and conservative pedagogical practices: The 1:1 laptop initiative at the School proved successful on measures of motivation and engagement. However, on these indicators it is noted that middle school students had a less positive experience than their junior school counterparts. An important consideration in planning a change initiative was found to be timing, both in staff and student readiness and in the context of other school priorities. The research noted inconsistencies in the extent to which teachers used laptops in practice. The School has reached a point where it needs to build a common laptop implementation philosophy, which will unite teaching communities and create a more consistent approach to the adoption of 1:1 devices.

e) Paradox five - Integration and alienation of parents: Although the School allocated significant resources to building a sense of community to help drive the 1:1 laptop initiative, it is evident that parents in particular felt a sense of alienation from their child’s education. There are certainly opportunities for the School to improve student communication with parents and parent knowledge of learning with laptops (e.g., communication of the vision or goals of the program).
8.4 A Model for Understanding how Policy Intersects with Reality

The empirical research literature on 1:1 laptop programs (e.g., Bebell & O'Dwyer, 2010; Hatakka et al., 2013; Lei & Zhao, 2008; Newhouse, 2014) provides a thorough foundation on which to consider the worth of implementing laptop programs in schools. Due to the multifaceted nature of schooling and time bound requirements for the teaching of content, laptop programs can create tension in an outcomes-focused space. Frameworks have been developed to conceptualise the use of ICT such as that proposed by Bruce and Levin (1997), where the use of ICT is differentiated into meaningful categories.

The model underpinning this study uses a metaphor of a ‘set of cogs’ and ‘spanners in the works’ inhibiting the cogwheels from turning in unison. This framework is shown in Figure 8.1 via the diagrammatic use of the cogwheels and spanners. The four cogs of leadership, creative teachers, inquisitive students and National and State policy directions represent what the study has found to be crucial in the creation and maintenance of a quality 1:1 teaching and learning environment. Each cog offers opportunities to enhance well-managed student-centred approaches to learning through the use of mobile devices. Using the cogwheels as a conceptual framework emphasises the goals within each of the cogs with an overarching goal of developing students as self-regulated, reflective and life-long learners. Wedged into each of the cogs are the ‘spanners in the works’, the possible hindrances attached to a 1:1 laptop program for schools. These are essentially the paradoxes discussed previously. Confronting these spanners will ultimately lead to a smoother functioning of the machinery of 1:1 laptop schools.
Figure 8.1. A model for 1:1 laptop implementation based on the core themes to emerge from the research.

The conceptual framework proposed in this thesis provides insights into areas of significance for future 1:1 implementations and builds on previous frameworks of others (ACARA, 2010a; Bruce & Levin, 1997; Lei & Zhao, 2008; MCEETYA, 2006; Mishra & Koehler, 2006). The paradoxes (spanners) are now discussed in detail.

8.5 Paradox One: Autonomy and Systemic Dependency of Schools

Teachers and parents were concerned with the issue of assessment and the fundamental requirement to complete tests (e.g., NAPLAN and Western Australian Certificate of Examinations - WACE) in a written format. Most assessments at the School were conducted using a conventional pen and paper approach, whereas the majority of task-based assignments were completed using laptops. This predicament uncovered another pertinent issue of the problems linked with measuring academic outcomes when using laptops for learning.
Using NAPLAN as an indicator to monitor literacy and numeracy performance at the School was important for school leadership as the data formed the basis of designing improvements for student learning. This approach is consistent with Wildy and Clark’s (2012) recommendation that schools need to adopt a long-term view, taking time to understand the data, to inform change. However using NAPLAN results as the primary measure in determining the impact of the laptop program was problematic. NAPLAN is not designed to test students’ digital competencies or creativity, and it is, therefore, difficult to pinpoint if using laptops had caused students’ NAPLAN scores to increase or decrease. Factors such as the impact of the teaching and learning program (Schleicher, 2011), previous learning deficits and family backgrounds (Hartas, 2011) could potentially play a part in the variability of these results. As seen at the School, the rate of improvement between the two cohorts was different. The rate of improvement varied over time, as students shifted from a junior to a middle school setting. As shown by teacher and parent perceptions, the overwhelming fear was that lack of writing ‘pen in hand time’ would negatively impact on the students’ written examination performance.

The study presents a suite of identifying measures that could help in measuring academic outcomes, relative to the conventional forms of assessment such as NAPLAN. Cassidy (2004) reported that how teachers approach learning situations with the use of laptops has an impact on performance and achievement of learning outcomes. Therefore, a range of strategies may need to be included when using laptops as part of an effective assessment program. The following suite of measures has the potential to provide some guidance in considering such inclusions for teachers, school leaders and tertiary institutions:

### 8.5.1 Assessing or measuring creativity

With a focus on 21st Century learning in education systems across the world, creativity can easily be left in isolation in the context of assessment considerations. Schools have the potential to provide rich ICT experiences to promote a culture of creativity. Sawyer (2012, p. 8) provides a sociocultural definition, “creativity is the generation of a product that is judged to be novel and also to be appropriate, useful, or valuable by a suitably knowledgeable social group.” Providing students
opportunities to peer review or using external judges may validate or assist assessing or measuring the examples of creativity in schools.

Typical school reporting methods do not provide students with a grade for creativity, as was the case at the School. However, what laptop programs offer is the potential to use the device as a medium to approach higher order thinking skills and simultaneously be connected with the world seamlessly. This level of global connectivity opens a range of collaborative learning opportunities with other students and professionals across the world.

Mishra and Henriksen (2013) recognised difficulties in assessing or measuring creativity due to the subjectivity in any open-ended, complex or problem solving work or higher order thinking tasks. However, in terms of a 1:1 laptop program, as demonstrated at the School, student participants exhibited high levels of creativity (e.g., creating movies and animations) through the use of ICT. Anderson and Krathwohl (2001), in their revised version of Bloom’s Taxonomy considered creativity to be higher in the cognitive domain as seen in Figure 8.2.

Figure 8.2. Revised Bloom’s taxonomy by Anderson and Krathwohl (2001) drawn by Churches (2009, p. 3).

Bloom’s revised taxonomy by Anderson and Krathwohl (2001) focused on the development of higher order thinking skills and are listed in the first section of
Table 8.1 (as seen below). Churches (2009, pp. 2-5) added to the revised taxonomy by providing digital examples of each element of the taxonomy. The examples are shown in the second section of Table 8.1, which form part of a merged example of the modifications to Bloom’s taxonomy.

Table 8.6
Revised Bloom’s Taxonomy by Anderson and Krathwohl (2001, pp. 67-68) and Bloom’s Digital Taxonomy by Churches (2009, pp. 2-5)

<table>
<thead>
<tr>
<th>Author</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson and Krathwohl</td>
<td>Remember</td>
<td>Understand</td>
<td>Apply</td>
<td>Analyse</td>
<td>Evaluate</td>
<td>Create</td>
</tr>
<tr>
<td>(2001)</td>
<td>Recognising, recalling</td>
<td>Interpreting, exemplifying, classifying, summarising, inferring, comparing, explaining</td>
<td>Executing, implementing</td>
<td>Differentiating, organising, attributing</td>
<td>Checking, critiquing</td>
<td>Generating, planning, producing</td>
</tr>
<tr>
<td>Churches (2009)</td>
<td>Bullet pointing, highlighting, bookmarking, social networking and social bookmarking</td>
<td>Advanced and Boolean searching, blog journaling, categorising, commenting and annotating, and subscribing</td>
<td>Operating, playing, uploading and sharing, and editing</td>
<td>Mashing, linking, validating and tagging</td>
<td>Blog/commenting and reflecting, posting, moderating, collaborating and networking, and testing</td>
<td>Programming, filming, animating, video casting, podcasting, mixing and remixing, directing and producing, and publishing</td>
</tr>
</tbody>
</table>

8.5.2 Assessing 21st century digital skills

To assess 21st century learning skills, defined previously in the literature review as skills focusing on complex thinking, learning and communication skills, the School may need to look at a broad range of measures as an indication of the impact of laptops on learning. Griffin et al. (2011, p. 24) suggested 21st century standards and assessments should consider the following 10 principles:

- align with 21st century goals;
- incorporate adaptability and unpredictability;
- be largely performance based;
- add value for teaching learning;
- make students’ thinking visible;
- be fair;
• be technically sound;
• be valid for purpose;
• provide feedback to build capacity for educators and students; and
• be part of a comprehensive and well-aligned system of assessments designed to support the improvement of learning at all levels.

One of the challenges of integrating ICT into the curriculum is ensuring that developing and assessing 21\textsuperscript{st} century digital skills do not negatively impact on NAPLAN and WACE performance. Using these 10 guiding principles for designing assessments focused on meaningful learning could help the School transform future assessments and learning that fosters an approach of including 21\textsuperscript{st} century learning. Equally, in terms of fitting in with NAPLAN and WACE imperatives these principles could help students to improve their problem solving capacity and subsequently help their overall performance in assessments that require students to solve complex problems.

8.5.3 Post-school impact

Another feature of the 1:1 laptop program that is difficult to measure is the impact that the 1:1 laptop program may have on student development post-school. Both students and teachers indicated their level of ICT competency improved over the study. This skill development is relevant in terms of learning for the future and supporting life-long learning. Therefore, a student’s preparation for post-school life could well be aided with sustained ICT rich environments as provided at the School. Teacher Participant 62 believed learning with laptops was essential for this readiness:

\begin{footnotesize}
We often get questioned about why we have laptops, because they are boys, they are youngsters, so why are they not using pen and paper, and I always think, when they get out into the real world, they are going to have to use laptops, ICT. Most work places do not do pen and paper, they do IT, so this is a way of teaching them from a younger age of how to use the IT that is available to them, the appropriate use of it, how to be good stewards of it, what is appropriate and not appropriate. So for me, it is more of a life skills learning thing than it is about what they are getting out of it specifically for a subject. (C622012)
\end{footnotesize}
With society having such a strong reliance on the use of ICT in the workforce, 1:1 laptop programs could act as early developers for the required skill acquisition students may need for learning post-school. Schools that adopt 1:1 programs might be a bridge between the student and their future position in the workforce (Kozma, 2005).

### 8.5.4 A visionary educative ICT agenda involving the whole school community

As indicated in the model for understanding how policy intersects with reality, schools require proactive leadership with a visionary educative ICT agenda developed with the school community. Implementing a laptop program requires a consultative approach with teachers, students and parents to create a sense of shared understanding. Developing an ICT agenda with a focus on improved learning through 21st century approaches, the continued education of staff, and communication to parents could help prepare school communities for such implementations. The community approach could be as practical as providing the following:

- informative and frequent snapshots of what is taking place in a school with the use of ICT;
- allowing parents access via school-based portals or websites to see student work;
- provision of open sessions for parents to witness the educational vision of the school when using laptops;
- parent training or coaching of key ICT aims or goals; and
- involvement of staff and external members of the community as part of an innovation network to provide the school with ideas.

The School attempted to provide these strategies to promote a greater buy-in from the students, teachers and parents involved in the 1:1 laptop program. Across the three years of the study the School was determined to minimise the chances of remaining educationally idle, falling behind in ICT standards or implementing the program for the sake of it. The significance of effective school leadership within
schools is, therefore, highlighted and is supported by the available literature (e.g., Newhouse, 2012; Ottestad, 2013; Yuen, Law, & Wong, 2003).

In summary, measuring academic outcomes when harnessing 1:1 laptops for learning is complex. Using NAPLAN as an indicator provides valuable information for schools. However, the opportunity to embrace new approaches for assessing or measuring creativity; embracing 21st century learning; and involving a school community to form a visionary educative ICT agenda are some ideas schools may consider when addressing measuring the academic outcomes in a 1:1 environment.

8.6 Paradox Two: Seduction and Engagement of Students

8.6.1 The seductive power of digital technologies

Managing distractions within classrooms is not something new. Classroom control and management as explained by Charles (1981) and further discussed by Tauber (1999) are integral to effective teaching and learning. Prior to the introduction of ICT in classrooms, students could be off-task, distracted and generally disengaged. Students in the 21st century are immersed in a world of technology where social media and games are distractions that can divert their attention from learning (Hatakka et al., 2013). Managing these distractions increases classroom management exponentially as a challenge for teachers. How the School managed student behaviour with the use of ICT was complex, as students pushed the boundaries when using laptops, and there was no easy fix. This tendency is consistent with the observations of Hope (2005). An example of this was when students gained parent passwords (some parents elected to give their son their administrator password) to circumvent parental controls of their laptop. This enabled some students to be the administrator of the device and manage their laptop accordingly. The School had to act on this and apply a new level of administration, which eventually handed the control back to the School, however this took time and required external support and resourcing.

The research indicated that leisure-oriented gaming is commonplace between students in years five and nine, though mainly either offline, on mobile devices or through 3G or 4G networks. Teacher participants taking part in the study were
generally unconvinced of the benefits of using digital games as a core component of their pedagogical approach. Leisure-oriented gaming had a detrimental impact on the culture of learning at the School and, according to parents and teachers at least, it was distracting for students who wanted to learn. The main reasons cited for student gaming were either boredom with the teaching approach, an inability to understand the value of subject matter and/or the existence of teaching practices that allowed gaming to flourish in the classroom.

Presenting students at the School with a personal laptop was a little like giving a set of car keys to a restless adolescent, eager to experience the thrill of the open road. Like a driving instructor explaining the road rules before handing over the keys, the School earnestly put in place policies, procedures and support mechanisms to help students on their journey. It also constructed a transparent policing system, and from time to time instituted a ‘blitz’ to ensure that rules were observed. To a certain extent the controlled 8.00 a.m. to 5.00 p.m. environment within the School network was successful. Contraventions of the School’s Acceptable Use Policy were under control at the conclusion of the research, and there was a sense of optimism about the pedagogical possibilities of laptops. However, the risk of wasteful, off-task and even subversive uses of digital devices was ever-present both on campus and in students’ homes. Students in the digital world can readily use multiple devices (e.g., mobile phones, iPads and home computers), configuring these devices to run on a variety of networks (e.g., devices linked to mobile phones that act as Personal Hotspots). Further, students can download or share videos, images and software via Bluetooth networks or memory sticks before entering the unregulated offline environment to consume content or play games.

Any ‘carrot and stick’ approach clearly requires a sophisticated educative dimension. However, whereas in the past, teachers and parents were able to role model appropriate behaviours and actions, in the digital world many parents and teachers feel alienated by a lack of expertise. So what can be done? This study acknowledges the management of student distraction as a critical success factor in the implementation of 1:1 devices in the classroom, and does not attempt to offer flippant ‘silver bullet’ solutions. The research of Bate, Macnish and Males (2012a) highlighted the need for a holistic model to the management of student distraction, which included the following: documented ICT policies and procedures; robust ICT
built around safety; ongoing monitoring of how 1:1 devices are used by students; active use in the classroom; community approach; and active involvement of parents. The following ‘building blocks’ approach, Figure 8.3, illustrates this holistic model for managing distractions.

Figure 8.3. Building blocks for effective management of distraction in a 1:1 environment.

The four sequential steps of the effective management of distraction model comprising of active teaching and active task creation, buy-in from students, community involvement, and deterrents to stop unacceptable use of ICT all play a role in managing distractions in a 1:1 environment.

Data from students, staff and parents collected over the course of the study suggests that policies and procedures are well documented and well understood. The
selection of Apple laptops which included a parental controls feature, coupled with the work done at the School to ensure that these controls were not compromised within a networked environment, indicates a strong and effective ICT environment. Further, the e-safe monitoring program implemented after the first year of the study had a remarkable impact on reducing inappropriate behaviours on the School network, particularly in relation to pornographic material (Bate et al., 2012a). Data from parent, student and teacher survey questionnaires and interviews at the conclusion of Year One suggested a requirement for more thorough student monitoring and, as a result, the School introduced a key-logging monitoring program in Year Two. Key-logging provided the School with further information about the types of websites being accessed by students. e-Safe Systems Limited, a United Kingdom based company, was contracted to monitor student use of their laptops whilst on the School’s network. e-Safe offered a key-logging monitoring service that recorded potentially suspicious images and text typed as search requests, and inappropriate websites accessed (E-Safe, 2011). The School received detailed analytics of what might be inappropriate material for evaluation, without blocking websites, and where necessary, action was undertaken.

One area identified for potential improvement was the ongoing monitoring of how the teacher engages students in using their 1:1 devices. This issue is raised by Teacher Participant 52, who believed the importance of constantly evaluating laptops use was essential in minimising distractions:

I think with any device if we are not engaging the boys with the right activity or the right timing for an activity eventually boys do turn to gaming because they’re bored in the classroom. So as much as it is a student’s responsibility to stay on task, it’s also the teacher’s responsibility to reflect on the activity and ask them, ‘Why isn’t this working?’ or ‘Why have I not been able to keep them on task during the lesson? Is it the way I structure up my lesson? Do I need to break it down into smaller segments and feedback more often?’ These are things that teachers need to ask themselves to make sure that these distractions are less of an issue. (C522012)

If students engage with interesting and well-designed activities using ICT, then the tendency for distraction will be lessened (Postholm, 2007). The appointment of an ICT specialist at the School to help teachers envision opportunities to integrate ICT had a positive impact. Further, the development of an ICT educative agenda (Vanderlinde, Van Braak, & Tondeur, 2010) which involved the whole school community, embraced the variety of ICT, acknowledged the ways in which devices
interact, and discussed ICT strengths, weaknesses, opportunities and threats, generated a greater sense of ownership amongst all participants in the 1:1 implementation. Framing and implementing this educative ICT agenda is challenging in light of the raft of other priorities faced by students, teachers, parents and school administrators. However, the importance of taking the whole community on the 1:1 implementation journey is crucial (LaRose, Rifon, & Enbody, 2008).

Appropriate use of ICT transcends the management of student distraction in the classroom. It has important social and ethical implications, particularly for young people as they learn how to conduct themselves in society, and develop relationships with their peers and family. Of concern to the whole school community is the way in which values are explicitly and implicitly mediated through the Internet, particularly via pornographic and gaming content. These values will ultimately shape our future society; therefore, it is important that the whole school community engage in an educative journey that informs and helps to create a shared vision of what constitutes acceptable use of ICT and its implementation. The current research has found that young male students are curious about pornography and gaming and as such will regularly push the boundaries of what is acceptable in school settings. It is suggested that involving teachers, parents and students in the dialogue will lead to more ownership, and ultimately, success.

Regular seminars and forums, involving the whole school community could be implemented to demystify ICT and possibly re-harmonise households. Topics such as what constitutes an educational game, setting up and monitoring home networks, legal and ethical responsibilities associated with downloading material and sharing files, could all be relevant. This approach requires energy and resources, but if responsible use of ICT is key to the success of 1:1 learning environments, then whole-of-community strategies are worth considering.

**8.6.2 Innovative use of ICT to engage students at the School**

The potential to use ICT for creation purposes (e.g., mind-mapping, movies, music, podcasts, visual graphics, applications or animations) could be an area easier to promote to a cautious school community, where there is an understanding that ICT and creativity are commonly not used to their fullest potential (Brooks, Borum, &
Rosenørn, 2014). Applying creative approaches for using ICT rather than just using laptops to do more of the same (e.g., typing, using the Internet or creating presentations) would seem to be a good starting point for change.

One of the greatest opportunities for engaging male students in education through ICT is with digital games. Digital games can support complex generic lifelong learning competencies as opposed to simply mediating content. For example teamwork, problem solving, experimentation, adaptation, creativity and reflection have all been identified as attributes of a ‘good’ game (Shute & Fengfeng, 2012). However, digital games that facilitate these higher order cognitive processes require teachers to determine first the educational value of the game and second, align the game seamlessly with educational goals. Not only does this take considerable skills, plus time and resources (Simeoni et al., 2012), it is also pedagogically risky with no guarantee of success. The default position at the School is that gaming is banned in the absence of a strong demonstrable rationale. This conservative culture may stifle innovation, but at the same time it serves the political needs of the School well. This stance is consistent with the observation made by Selwyn (2011, p. 104), that:

The (non) use of digital technologies should be seen in the light of teachers' primary concerns of maintaining discipline and order in their classes; of ensuring that students achieve 'good' grades in external and internal assessments of learning; that classroom activities follow set curricula and meet the varied expectations of school managers, parents and other stakeholders.

The findings showed a school that was sensitive to the risks of gaming and adopted a range of successful strategies to manage these risks. At the same time, innovative use of digital educational games was rare. The School community was largely united in its desire to limit leisure-oriented gaming during school hours and did not pursue digital educational games as a valid pedagogical approach.

The 1:1 laptop program was introduced with the best of intentions to help build students' 21st century skills (DEEWR, 2012). However, the School operates in a volatile environment where success is gauged according to a relatively narrow set of measures which are collected on an annual basis. These measures largely incorporate student performance in two sets of high stakes examinations: NAPLAN, which takes place in the formative years of a student’s education in Australia, and the Western Australian Certificate of Education (WACE), held at the conclusion of Year 12 (final
year of schooling in Australia). Performance in the WACE, in particular, has significant implications for student options as far as tertiary admission is concerned. Continuous assessment results obtained by students in the previous two years are moderated by the performance of a school as a cohort in the WACE examination. Effectively a school as a whole needs to perform well so as not to impact on the options of individual students. Parents seeking the best educational outcomes for their children may try to select high academic performing schools to guarantee that their child’s options are not limited by what they perceive as poor cohorts in other schools. This structural feature of the Western Australian schools’ sector has implications for all schools in terms of maintaining their market share. Performance in examinations, therefore, is an important factor in decision-making within the School, which is competing for students in order to be viable, grow and flourish. Academic performance as gauged through examinations means that education is tightly integrated with stated curriculum learning outcomes; and orientated towards ensuring that students perform in examinations. High stakes assessment practices put pressure on teachers to get through the curriculum (Jordon, 2008; Lim & Chai, 2008; Voogt, 2009) and teach for tests (Demetriadas et al., 2003; Liau et al., 2008; Voogt, 2009). According to Lane (2004) high stakes assessment compromises cognitively rich teaching and assessment practices. Further, the tendency of these examinations to be hand-written rather than using a laptop sends an unequivocal message to students and teachers not to become too reliant on ICT.

As discussed, one of the key indicators of success at the School is student performance in high stakes assessment. This ethos is valued by all stakeholders including parents, teachers, school leaders and even students themselves. Expending time and energy to implement and elaborate games in an already crowded curriculum was perceived by teachers as a risky strategy. Further, the School's interpretation of the local educational landscape and the broader ICT policy environment sends explicit and implicit messages to teachers shaping their pedagogical approaches in the classroom. In short, school priorities (academic excellence as determined by NAPLAN and WACE), policies (e.g., Acceptable ICT Use) and procedures (e.g., forensic monitoring) reinforced the message that gaming is risk-managed, and that innovating with digital games is on the fringe of what might be considered acceptable. The tendency for leisure-oriented games to distract students in the
classroom also ‘stigmatised’ games at the School, further inhibiting the diffusion of educational gaming as an innovation. This finding is consistent with other research (e.g., Koh, Kin, Wadhwa, & Lim, 2012).

Further research into digital gaming might examine the range of educational contexts in which digital gaming is introduced paying particular attention to political and economic drivers that impact on decision-making and which ultimately affect student learning. Identification of key enablers that might encourage teachers to use digital games to innovate in the classroom could also be useful.

A number of empirical studies which demonstrate educational benefits of digital games have recently emerged (Haiyan, Pan, Hirumi, & Kebritchi, 2012; Hess & Gunter, 2013a; Ke, 2008; Miller & Robertson, 2011). These studies encourage educators to innovate with confidence. However, this study introduces a socio-cultural perspective stressing that school communities are not apolitical, and that decision-making should consider both the risks and the potential rewards of innovative practice.

Some ideas that may support moving towards a more innovative approach to gaming include:

- Assisting educators to build bridges within their school communities through online and face-to-face mechanisms (e.g., wikis that showcase digital games, information sessions) with open discussion of the benefits and risks of digital games.
- Further develop and showcase the evidence-base on successful in-context exemplars of how to best manage digital gaming in schools and how to best harness digital gaming for innovation in schools.
- Negotiate the use of digital games with parents, balancing the demands of the curriculum with providing students with opportunities to use digital games in ways that embrace the principles of life-long learning.
• Development of checklists, evaluation tools and templates to help educators make informed judgments on the educational value of digital games.

• Institute a whole-of-school community approach to appraising digital gaming by inviting parents to become involved in playing and reviewing digital games.

• Implementation of a gradual culture change towards continuous, rather than high-stakes assessment practices.

• Pilot and test the use of computer, laptop and tablet technologies in current high stakes assessments.

• Further research to find a particularly good example of an educational game in one subject and using it as a positive sensitising, that in time could clear the way for broader experimentation with educational games and simulations in other subjects.

Adoption of digital games in education requires careful consideration and planning. There are still pedagogical challenges facing teachers in terms of using digital games to stimulate higher order cognitive processes, better managing ICT rich classrooms, and minimising distractions from gaming. A crowded curriculum and high-stakes assessment processes are also somewhat inconsistent with the promise that digital games bring to generating new forms of learning that focus on problem solving, exploration, investigation and creative work, and that ultimately support life-long learning (Bate et al., 2014). Therefore, there is a need to broaden the argument from gaming to creative teacher-led educational uses of ICT.

The management of students within a 1:1 classroom is difficult and there is no single approach that fixed this issue. Students at some stage were fascinated with gaming and found themselves at times being distracted or tempted by the seductive power of technology. The adoption of digital gaming for learning requires a level of scrutiny that takes into consideration the risks and affordances for teaching and learning. Although, innovative approaches to learning through the use of ICT have
the potential to engage students, adopting untried approaches in a crowded curriculum was perceived to be risky. A regulated environment where active teaching and task creation, buy-in from students and the community, and deterrents put in place, all played an integral part in the effective management of distractions in the 1:1 laptop environment.

8.7 Paradox Three: Hopes and Fears of Web 2.0

Web 2.0 technologies assist interactive information sharing and collaboration through the Web, where users can interact and edit information, and are popular with young people (Lenhart & Madden, 2005). Given the mass adoption of Web 2.0 by young people there is debate in educational circles about how the use of these technologies might be used in schools (Selwyn, Potter, & Cranmer, 2010). Opportunities for teachers to use Web 2.0 to embrace constructivist approaches through social interaction to construct knowledge could be viewed as a benefit, however, the risks (e.g., off-task behaviour, distraction, subject area relevance) of whether this approach assists learners may outweigh the benefits. Luckin et al. (2009, p. 102) believe, “it is not down to teachers alone, parents, institutions and policy-makers also have a role to play – in supporting teachers to take that risk.”

8.7.1 Boosting collaboration, cooperation and communication

Teachers and students both reported a decrease in collaboration and cooperation in classes. There appeared to be a shift towards increased student independence since the implementation of the 1:1 laptop program. According to Schulz-Zander, Büchter, and Dalmer (2002) ICT embedded in a school learning culture providing opportunities for students to cooperate and collaborate has the potential to stimulate the necessary change in schools so that they can better meet the demands of the knowledge society, particularly the ability to work effectively as part of a team. Yet, at the School, teachers rarely used laptops to improve collaboration or cooperation (discussed in section 4.3.4 and 4.7.4 respectively), perhaps due to a crowded curriculum, assessment schedules or simply not having adequate time or skills to use laptops. Web 2.0 technologies are a method for teachers to boost the collaboration, cooperation and communication. Applications such as SlideShare,
Prezi and Picsviewr are examples of presentation applications that enable students and teachers to create presentations and then share them online.

Using applications designed for collaboration could be useful for teachers and assist them with signature pedagogical approaches with the help of Web 2.0. The following applications seen in Figure 8.4 are a range of commonly used Web 2.0 technologies aimed at increasing collaboration and teamwork skills. These examples are just a small snapshot of what is available and are rapidly becoming tools of choice for an increasing number of classrooms (Crane, 2012).

**Figure 8.4. Examples of frequently used Web 2.0 technologies aimed at increasing technology.**

Teachers at the School used Web 2.0 technologies minimally although as uncovered in the teacher findings chapter (Chapter Four), they had a basic understanding of the use of Web 2.0. The School had not made a blanket rule to ban the use of all Web 2.0 tools, except for Facebook. Teachers seemed reluctant to experiment because of the unknown capacity of how these tools could help teaching and learning; they were too busy, focused on the structured curriculum; and there appeared to be a fear factor of taking a leap of faith to use Web 2.0 tools for learning. The following excerpt is an example of this:

To tell you the truth I really don't have a good grasp of Web 2.0 tools. I hear they are good, and I would like to use them, but at the same time I have some apprehension of
whether they will work in my mathematics classes. I would need to be shown how they could work to be convinced for using them in my classes. (C542012)

Some teachers may regard themselves as the experts and do not want too much communication and therefore the risks of using Web 2.0 may be far greater than the benefits. It could be that deep down some teachers at the School are not particularly oriented towards social constructivism. Certainly there was no implicit block put in place by the School to prevent teachers from using Web 2.0 technologies. Another possible reason as to why teachers did not use these tools for learning was because of the structured curriculum and standardised assessment constraints. Teachers were time-poor and needed support in determining what Web 2.0 technologies would work for them. These views are similar to the research of Kale and Goh (2014), who identified these types of sentiments in the attitudes of 167 K-12 teachers when using Web 2.0 technologies in their teaching. Ultimately it would appear that it depends on individual staff who are willing to experiment with Web 2.0, which in turn may reduce the barriers that exist when it comes to harnessing Web 2.0 technologies for learning. The School may well need to look at targeted professional learning, workloads, and the opportunity for staff to access time to practise with Web 2.0 technologies depending on their subject area.

8.7.2 Targeted professional learning

The research found that teachers required professional learning in collaboration, cooperation, communication and differentiation of learning. As Brown (2006) reported, the value of ICT professional learning is obvious. Perrotta (2013) suggested teachers need technical and pedagogical support when using ICT. Therefore, professional learning needs to be targeted and as Bebell and O’Dwyer (2010) found, it is vital for the success of any 1:1 laptop implementation. The quantitative data in Chapter Four showed the limited use of laptops for collaboration and cooperation. Herrington and Parker (2013) highlighted the potential for using emerging technologies for learning, providing opportunities for communication, collaboration and a platform for creation. Professional learning opportunities tailored to the use of ICT may provide opportunities for teachers to consider using laptops for communication and collaboration. As a starting point, teachers may require support with emerging technologies; for example, the use of Web 2.0 applications. Such applications could be used as another medium to connect with the current generation.
of students, as their personal use of mobile technologies continues to rise (Edmond, Thorpe, & Conole, 2012).

The potential for using ICT to scaffold higher order thinking and for differentiation were other possible professional learning opportunities shown in the study. Santangelo and Tomlinson (2012) proposed that if teachers are to teach effectively in a diverse student environment, then they need to differentiate proactively in their classrooms. Differentiated learning for students has been shown to facilitate higher levels of achievement (Hallinan & Kubitschek, 1999).

Overall, Web 2.0 can provide opportunities for teachers to embrace constructivist approaches for teaching and learning. However, there is no single solution for schools when searching for an answer to the question of whether Web 2.0 is worthwhile. Teachers taking pedagogical risks in using Web 2.0 technologies may well need support from the wider school community if Web 2.0 is to be embraced to promote alternative approaches to collaboration, cooperation, and differentiation. Finally, targeted professional learning in these areas might well serve as a catalyst for teachers to build confidence and take a ‘leap of faith’ into applying Web 2.0 to their pedagogical challenges.

8.8 Paradox Four: Transformative and Conservative Pedagogical Practices

The study revealed students, teachers and parents held positive perceptions about the effect of motivation and engagement towards learning since the implementation of the laptop program. These perceptions are in line with previous research as discussed in the literature review, indicating laptops help to motivate and engage students in learning (Bebell & Kay, 2010; Keengwe et al., 2012; Suhr et al., 2010). Teacher participants at the School had limited involvement in the planning and administration of the 1:1 laptop program, chiefly instituted by the school leadership team. As with other ICT implementations, teachers were challenged to adapt their way of teaching with the onset of the 1:1 laptop program (Kervin & Mantei, 2010). Developing effective teaching strategies emerged as a key issue over the study. Despite the varying views of some teacher participants who questioned the effectiveness of the 1:1 laptop program, when all 27 teacher participants in the final
year of the study were asked, “Would you keep the laptop program?” all indicated they would retain it. The following excerpt is an example of this:

I would certainly keep it, I think the fact that ICT and computers in some way, shape or form a big part of students’ and adults’ workplace. Whether it be university studies or through their workplace training that they’ve got to learn to be able to live in a life with ICT, and use it well and manage all the other things in their life in the same sort of way. Do we put restrictions on their usage or something like that? I don’t know, but finding the best model will be an interesting one in the coming years. But I certainly think that it needs to be there because we are teaching the kids the right sort of skills that they need for life. (C522012)

However, findings from observations showed the use of laptops, was varied in use and output. On the one hand, teacher participants were advocating sustainability of the laptop program; however, when observing lessons there were inconsistencies in the level of use of laptops for teaching and learning. These inconsistencies suggest that teachers knew it was the right thing to do; they just did not know how to best go about it.

8.8.1 Balanced approach to teaching

The classroom dynamics had evolved since the introduction of the 1:1 laptop program. Classrooms at the School transformed from limited computer access (e.g., five to six computers in most rooms and computing laboratories) to an environment where each student had their own laptop. The role of the teacher also changed with teachers taking on a more facilitative rather than teacher centred role. It also became apparent that keeping a balance between ICT-rich and non-ICT activities rendered better results. Teachers who did not over-rely on laptops were themselves more satisfied and in turn were able to develop more vibrant teaching and learning settings. The research findings did not support the abandonment of the laptops; rather participants favoured a balanced approach.

One of the aims of the implementation was to provide opportunities for both students and teachers to have greater access to ICT and adopt a 21\textsuperscript{st} century digital approach to teaching and learning. However, one recurring theme to emerge from parents, teachers and students was a call to maintain the balance:

You have got to have a balance really; you cannot be on your laptop all the time, even if it is learning all the time. You have to do a mix of things. (A052010)
Keeping the balance is important. I think some jobs would call for a laptop, but other ones rely on pen and paper approaches. (B232012)

Very careful of keeping the balance, and I guess the reason for that is, I guess, because I have been teaching for so long without even having to use a laptop, so for me it is all about trying to find that balance. We use it in all subjects and for a variety of reasons. (C672012)

It’s all about balance, so it’s not necessarily a bad thing. It’s just if one thing overtakes another, I think it’s a problem. (Parent Forum Year Three Cohort A and Cohort B)

In discerning what was meant by a ‘balanced approach’ the research considered the levels of use of ICT by teachers and students; the overuse of ICT not aligned with educational goals; the alignment of ICT use with educational objectives; and broad uses of ICT. All of these considerations helped in framing an understanding of the term ‘balanced approach’.

Bruce and Levin (2001, p. 2) reported the balance between learning and doing has been impacted by new technologies for learning. Furthermore, they are of the view that there is a “need for a balance between learning and doing, in which the costs of learning are outweighed by the benefits of learning.” Ultimately, the School and the parents were interested in an implementation approach where the use of laptops would not compromise the students’ learning.

The study revealed how teachers facilitated laptop use varied from subject to subject at the School adding further to the dimension of a balanced approach. In some instances laptops were being used for a large proportion of the day where in other cases laptops were not being used at all. This variability contributed to a disparity of how students were using laptops for learning. In some classes, laptops were embraced whereas in others they were used minimally or in some instances not at all. The School reacted by employing an ICT facilitator to support teachers in developing strategies of how to use laptops for learning. This appointment provided optimism for the School in having a skilled educator on the ground to attend to the needs of teachers in a 1:1 environment. The initiative highlighted the importance of uniting teachers in a common vision with the aim of reducing the gap between subjects, the pursuit of continuous improvement and the provision of pedagogical support. This approach was central to improving teachers’ technological pedagogical knowledge (Mishra & Koehler, 2006) through the use of ICT.
The provision of the laptop, a powerful tool for learning, shifted the teacher capacity to move from a didactic form of delivery to that of a facilitator-type role. Shifting to more student-centred approaches, enabled teachers to provide learning experiences that were both motivating and engaging:

I think generally overall I just find the boys are more motivated, it is more engaging for the students to learn. The biggest thing, I think, is for us teachers to learn how to optimise the use of the laptops in the classroom. (C692011)

The shift to a more facilitative pedagogical approach required teachers to think about how they could use the 1:1 laptop environment to optimise learning for each individual student. The following excerpt provides an example of how laptops were used for differentiation:

In terms of differentiation it helps if the kids are away from what I am doing so I am there facilitating and helping with problems, but not just moving the lesson forward and being the sole sort of focal point of the room. It means that the kids can work at their own pace and focus on challenging themselves and extending themselves. Laptops are integral to doing that because if you use something like MyMaths Online it has support built-in there and then anything that they still do not get they have got me to float around the room to help them, and also their peers that can help them as well. (C652012)

With the increased reported independence of the student participants, laptop use requires students to have greater self-regulation. This attribute of the model for understanding how policy intersects with reality (as seen in Figure 8.1) highlights the potential for students to become reflective and life-long learners. However, this level of differentiation was not typical across learning areas.

The study reinforced the need for the School to spend more time and money on the development of comprehensive, differentiated learning experiences rather than focusing on operational issues such as purchasing and supporting the device itself. These operational issues are necessary; however, they should not be the main focus of a 1:1 program. A level of rigour is required at the start of the process to determine how mobile devices can be best integrated into the teaching and learning program of schools (Weston & Bain, 2010).

Finally, by understanding the fundamental traits for effective teaching, the classroom learning experience could meet the demands of student requirements when immersed in a 1:1 learning environment. Teachers who continue to adopt the ‘sage
on the stage’ approach, run the risk of compromising the learning within their class or the level of success of a 1:1 program (Groff & Mouza, 2008). Teacher effectiveness is a key component underpinning the success for learning (Hewitt, 2008; Kochtanek & Hein, 2000). Hattie’s (2009) research onto effect sizes indicates that teachers have the potential to have the greatest influence over student performance. Therefore, it is necessary to understand how the 21st century student learns and what type of learning environment addresses their needs (Lemley et al., 2014; Prensky, 2001). A laptop is a powerful tool that needs a purpose within the classroom. Without this purpose, what happens in the classroom or what happens to learning can be compromised. As demonstrated in the School, a 1:1 laptop program can impact negatively when students are distracted by all the seductive qualities of games or social networking that negate an effective learning environment as discussed in 8.5.1. Managing these distractions is an ongoing challenge for 1:1 schools.

Observations over the period of the research confirmed a steady improvement in the way teachers used ICT. However, over the course of the study when comparing the views of teachers and students there was substantial variability in the way in which laptops were perceived as being used for teaching and learning. Students emphasised that for learning to be meaningful when using laptops, teachers needed to take into consideration a range of strategies. Students stressed the importance for teachers to remain mobile when delivering lessons as this minimised the chances of students being distracted in the learning environment. Classroom organisation as discussed by Lyons, Ford and Arthur-Kelly (2011) is necessary for the enhancement of classroom management. Furniture arrangement and the structuring of groups was important from both a classroom management and a learning perspective. Rows of desks might not be the most suitable approach when using laptops for learning. A teacher’s presence by simply walking around a classroom can contribute to the focus of a student when using a laptop, reducing off-task behaviours.

Engagement is key between teacher and student as it allows for interaction and conversation to enhance the learning experience. There is also a need for the classroom to have a strong sense of management and discipline. Sprick (2013) supported these sentiments and stressed the importance of having defined and clearly
consistent behavioural expectations for class activities. This view also resonated with student participants from both cohorts.

Some teachers were reluctant to embrace laptop use because the ultimate assessment tool (final examinations) was a pen and paper exercise. Not having an overreliance on the laptops was a view shared not only by teachers, but also parents. Similar to other studies (Giordano, 2008; Voogt, Almekinders, van der Akker, & Moonen, 2005) that promote targeted workplace-based professional development, the teacher participants shared the view that professional development had been adequate and transferable to their teaching. What did arise from the study and consistent with the research of Cowie et al. (2011) was the recognition of a designed and targeted approach to regular professional development. Targeting teacher use of laptops for teaching and learning in a variety of areas such as collaboration and differentiation could help focus professional learning programs when using laptops for teaching and learning.

Teachers reported that since the introduction of the 1:1 laptop program, there had been noticeable impacts on the teaching and learning dynamics within the classroom for operating and inquiring with ICT. This finding connects with the research of Garthwait and Weller (2005) who found that with the implementation of a higher ratio of computers to students there may be a change to classroom teaching and learning dynamics in classrooms. When explaining the dynamics of teaching and learning with laptops, the shift from a pen and paper environment to each student having a laptop on their desk could be viewed as confronting for teachers who have yet to experience such change.

Given that teachers have taught a particular way, the introduction of the laptops suddenly changes a classroom environment. Instead of focusing on how to deliver a particular lesson, teachers found themselves having to learn how to facilitate using laptops. In the observations that were conducted in the early phases of the introduction in Year One of the study, there was evidence of a wide variability of how teaching using 1:1 laptops was being conducted in each classroom. Some teachers demonstrated a willingness to use laptops and at the same time consider aspects such as table and seating arrangements of their classes. This willingness was in stark comparison to some teachers who conducted lessons in the manner they had
previously directed them without laptops. The variability provided students with opportunities to push the boundaries from teacher to teacher in terms of how they behaved, and the extent to which they were engaged or distracted. Students discerned when they could access content, or use the laptop for other activities that were not related to learning. For some teachers, this caught them off guard, or they were simply not prepared for what could occur without careful laptop management. In a classroom prior to laptops, a quiet class of students could be perceived by the teacher as possibly being on-task and learning. However, in a 1:1 laptop classroom this quiet atmosphere was not what it seemed, with students engaging in off-task behaviours; placing teachers in a position of having to rethink their individual approach to teaching and learning with laptops.

**8.8.2 Effective teaching strategies**

Results from the 1:1 laptop program indicated an improvement of the level of teacher ICT competency, confidence, and their view of positive impacts of laptops in the classroom. These attitudes are consistent with the study conducted by Falba, Grove, Anderson and Putney (2001). Teachers, by the completion of the research, had moved away from the often onerous tasks of typing up information or simply completing drill and practice activities as described by Chalkley and Nicholas (1997). Teacher willingness to adapt to the 1:1 implementation promoted a shift in the types of lessons that occurred. An example of this was the use of the Australian Stock Exchange (ASX) stock market game that was used as a self-paced tool in a relatively unsupported manner (e.g., there were limited formal opportunities for reflection on decision-making). The game itself helped students to build research and strategic decision-making skills and develop an understanding of relationships between disciplines (e.g., economics and politics). Similar to the research of Orlando (2013) into teacher use of ICT, these shifts reveal teachers were not resistant to change. The change might be perceived as slow if one could expect teacher use of ICT to be at a higher level than the discussed or observed examples. However, is it realistic to expect major shifts in the adoption of laptops for learning in a short time-frame? Three years could be viewed as a snapshot in shifting teachers’ pedagogical beliefs (Bate, 2010a), and subsequently their capacity to use laptops for student-centred learning.
Since 1998, with the introduction of the search engine Google, a generation of students have been able to quantify statements or questions by accessing Google instantaneously through the use of their laptop (Schuster, 2010). Previously this would have been an iterative process between the teacher and the student, or a student using the library or other sources to access information to respond to a question of interest. This is no longer the case. In general, the research found that the students were able to help resolve problems and support each other without the teachers necessarily providing all the answers. Inadvertently, teachers found themselves redefining their roles in the 1:1 laptop environment and transitioning into a facilitating role; for example:

It is mainly facilitating and guiding what they are doing and how they are doing it. I find that they are a lot more independent and once given a task they come up with their own ideas of how they might do that using their laptops. Whereas, perhaps in the past it would be more teacher driven, and you would have to sort of maybe give more outlines. (C372012)

This perception from teachers that this role is fundamentally altered by the 1:1 laptop implementation is consistent with previous research (Pearson & Naylor, 2006). The current research found that the facilitator role adapted by teachers enabled students to access massive amounts of information and use this for learning. Teacher Participant 31 who had been teaching for five years, predominately in middle school mathematics expressed the changing role of teaching and demonstration of this shift in an excerpt from Year Three of the study:

A: Now you cannot fool a kid, you know, if you tell a kid something – ‘Are you sure, Sir, are you sure? Let me Google it.’ You know, maybe they have read it somewhere, maybe they have heard of it somewhere.

Q: But they have got the tool to check up on you?

A: They will check up on you, and they will check – ‘But Sir, I found here, it says this, …’ You go, ‘Oh, that is true,’ and you get caught out so you have to be very careful. Now they know how to search. I think they are a lot smarter nowadays; they want to know exactly the truth, you know, and they search for it. Is this guy really the richest, you know, whatever, the fastest – they will research it. I think that is the beauty of it, it’s really good.

Toshalis and Nakkula (2012) found an approach with students involved in learning activities that support academic challenge significantly increases the capacity for learner engagement and academic achievement. However, Carini, Kuh, and Klein’s (2006) research into student engagement and learning showed that the
learning outcomes emanate from a range of sources, of which learner engagement is one. Improving teaching and learning is essential when using ICT, and both learner engagement and facilitating academic achievement are integral to developing teacher competencies when teaching in a 1:1 laptop school.

As stated in the OECD (2009b) report, the traditional model of education, through which teachers communicate factual knowledge to students by lesson delivery and the use of textbooks remains the predominant style of teaching across much of the world. With the ability for students in 1:1 laptop schools to access content via search engines, teachers at the School were cognizant their roles as teachers had changed. For example:

I think for me it is trying to keep up-to-date with the technology because the students are so quick in getting the technology. I also think it is important that I ask them what they are learning because I’ve found that I’ve learnt a lot from them and I learn a lot every day almost with something new from them. So I think one of my roles is to make sure I keep up-to-date. (C342012)

Facilitation of learning was key as the breadth and depth of knowledge available for students was vastly increased with the ubiquitous nature of laptops and the accessibility of the Web. Students’ ability to access information and apply newly acquired knowledge to learning was evident suggesting the significant potential of 1:1 laptop programs for learning. Teachers were confronted with a shift in learning for themselves as greater student access to information required teachers to be aware of the constant advances made through ICT and the inadvertent pressures of being continually informed.

A collaborative approach between the students, teachers, parents and the school is vitally important for the attainment of common goals (Epstein, 2001). Effective 1:1 laptop programs require a systematic, balanced approach where there is a linkage between all of the participants. The focus of participants’ feedback initially about the 1:1 laptop program, was on off-task behaviour. Over time this changed, with the School responding to concerns such as distractions, school monitoring and educating parents how to manage the device.

The following principles could assist teachers in 1:1 laptop classrooms as the existing model of education continues to evolve:
• student autonomy of their learning, capability to apply and transfer knowledge and the capacity to use ICT creatively;
• active and mobile communicating teacher;
• collaborative experiences during lessons; and
• clear boundaries with an expectation on students to produce concrete outcomes.

For students to maximise their learning of 21st century skills, there is a real need for targeted forms of teaching and learning approaches, that Shulman (2005) referred to as signature pedagogies. Utilising strategies and methods that may suit certain subjects better than others, may become significant for improving the chances of imparting a body of knowledge and assist teachers’ integration of technology (Harris et al., 2009). Similarly, Webb and Cox (2004, p. 235) discussed pedagogical reasoning as being at the core of ICT use for teaching and learning:

ICT-based learning environments require teachers to undertake more complex pedagogical reasoning than before in their planning and teaching that incorporates knowledge of specific affordances and how these relate to their subject-based teaching objectives as well as the knowledge that they have always needed to plan for their students’ learning.

A clear message that is fundamental to the success of 1:1 initiatives is a focus on evaluation and the opportunity for feedback. Student participants articulated a strong sense of understanding in their view of effective teacher characteristics in the 1:1 laptop environment at the School. Teachers need to be aware of their students’ views and find ways to connect and provide valuable experiences promoting effective teaching and learning (Schleicher, 2012). Therefore, effective teaching strategies equate to sound classroom organisation and management, plus a move from directive teaching to facilitation, linking to contemporary learning theory where learning is active, constructive, authentic and self-regulatory (Jonassen, 2008).

8.9 Paradox Five: Alienation and Integration of Parents

The findings revealed that parent perceptions of the laptop program were at odds with the student participants. There was scepticism among parents about the
effectiveness of the laptop program and the concern of the potential dangers of using ICT too much for learning. Consequently, some parents were antagonistic towards the use of ICT. This perception revealed a deeper issue, with some parents reporting being alienated since the introduction of the 1:1 laptop program.

8.9.1 Parent alienation in a 1:1 laptop school

One of the recurrent themes to emerge from the research was a sense of alienation, that some parents felt, as a result of the 1:1 laptop implementation. This alienation was particularly prevalent in Cohort B. The study found that when the screen comes up, it sometimes forms a barrier between student and parent with loss of eye contact as the student becomes more engrossed in digital content. Communication suffers and often parents are simply excluded from the student’s learning if any is happening at all. One way to address alienation is to become involved. Parents who find themselves in this position may require some ICT knowledge and an injection of confidence to adopt a more assertive position. Making the curriculum readily available through the School portal was an effective initiative implemented by the School. The analytics were proof of this, with a total of 1,795,551 page views in Year Three of the study. This figure alone, would suggest the implementation of the portal was a significant step in improving the link between School and home. Further to this, through the introduction of an ICT facilitator, School parent information sessions took place to ensure parents understood the use of laptops for learning. These proved to be useful at the School in educating parents about themes such as setting up the home ICT environment to involve screen sharing to make students’ work more transparent.

Ortiz, Green, & HeeJeong (2011) suggested a link in the way parents perceive ICT and the influence that it has on their own son’s learning. If the parent held a favourable perception about the laptop as a tool, then there was the possibility that their son would have a similar view. Also, as discussed in section 6.2.2 of Chapter Six, the data found that parents with lower than average ICT knowledge and skills had a greater level of uncertainty with the 1:1 laptop program. This finding calls for further inquiry.
Even though parents perceive that they know what schools are about as they were once students (McDonald, 2010), these views were not always aligned to the changes in learning since the onset of the 1:1 laptop program. For most parents, an important gauge of how their son is performing is the subject grades achieved over the course of the year. For some parents, it was their view that the laptop program had negatively impacted on their son’s progress or achievement due to the associated distractions and loss of control in their homes.

The views of parents changed over the period of the study and also differed between the junior and middle school experience. Parent perceptions of excessive and frivolous time that their children spent on the laptop were more prevalent in the middle school than the junior school. If these perceptions are accurate, then this appears somewhat at odds with the proposition that children become better learners as they grow older (Maldonado-Carreno & Votruba-Drzal, 2011). The situation is clearly more complex as students move into teenage years where they become increasingly faced with dilemmas over which objectives to pursue. For example, cognitive and academic goals may compete with tendencies to seek belonging, build self-esteem and gain the respect of others (Schweinle, Turner, & Meyer, 2009). Mastery of digital technologies (particularly gaming) may be a passport to popularity. Other contextual factors also come into play as students enter middle school. For the first time, they have subject-specialist teachers and are expected to move between learning spaces responding to different teaching and classroom management approaches. It is understandable that less independent students are seduced by trivial uses of ICT in this new environment in contrast with the stability of a primary school setting, typically characterised by strong and respectful student-teacher relationships. There may be a need for special support in the first year of middle school when implementing a 1:1 laptop program as this is a particularly challenging time. This consideration could be a fruitful avenue for further research as discussed in Bate et al. (2012b).

The differences between student and parent perceptions of changes in learning since the introduction of the laptop program were fractured. Students from both cohorts perceived greater shifts in their learning than their parents. It is possible that the parent perceptions of frivolous and excessive use of the laptops and parent detachment or alienation may have negatively influenced their impressions of the
overall learning taking place. Much has been written about parents as partners with schools and the impact they have on the raising and educating of their children (Khong & Ng, 2005; Oostdam & Hooge, 2013; Springate & Stegelin, 1999; Vincent, 2000). As parents struggled with the introduction of the laptop program and the adoption of new methods of teaching and learning, they were unable initially to connect with the new learning environment.

### 8.9.2 Parent integration

The research suggests that for alienation of parents to diminish, effective communication between all participants should occur. Student communication of learning with their parents is complex. As parents may be seeking greater insights into what may be occurring at school, students may not often provide the level of insight that parents seek. Junior school parents (Cohort A) at the School appeared to be more involved in their son’s education, and this was evident through the parent forum feedback about the junior school implementation. Even though views of parents were varied, with some parents having issues with the laptop program and others not, there was certainly a difference between the junior and middle school implementation experiences. Parents who had a son in the middle school had less involvement in comparison to parents from the junior school setting. Parents in Cohort B may have felt this way because they suspected they could no longer assist their son due to the challenging nature of education as reported by Hill and Tyson’s (2009) research in determining whether and which types of parental involvement are related to achievement. Lam and Ducreux (2013) reported the level of parental involvement continues to decrease as students track through school. Therefore, the risk of alienation could be seen to escalate, continuing to widen the information gap between students, teachers, parents and schools. As one teacher commented:

> I would like to see the parents be involved not only on the ICT side of things but all aspects of their work and homework and so forth. (C712011)

Schools in the 21st century seek to ensure learning is accessible for not just students and teachers, but also parents. The provision of active school portals with updated information can assist in removing the barriers to effective communication some parents experience with this technologically-minded generation.
Mobile learning provides opportunities for constructivist approaches to teaching and learning which engage students collaboratively in knowledge construction. Most teachers in the study acknowledged the links between using ICT and more student centred pedagogies. However, paradoxically, since a large portion of student work is digitally created, parents now have less knowledge of what is taking place for their children.

I think a lot of parents don’t see the good things that their child is doing on the laptops. (C682011)

By “good things” this teacher participant was most probably referring to digital resources the students were able to access or use on a daily basis in a classroom. Ultimately the ability to access a wide range of information for subject specific purposes was often mentioned by teachers as helping student learning.

If parent support for their child’s learning is a critical factor in successful learning, then minimising this sense of alienation should be built into the planning of mobile learning initiatives. Strategies could include screen sharing both at school and home and also regular parent information and/or skills sessions using laptops. Epstein (2008) reported that with family involvement, students can improve in subjects such as English and Mathematics, set higher goals, come prepared for class and tend to have fewer behavioural problems.

8.10 Summary

The study identified five paradoxes that were a useful focus in which to conceptualise change. These are:

• autonomy and systemic dependency of school;
• engagement and seduction of students;
• hopes and fears of Web 2.0;
• transformative and conservative pedagogical practices; and
• integration and alienation of parents.
With each of these paradoxes, this chapter has proposed a set of ideas and suggestions, developed through the experiences encountered at the School. Ultimately these can be summarised as follows. The study found that excellent 1:1 implementation is founded on exemplary teaching and learning characterised by differentiated learning; enhanced facilitation skills; a balanced approach to teaching and learning; an ability to manage distraction; and school community involvement. Some opportunities to improve the teaching and learning environment in boys’ education could be explored through greater use of 1:1 devices as collaborative tools, and appropriate use of educational games and simulations.

In order to build a strong community consensus, the School needs to capture academic and incidental learning outcomes not traditionally captured in high-stakes assessment processes. Some ideas for alternative methods of capturing outcomes include embracing 21st century learning principles and shifting the emphasis from standardised testing. There were some significant differences between junior and middle school 1:1 implementations. The differences suggest that introducing a 1:1 program earlier (e.g., in junior school) will yield better results than introducing it later in boys’ education (e.g., middle school) when students are confronted with greater pressures and temptations. The final chapter of the thesis will conclude the study and suggest some ideas for further research.