2015

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

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CHAPTER 3. Methodology

3.1 Chapter Overview

The formation of the research methodology draws upon elements from the three research domains of Brinberg and Kidder (1982) being conceptual, methodological and substantive which are integral to this thesis. These three domains informed the research and helped to determine the instruments and techniques for the method adopted to respond to the research questions. This chapter further explores the issues expressed in Chapter One and re-states the research questions, it then articulates how the research is situated within the pragmatic paradigm, reflects upon the role of the researcher, and recognises the limitations of the research. The chapter concludes with a consideration of the ethical issues associated with a study of this size and complexity.

3.2 The Area of Focus: ICT – Friend or Foe?

Chapter One articulated that the use of laptops in schools across the world had prompted some sections of the educational community to question the value and effectiveness of the widespread introduction of 1:1 laptop programs in schools (Cuban, 2006). Lei and Zhao (2008) argued that there are a range of educational factors that can effect student outcomes and expose the lack of evidence to support the contention that 1:1 laptop programs can make a contribution to academic attainment. Some of these factors relate to the users, the technology, pedagogical practice, constantly changing interactions and mutual influences.

With the Federal Government in Australia in recent years having a distinct strategic technology plan for implementing a 1:1 computer ratio in all schools for students in Years Nine to Twelve, assumptions about the effectiveness of 1:1 initiatives are open for discussion (DEEWR, 2009). For example, Warschauer (2005) reported on the study of ten schools in Maine and California with a range of students from grades three through twelve, finding no increase in test scores to link to the use of the 1:1 laptop program.
Students currently coexist with various forms of ICT in everyday life; however with an increasing exposure to ICT in schools, views of whether this approach enables or inhibits learning is a dilemma faced by many educators across Australia and the world. With such a thrust of ICT integration across the world, all stakeholders in the educational process will inevitably monitor its use stringently. However, Weston and Bain (2010) are of the view that there is no reason why educators would question the value of using a laptop at school, as laptops have become integrated into what students do and are tools that should be used as a part of learning (Senge, 2000). The majority of 1:1 laptop research to date has not been gender specific, whereas this study has a specific focus into boys’ education and the use of laptops.

3.3 Research Questions

This research aimed to investigate longitudinally, the implementation of the 1:1 laptop program at the case study school. This school is a Catholic school for boys founded in the Edmund Rice tradition in Perth, Western Australia. The research focused on students in Year Five in the Junior School (primary school), who at the inception of the study were aged 10 to 11 years of age. The research also focused on Year Seven students in the Middle School (secondary school), who at the inception of the study were aged 12 to 13 years of age. The research tracks these cohorts over three years (2010 to 2012).

Five research questions guided the investigation, namely:

1. How do boys utilise their laptops for learning?
2. How are teachers engaging laptop technology for educational purposes?
3. What educational impact if any, did the 1:1 laptop program have on literacy and numeracy outcomes?
4. What differences can be identified between junior and middle school implementation experiences in regard to research questions 1, 2 and 3?
5. What implications do the findings from research questions 1, 2, 3 and 4 have for the future inclusion of 1:1 laptop or mobile learning devices in schools?
These research questions are now discussed in detail.

### 3.3.1 Laptop use for boys

Research question one examines student use of ICT and their perceptions of the laptop program. Types of use, underlying attitudes, and levels of motivation and engagement complement the research undertaken by Won Hur and Oh (2012) who looked at learner engagement and student achievement with a male only cohort. It is beneficial to understand what boys use their laptop for and how they use their laptops for their own learning to ascertain the possible impacts. Students need to be highly skilled in the use of ICT, as recognised in the *Melbourne Declaration on educational goals for young Australians* (MCEETYA, 2008) and by the OECD in the *Learning to change: ICT in schools* report (OECD, 2001), and assessing the effects of ICT in education report (OECD, 2009a).

### 3.3.2 Teachers engaging laptop technology for educational purposes

Research question two provides a detailed perspective of the teachers’ viewpoints of the implementation of the laptop program in reference to how laptops may be used in their own classes. Furthermore, it is essential to describe the pedagogical beliefs of teachers and how these might shape the use of ICT in the curriculum (Zucker & King, 2009). This research question also considers the importance of how laptops may engage and challenge students in the area of digital literacy (Gabriel, 2010). By addressing this question, a clearer understanding of how teachers use ICT to connect teaching and learning will lead to knowledge of what methods may or may not be used in daily teaching with the aid of ICT.

### 3.3.3 Educational impact on boys’ education

Research question three acknowledges the need for further research to describe teacher and student practices with ICT and the way in which these impact on outcomes (Newhouse, 2008b; Penuel, 2006). This research question will also help to build on research into educational benefits and effect on learning conducted by Borja (2006), Jaillet (2004) and Lei and Zhao (2008). With a specific lens focussing on boys’ education, this question will gauge the educational impact of the 1:1 initiatives,
with a specific emphasis on literacy and numeracy. It is recognised that the academic improvements of girls have outstripped those of boys in past and recent times (Francis, 2000; Latsch & Hannover, 2014; Rowe & Rowe, 2002). The study, therefore is also interested in determining whether incorporating ICT into pedagogy can help boys engage in meaningful learning (Sokal & Katz, 2008).

3.3.4 Differences between junior and middle school 1:1 laptop implementation experiences

Research question four addresses possible contextual issues that may affect the implementation including behavioural, developmental and context-specific factors, and the implications for the future inclusion of 1:1 laptop programs in schools. It also considers methods and models of implementation and specific levels of development that may have a direct impact on results and outcomes (Holcomb, 2009).

3.3.5 Implications for the future implementation of 1:1 laptop programs

Research question five brings together key themes to emerge from research questions one to four and presents some issues for consideration in future implementations of mobile learning in schools. Of significance is the nature of how initiatives can be supported, addressing areas of learning, teaching and engagement as described by Donovan et al. (2010).

3.4 Research Approach

3.4.1 Mixed methods approach: Qualitative and quantitative research

A mixed methods approach allows the research to investigate the research questions in detail and with clarity by selecting the best available techniques (Tashakkori & Teddlie, 2010). According to Johnson, Onwuegbuzie, and Turner (2007, p. 123) mixed methods research:

… is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration.
The study had a specific objective of understanding the implementation of a 1:1 laptop program in an educational setting at an all boys’ school in Western Australia. It monitored the progress of 192 students and their families, and teachers over a three year period. These 192 students comprised 56 Year Five students and 136 Year Seven students who were new to the 1:1 laptop program in 2010, a new initiative for the School. Also of significance was the cohort of teachers involved in this study. Teachers were surveyed and interviewed according to their direct teaching involvement with the two cohorts, either in the junior or middle school.

The research used a variety of quantitative techniques to gather data from students’, teachers’ and parents’ on their views on engagement, ICT competencies, the integration of ICT into the curriculum, and teachers’ pedagogy in the use of ICT. To obtain insight on laptop use, a questionnaire was administered annually over the three year period of the study. Qualitative techniques were also adopted through the coordination of interviewing, focus groups and class observations. Both qualitative and quantitative techniques were strengthened by the triangulation of the data, highlighting the sentiments expressed by O'Dwyer and Bernauer (2014, p. 5) that, “numbers and words need not collide!”

Students were involved in a diverse curriculum requiring student movement to and from classes with their laptops encompassing an array of experiences with laptops within a junior or middle school setting. From the 192 student participants a sub-group of 30 student participants (10 Junior and 20 Middle School student participants) took part in an interview process. This sub-group provided further detailed information about laptop use, engagement, motivation and impacts on learning. The selection of these student participants is discussed in the purposeful sampling section of this chapter. Student participants from the junior school (students from Year Five in the first year of the study continuing to Year Seven in the third year) are referred to as Cohort A in the research. Similarly, student participants from the middle school (students from Year Seven in the first year of the study continuing to Year Nine in the third year) are referred to as Cohort B.
3.4.2 Paradigm: Pragmatism

A pragmatic paradigm underpins the research drawing on many ideas, with the researcher employing “what works,” using diverse approaches, and valuing both objective and subjective knowledge (Creswell & Plano Clark, 2007). Pragmatism is not the sole philosophy or paradigm associated with mixed methods research, but it is the main one (Tashakkori & Teddlie, 2003). As Denzin and Lincoln (2005, p. 53) state: “the core reflection process is connected to action outcomes that involve manipulating material and social factors in a given context.”

Pragmatism is a strong philosophical foundation for mixed methods research (Creswell & Plano Clark, 2007). It is posited that a pragmatic approach is best suited for understanding the various perspectives of a 1:1 laptop program and enabling for sound analysis of the data. Biesta’s (2010, p. 97) depiction of Dewyan pragmatism exemplifies the focus for the research in producing useful knowledge:

Pragmatism should not be understood as a philosophical position among others, but rather as a set of philosophical tools that can be used to address problems - not in the least problems created by other philosophical approaches and positions. One of the central ideas in pragmatism is that engagement in philosophical activity should be done in order to address problems, not to build systems.

Consequently, the debates that have existed between positivist and constructivist traditions have tended to highlight distinctions between qualitative and quantitative approaches with each side endeavouring to expose and defeat one another’s assumptions (Alexander, 2006). The research is, “not troubled by the incommensurable philosophical assumptions between paradigms” (Greene, 2007, p. 82); rather it is focused on a pragmatic paradigm that embraces qualitative and quantitative traditions to advance knowledge creation.

Multiple data collection techniques such as questionnaires, interviews, focus groups, observations, the collection of National Assessment Program for Literacy and Numeracy (NAPLAN) data and artifacts were combined to assist the longitudinal nature of the research by providing the researcher with examples of how a 1:1 laptop program may or may not enhance learning for boys.
3.5 Research Design

3.5.1 Research model

Students, teachers and parents responded to annual questionnaires and the subgroups from Cohort A and Cohort B were interviewed annually over three years. Also conducted over the same period were classroom observations and focus groups; these techniques provided insights into how the 1:1 laptop program had an impact upon learning for boys. External artifacts such as NAPLAN and eSafe monitoring reports were used to contribute to the research. Methods of data collection including sampling techniques are discussed in Section 3.6. Figure 3.1 highlights the research model.

*Figure 3.1. Research model summarising the steps of the research.*
3.5.2 Sequence of research

Figure 3.1 articulates the specific focus areas of the study and details the data collection methods. The first four steps were specifically linked to the data gathering instruments, whilst the final step was concerned with in-depth analysis derived from the findings from the first four steps. Throughout all five steps of the research the following instruments and methods were used: questionnaires, interviews, observations, focus groups, NAPLAN analysis and secondary sources including artifacts from the case study school.

All of the steps used in this research were integral in guiding the study across the three year period. Steps one, two and four occurred at annual intervals over the course of the research. Step three leveraged annual national assessment data on literacy and numeracy for the School. Step five synthesised data collected from steps one to four, appraising findings in the context of contemporary literature. With limited literature detailing laptop use in boys’ education in comparison with National performance benchmarks, an all-encompassing approach of available literature of laptop and ICT use was used to support the research.

3.5.2.1 Step one: Student use of laptops and learning

There has been significant research into the impact of 1:1 laptop programs in the last 10 years, particularly in relation to student learning. Russell, Bebell and Higgins (2004) reported that in 1:1 classrooms where technology was used more, student engagement and motivation was higher. Targeted areas in this section are:

- learning: general knowledge and generic skills (e.g. problems solving and communication);
- role of the student in the learning community;
- student productivity measures (time on task);
- cooperative learning tasks;
- digital literacy;
- development of knowledge of learning;
• interest in work;
• student satisfaction; and
• attendance, participation and the classroom experience.

The student questionnaire and interviews played an important role in unpacking the students’ views of these targeted areas. Ascertaining what students used their laptops for was necessary to draw closer links to their learning and determine their competencies. The targeted areas were:

• understanding basic operations and concepts of ICT;
• understanding ethical and social issues with the use of ICT;
• use of productivity tools for creating with ICT;
• use of ICT communication tools to scaffold learning;
• use of ICT for inquiry and research; and
• use of ICT for problem solving.

The research used the ICT capability learning continuum (ACARA, 2010a) to conceptualise the construct of student use of ICT. It adopts the five organising elements of the continuum, these being: applying social and ethical protocols and practices when using ICT, investigating with ICT, creating with ICT, communicating with ICT and managing and operating ICT, to determine laptop use by teachers and students. This continuum is also central to the work of Bruce and Levin (1997) and their taxonomy for learning with ICT covering the areas of: inquiry, communication, construction and expression. The annual student questionnaires (Appendix A) and interviews (Appendix C) were the instruments used to determine student participants’ use of laptops for learning. Additionally, classroom observations (Appendix K) took place annually to observe laptop use for learning. Parent questionnaires (Appendix F) and parent focus groups (Appendix I) also took place annually to establish parent perceptions about the 1:1 laptop implementation. These instruments are discussed in Section 3.6 Data Collection.
3.5.2.2 Step two: Teachers’ pedagogy in the use of 1:1 laptops

Step two was concerned with how teachers used ICT as part of their teaching each day. How technology is used in a pedagogically meaningful way, reorganisations in the processes of teaching, studying and learning are required by the researcher to interpret this section (Sipila, 2010).

An annual questionnaire delivered online through SurveyGizmo helped determine how the teacher participants used laptops for teaching and to promote student learning. Appendix B presents the teacher questionnaire. As with the student participants, the following constructs were targeted for the teacher participants:

- teacher attitudes and beliefs about laptop use for learning;
- how students managed and operated ICT;
- how students used ICT to investigate phenomena;
- how student used ICT for creation purposes;
- how students used ICT for communication; and
- how students used ICT ethically.

These constructs were used at the annual teacher interviews to tease out issues that were reported in the annual teacher questionnaires. Interviews are conversations and explanatory interviews (whether semi-structured or focused) are much more like a natural conversation than an interview schedule and aid in addressing teacher pedagogy in the use of ICT (Williams, 2003).

3.5.2.3 Step three: Possible impact of 1:1 laptops on literacy and numeracy outcomes

Step three was interested in discerning possible impacts on learning with a specific focus on literacy and numeracy. There has been significant research about 1:1 laptop use and the impact on specific academic areas and student achievement (Bebell & Kay, 2010; Bebell & O’Dwyer, 2010; Dunleavy & Heinecke, 2007; Muir et al., 2004; O’Dwyer et al., 2008; Suhr et al., 2010). Weston and Bain (2010) use Cuban’s (2006) approach of carefully scrutinising portrayed improvements in student achievement with a focus on teaching rather than on a device. This is the debate that
challenges these interpretations, and more importantly shapes this research. NAPLAN, which is standardised, was chosen as the main indicator to analyse the possible impacts on literacy and numeracy outcomes. It is an assessment widely known in the Australian school system and is often discussed in schools, communities and political forums in Australian society. Subsequently, NAPLAN data between 2008 to 2012 was gathered to determine if there was any relationship between the 1:1 laptop initiative and literacy and numeracy outcomes.

3.5.2.4 Step four: Implementation differences between junior and middle school

To understand the differences between the implementation of the laptop program, three subgroups were formed from Cohort A, Cohort B and teacher participants. Details on how these subgroups were formed are provided in Table 3.3. These subgroups comprised participants who were interviewed annually to establish if there were specific differences or similarities. Appendix C provides student and teacher interview questions. Teacher and student participants were also observed annually using a protocol developed by Judson (2006) over the three year study. Classes selected for observation were based on the participants who were involved in the study each year (both teachers and students). Semi-structured interviews of the School Headmaster, Deputy Headmaster and the Director of ICT occurred in the first year and third year as the three participants were not attached to a classroom-teaching role to justify annual interviews based on the research questions. The Dean of Academic Studies was interviewed annually as he had a closer link to the daily operation of the School, particularly in relation to the implementation of the 1:1 laptop program. These four individuals held positions of responsibility and were integral strategically and operationally in the 1:1 laptop implementation process and are referred to collectively as the School leadership team. The purpose of collecting data from the School leadership team was to set the 1:1 laptop implementation within a strategic framework noting differences between planned and actual outcomes. Appendix D provides the interview questions used for the School leadership team.
3.5.2.5 Step five: Implications of the 1:1 laptop initiative for future use of ICT

Finally, step five examined the implications of introducing a 1:1 laptop program. Bringing together all of the data (interviews, questionnaires, observations, focus groups, NAPLAN data, and artifacts) and then analysing these data in the context of current literature, leads to deeper understandings into the implementation of ICT use through laptops or other mobile devices. Concentrating on the five specific steps, also helped to describe and explain changes in the implementation of the 1:1 laptop program.

3.6 Data Collection

3.6.1 Data collection techniques

This research used a mix of qualitative and quantitative techniques for data collection. These included: questionnaires, interviews, observations, focus groups, sources such as NAPLAN and secondary artifacts from the School (e.g., eSafe reports). Table 3.1 provides an explanation of the link between methods of data collection and the research questions.
Table 3.1  
*Data Collection Methods and Research Questions*

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Data collection method</th>
<th>Research questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2,4</td>
<td>Student questionnaire</td>
<td>This questionnaire addresses research questions 1, 2 and 4 with a direct focus on students in the study about the use of laptops and learning.</td>
</tr>
<tr>
<td>1,2,4</td>
<td>Teacher questionnaire</td>
<td>This questionnaire addresses research questions 1, 2 and 4 with an emphasis on the teaching and learning aspects of the implementation.</td>
</tr>
<tr>
<td>1,2,4</td>
<td>Parent questionnaire</td>
<td>This questionnaire addresses research questions 1, 2 and 4 with an emphasis on parent perceptions of the 1:1 laptop implementation.</td>
</tr>
</tbody>
</table>
| 1,2,3,4,5          | Teacher and student interviews and, parent focus groups.  
                           Director of ICT interview  
                           Dean of Academic Studies interview  
                           School Deputy-Headmaster interview  
                           School Headmaster interview | Interviews provide further information about research question 1, 2, 3, 4 and 5 with specific reference to the implementation experiences between the junior and middle school. |
| 1,2,4              | Observations           | Observations provide further information about research questions 1, 2 and 4. |
| 3                  | Collection of artifacts from the school (e.g., NAPLAN data, lesson plans etc.) | These address research question 3. |

3.6.2 Research and data collection overview

Commencing in 2010 with Year Five (Cohort A) and Year Seven (Cohort B), the study followed Cohort A participants to Year Six in 2011 and Year Seven in 2012; and Cohort B participants to Year Eight in 2011 and Year Nine in 2012. Also included in the data collection were teachers from both cohorts and parents. By following these cohorts, and triangulating these data with perceptions from teachers and parents, the study could address the research questions. Qualitative and quantitative data were collected about how students and teachers used laptops, and educational impacts and differences between junior and middle school implementation experiences from both laptop year levels.
Figure 3.2 provides an overview of the number of student, teacher and parent participants who responded to the questionnaires over time for both cohorts. Table 3.4 provides response rates for all questionnaires over the three years of the study.

Figure 3.2. Number of participants responding to questionnaires throughout the study (2010 to 2012).

Both Cohort A and Cohort B remained the same in sample size for both students and parents from the first year to the third year. Teacher numbers varied each year due to teacher involvement across the specific year levels over the course of the study. Table 3.2 shows the data collection timeline and total number of questionnaires conducted.

Table 3.2
Data Collection Timeline: Total Sample of Questionnaires

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Student questionnaire</td>
<td>Mar (N = 192)</td>
<td>Oct (N = 192)</td>
<td>Oct (N = 192)</td>
<td>Oct (N = 192)</td>
</tr>
<tr>
<td>Teacher questionnaire</td>
<td>Mar (N = 46)</td>
<td>Oct (N = 46)</td>
<td>Oct (N = 56)</td>
<td>Oct (N = 61)</td>
</tr>
</tbody>
</table>

Note: Inception# = Data collection phase instituted at the commencement of the 1:1 laptop implementation (March / April 2010).

As discussed, annual interviews, observations, parent focus groups and student gaming forums were utilised over the course of the study. A total of 30 student participants (10 from Cohort A and 20 from Cohort B) were interviewed at the inception, first year, second year and in the third year from the total of 192 students.
involved in the study to discover how laptops were being used. There were 102 teachers at the School, however those teachers who taught more than six periods (the minimum number of periods teachers needed to fully appreciate the impact of the 1:1 laptop program) a week and taught students either in Cohort A or Cohort B were selected for an annual interview. These interviews were conducted to ascertain how teachers used the laptops for learning rather than focusing solely on the implementation. The School leadership team, as previously discussed in section 3.5.2.4, were also interviewed for the purpose of gaining insights into their perspectives of the 1:1 laptop implementation. Observations also took place each year for the purpose of understanding how students and teacher used laptops for learning (this is discussed in further detail in section 3.6.7). Parent focus groups were designed to tease out some of the reported themes that became apparent post the parent questionnaire. Finally, one of the themes to emerge from student questionnaires and interviews; gaming, presented an opportunity for the study to conduct five student gaming forums to further examine the issue. Involving 30 students from Cohort A and Cohort B five forums were run. Selection methods are discussed in further detail in Table 3.3.

3.6.3 Sample

3.6.3.1 Background of sample and method of selection

Students, parents and staff involved with Years Five (Cohort A) and Year Seven (Cohort B) in the implementation year took part in this longitudinal study. Both Cohort A beginning in the Junior School, and Cohort B, in the Middle School, were studied simultaneously between 2010 and 2012. The research aimed to gain a greater understanding of how students used laptops for learning and how teachers implemented strategies for students to use their laptops in learning. Cohort A and Cohort B were selected for the study as these two were pioneers in the implementation of the 1:1 laptop program. Table 3.3 summarises data collection selection methods, and sample size.
### Table 3.3  
*Total Sample Size and Selection Methods of the Study*

<table>
<thead>
<tr>
<th>Data Collection Method</th>
<th>Sample Size</th>
<th>Selection Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Questionnaires:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohort A student questionnaires</td>
<td>56</td>
<td>All students in Cohort A were asked to complete a student questionnaire annually.</td>
</tr>
<tr>
<td>Cohort B student questionnaire</td>
<td>136</td>
<td>All students in Cohort B were asked to complete a student questionnaire annually.</td>
</tr>
<tr>
<td>Teacher questionnaires</td>
<td>72</td>
<td>All teachers who taught across Cohort A or Cohort B were asked to complete a teacher questionnaire annually.</td>
</tr>
<tr>
<td>Parent questionnaires</td>
<td>192</td>
<td>All parents of Cohort A and Cohort B students from the implementation year were asked to respond to a parent questionnaire annually.</td>
</tr>
<tr>
<td>Cohort A student semi structured interviews</td>
<td>10</td>
<td>Purposeful sampling targeting students using the maximal variation strategy (students from high, middle and low achievement levels).</td>
</tr>
<tr>
<td>Cohort B student semi structured interviews</td>
<td>20</td>
<td>Purposeful sampling targeting students using the maximal variation strategy (students from high, middle and low achievement levels).</td>
</tr>
<tr>
<td><strong>Semi structured interviews:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers</td>
<td>37</td>
<td>Teachers who taught six or more periods a week to Cohort A or Cohort B. This number was selected as a threshold having a greater connect with both Cohort A and Cohort B.</td>
</tr>
<tr>
<td>Leadership team</td>
<td>4</td>
<td>The School leadership team consisted of the: Headmaster, Deputy-Headmaster, Dean of Academic Studies and the Director of ICT.</td>
</tr>
<tr>
<td>Parent focus group</td>
<td>192</td>
<td>Parents from both cohorts were invited to take part in focus groups annually via the annual parent questionnaire.</td>
</tr>
<tr>
<td>Student gaming forum</td>
<td>30</td>
<td>Student participants from Cohort A and Cohort B interview sample.</td>
</tr>
</tbody>
</table>

Students, teachers and parents from both cohorts were invited to be involved in the study by completing an annual questionnaire, and signing a statement of informed consent. Parents were invited to be involved in the research because they could provide a valuable perspective on how students used their laptops for learning, particularly at home. Parents were also asked to authorise student involvement, as students were under the age of 18, by signing a statement of informed consent.
(Appendix E). These forms were signed at the 1:1 laptop deployment session, which took place in the first year of the study. Three separate questionnaires (student, parent and teacher) were administered online to all 196 students, their parents, and the teachers involved with each of the cohorts. The questionnaires were introduced to participants by email. Table 3.4 provides the responses rates for the student, parent, and teacher questionnaires. Parent responses increased as the 1:1 laptop initiative gained momentum.

Table 3.4
Participant Response Rates for the Annual Student, Parent and Teacher Questionnaires

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Inception# %</th>
<th>First Year %</th>
<th>Second Year %</th>
<th>Third Year %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Cohort A</td>
<td>100.0</td>
<td>96.4</td>
<td>92.9</td>
<td>91.1</td>
</tr>
<tr>
<td>Student Cohort B</td>
<td>100.0</td>
<td>83.8</td>
<td>81.6</td>
<td>97.8</td>
</tr>
<tr>
<td>Parent Cohort A</td>
<td>62.5</td>
<td>87.5</td>
<td>80.4</td>
<td>82.1</td>
</tr>
<tr>
<td>Parent Cohort B</td>
<td>52.9</td>
<td>77.2</td>
<td>73.5</td>
<td>75.7</td>
</tr>
<tr>
<td>Teacher</td>
<td>84.8</td>
<td>76.1</td>
<td>83.9</td>
<td>85.2</td>
</tr>
</tbody>
</table>

Note. Inception# = Refers to the initial questionnaire that took place one month after the implementation in the first year of the study (March 2010). Annual questionnaires were completed at the end of each year.

3.6.3.2 Purposeful sampling: Student and teacher interviews

Purposeful sampling ensured that all chosen interviews carefully represented the School community as closely as possible, “illuminating” the research questions (Patton, 2002). Students selected for the sample group followed the maximal variation strategy from high, middle and low academic rankings to capture a range of perspectives into how laptops were used for learning. The achievement ranges were based on historical artifacts such as NAPLAN. The sampling also provided a range of perspectives to see if there were any differences between the cohorts with the implementation of the 1:1 laptop program. Teachers were selected on the basis of having a teaching load of six periods or more across all learning areas taught at the School relevant to the groups. As discussed this teaching commitment was judged as the minimum required for teachers to have a sufficient connect with 1:1 laptop initiative. Therefore, the student sample remained consistent over the period of
research. However, a different set of teachers were interviewed each year depending on their commitment to their sample. Further, the extent of consistency of parents involved in the research depended upon them attending the focus groups.

### 3.6.4 Questionnaires

Student, teacher and parent survey questionnaires were administered each year. These were set up to collect data at specific yearly intervals over the three year period to discern if there were changes in participants’ perceptions of the 1:1 laptop implementation. Survey questionnaires comprised quantitative and qualitative components which enabled the research to gain access to data representing attitudes and opinions towards the implementation of the 1:1 laptop program. Appendices A, B and F provide the questionnaires administered to students, teachers and parents. In longitudinal research, questionnaires are useful to gain insights into possible changes to attitudes and behaviour (Vandenberg & Ployhart, 2010). The School leadership team were also surveyed over the three year period to collect data about learning and teaching using 1:1 laptops from the leadership perspective.

#### 3.6.4.1 Formation of the questionnaire: Students, teachers and parents

The questionnaires used in this study drew upon previous instruments developed by Newhouse (2005) who conducted research for the Western Australian Department of Education and Training in the area of using notebooks for learning. Newhouse’s (2005) questionnaires were further developed for this study, specifically relating to the dimension of 1:1 laptop learning. Newhouse targeted the areas of student engagement, impact on learning outcomes, teachers’ pedagogy and teacher and student ICT competencies. By utilising the framework employed by Newhouse, a comprehensive and tested form of data collection was adapted as a basis for the study. The original design of the questionnaires catered for students, teachers, key leaders and parents in a public school setting in Western Australia.

In developing the questionnaire for this study, 10 constructs were identified as being important in understanding laptop use for teaching and learning with varying questions in each questionnaire (student, teacher and parent). Newhouse (2005) drew on a range of questions that he classified as “key performance indicator data” to help
determine notebook use in his research. The following 10 constructs demonstrate the type of responses for all questionnaires:

1. Laptop use: (Five point Likert-type scale: Everyday, Two to three times a week, Every two weeks, Once a month, Never)

2. Laptop use for teaching and learning: (Five point Likert-type scale: 0-5%, 5-10%, 10-25%, 25-50%, >50%)

3. Student engagement and motivation: (Five point Likert-type scale: 1 Low to 5 High)

4. Feelings and experience using ICT: (Four point Likert-type scale: Often, Sometimes, Rarely, Never)

5. Frequency of use in time: (Five point Likert-type scale: less than 30 minutes, 30 minutes, One hour, Two to three hours, More than three hours)

6. Student observation: (Yes or no responses with written comments)

7. ICT competencies: (Three to four point scales using exemplars of what can and cannot be completed in the ICT competency)

8. Impact on learning: (Five point scale: High to low or seven point scale: 3, 2, 1, 0, -1, -2, -3).

9. Other technologies: (Written or open ended comments)

10. 1:1 laptop program statement: (5 point Likert-type scale: Strongly agree, Agree, Don’t know, Disagree, Strongly disagree).

Four questionnaire iterations took place over the three year study. These are explained below:

- An initial (inception) set of questionnaires were administered to the students, teachers and parents soon after the implementation of the 1:1 laptop program. This set of questionnaires provided background information about the students, teachers and parents. The student questionnaire contained 13 items,
the teacher questionnaire contained 50 items and the parent questionnaire contained seven items (Appendix G).

- An annual questionnaire was administered to the student, teacher and parents at the conclusion of Year One of the study. The composition of the three questionnaires about the 1:1 laptop program was: 25 item annual student questionnaire, 26 item teacher questionnaire, and a 12 item annual parent questionnaire.

- The annual questionnaire remained consistent for the student participants. However, with the analysis of the data, the themes of mobile telephony, gaming, distractions of using laptops for learning and monitoring of laptops emerged as themes consistent for both parents and teachers and additional items were included in their questionnaires. Therefore the composition of the Year Two and Year Three questionnaires were as follows: 25 item annual student questionnaire (including four qualitative), 28 item teacher questionnaire (including two qualitative items), and 19 item parent questionnaire (including four qualitative items).

In summary, the annual questionnaire changed for both the teachers and parents from the first year to the second year of the study due to the emergence of the consistent themes discussed above. Changes to the questionnaires were studied and reviewed by two university academics for authenticity and relevance. Appendix H provides a summary matrix of the Cronbach’s Alpha results yielded by applying Reliability Analysis to the three Questionnaires in their final form. The results indicate that the multiple-Item ‘Themes’ (constructs) had satisfactory levels of reliability.

3.6.4.2 Field test of the student questionnaire

As discussed, two university academics examined all items of the questionnaire to help ensure congruency between the data collection instruments and the study’s research questions. With a focus on the student questionnaire, a rigorous examination of the questions and scales used for each area ensured that each key area was clear and concise. The teacher and parent questionnaires were also peer examined following the above mentioned process.
Twenty students from Years Five and Seven from the case study school were used as a pilot group in December 2009 to complete the questionnaires and provide written feedback on the design and structure of the questionnaire used. SPSS (v.20, IBM, USA) was used to gauge questionnaire reliability, by calculation of Cronbach’s Alpha for each of the multiple-Item questionnaire ‘Themes’ (constructs).

3.6.5 Interviewing

A semi-structured interview technique was adopted for the study, which allowed the researcher to engage participants in a conversational dialogue about the 1:1 laptop implementation and the effect on boys’ education. All interviews were audio recorded by the researcher and then transcribed. The semi-structured interviews consisted of a series of questions in the form of an interview schedule but the sequence could be varied. To acquire detailed information about the 1:1 laptop program and participants’ responses, a sample of teachers and students were interviewed as previously discussed. All parents from each cohort were invited to an annual focus group to respond to a range of questions pertaining to the 1:1 laptop program.

Questions were general and provided for the interviews to have some scope to ask further questions from given responses that were seen as noteworthy (Bryman, 2008). Appendix C presents the student and teacher interview questions, Appendix I presents the parent focus group questions, and Appendix J presents the student gaming forum which was convened specifically to confront the perceived problem of student gaming during school hours. The proportion of sample numbers as previously shown in Table 3.3 displays the total population of the research group. The sample may be considered appropriate, as single case study sites need less of an emphasis of having large samples due to the difficult nature of having to configure complex plans (Punch, 2009).

Teachers who taught more than six periods a week (see Table 3.3), were chosen each year from the two cohorts targeted in the research and the subjects they taught at the School. Selected students ranged from high academic achievement, students in the mid range and students at the lower end of the academic spectrum, and were selected on their NAPLAN performance in all of the areas (reading,
writing, language conventions, and numeracy). In relation to the specified bands within NAPLAN, participants from Cohort A were situated in bands three to eight and Cohort B were situated in bands four to nine to represent the three achievement groups. Participants were interviewed for approximately 30 to 60 minutes and interviews were audio recorded with prior cleared consent. Table 3.5 displays the total number of student, teacher and parent interviews for the study.

<table>
<thead>
<tr>
<th>Participants</th>
<th>Inception*</th>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort A student</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>Cohort B student</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Cohort A teacher</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Cohort B teacher</td>
<td>15</td>
<td>15</td>
<td>11</td>
<td>15</td>
<td>56</td>
</tr>
<tr>
<td>Leadership team</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Parent focus group</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Gaming forum#</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total interviews</strong></td>
<td><strong>51</strong></td>
<td><strong>52</strong></td>
<td><strong>46</strong></td>
<td><strong>63</strong></td>
<td><strong>212</strong></td>
</tr>
</tbody>
</table>

Note. Inception* = Initial interviews that took place within the first three months of the implementation in the first year of the study. Gaming forum# = Five gaming forums conducted with 10 students from Cohort A and 20 students from Cohort B.

## 3.6.6 Observations

Rossman and Rallis (1998) suggest observations in natural settings can produce rich descriptive data through open ended narrative or through the use of published checklists or field guides. Through the course of the research non-participant observation took place and observations sought to not interfere with the participants in the activity.

Judson (2006) developed an observation measurement called Focus on Integrated Technology Classroom Observation Measurement (FIT:COM). This instrument has five constructs that were used to assess the ICT use within a classroom context. These included: Design of technology integration; class dynamics; meaning and purpose; content and knowledge; and, technology as tools. All five constructs contained five statements (25 statements in total), where a five-point scale was available for an observer to rate (0 = never occurred to 4 = occurred
A maximum score of 20 was attainable for each of the five constructs, with an overall possible score of 100 for the observation instrument. An adapted version used by Bate (2010b) in his research into the study of “Beginning teachers’ pedagogical identity and their use of ICT” was used to guide the observation process of this research (see Appendix K). Results from the observations were recorded on the template drawn from Bate’s research. Observations were scheduled with teachers to minimise the impact on classes and took place in classrooms (typically between 30 and 45 minutes) at the School. The researcher with the assistance of an observation colleague were situated at the back of the classroom whilst instruction took place. Post instruction both observers moved around the classroom. Table 3.6 provides an overview of the total observations that occurred over the duration of the study.

### Table 3.6

<table>
<thead>
<tr>
<th>Year</th>
<th>Cohort A</th>
<th>Cohort B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Second</td>
<td>4</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Third</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total observations</strong></td>
<td><strong>12</strong></td>
<td><strong>18</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

Four observations were independently co-observed by an associate of the researcher in the first and third year of the study. This process helped to improve the general quality of the data collected using the FIT:COM observation protocol. In each of the four co-observed classes, variation in interpretation was minimal (3% and 2% in the first year, and 4% and 3% in the second year). The co-observed FIT:COM scores are shown in Table 3.7.

### Table 3.7

<table>
<thead>
<tr>
<th>First Year</th>
<th>Third Year</th>
<th>Researcher</th>
<th>Associate</th>
<th>Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>C41</td>
<td></td>
<td>50</td>
<td>47</td>
<td>0.03</td>
</tr>
<tr>
<td>C42</td>
<td></td>
<td>53</td>
<td>55</td>
<td>0.02</td>
</tr>
<tr>
<td>C31</td>
<td></td>
<td>48</td>
<td>44</td>
<td>0.04</td>
</tr>
<tr>
<td>C37</td>
<td></td>
<td>63</td>
<td>66</td>
<td>0.03</td>
</tr>
</tbody>
</table>

*Note. C41, C42, C31, C37 = Refers to the four teacher participants from the study that were co-observed.*
Observers monitored movement around the classroom, communication between students, and classroom dynamics in relation to behaviour for the set period. During the observation cycle artifacts (e.g. lesson plans and assessment tasks) were collected to increase the understanding of the viewed lesson.

### 3.7 Data Analysis

Data from all of the collection methods were analysed and scrutinised for common themes. Key themes of student engagement in learning, student and teacher laptop use, teachers’ ability to integrate ICT into the curriculum, teachers’ pedagogy in the use of ICT, and learning impact helped to interpret the implementation of a 1:1 laptop program at the School. When analysing the qualitative data, the research adapted Miles and Huberman’s (1994) method of data reduction, data display, and drawing and verifying conclusions. In analysing the quantitative data in the questionnaires, descriptive analysis and two-variable relationships (Punch, 2009) provided a starting point. Mean scores and the corresponding standard errors of the means were used to compare and contrast Cohort A and Cohort B and provide a summary of any relationships.

In addition to comparisons of mean response scores between the two Cohorts A and B, comparisons of mean scores between the First, Second and Third years, within a cohort, were also undertaken, so as to identify statistically significant changes in time. In the case of comparing only two mean values (e.g., Cohort A vs. Cohort B), the 'Independent Samples t-test' was applied. In the case of comparing three mean values (e.g., First Year, Second Year and Third Year), the 'One-Way ANOVA' test was applied. In Section 7.3, access to all of the individual data was not available, but only to summary data, (i.e., N, Mean, Standard Deviation). In this instance the 'One-Way ANOVA Test for Summary Data' (URL: http://danielsoper.com/statcalc3/) was used. This test may be applied to the comparison of two, three or more mean values. In the case of comparing two mean values it is equivalent to the Independent Samples t-Test. In all cases where a test indicated statistical significance, its level of significance was indicated as either p < 0.05 or p < 0.01. Both forms of data analysis were computer assisted with NVivo being used for qualitative data analysis and mainly SPSS for quantitative data analysis.
From a validity and trustworthiness perspective, mixed methods research enabled the researcher to draw meaningful and accurate conclusions from all the data in the study. The use of qualitative research was used to corroborate quantitative findings (Hammersley, 1996).

3.7.1 Quantitative data

The questionnaires were subject to Reliability Analysis and revealed values of Cronbach’s Alpha (see Appendix H) for the distinct ‘Themes’ (constructs) that indicated satisfactory reliability.

As discussed in section 3.6.4.1 the final questionnaires contained 25 items for the students, 28 items for the teachers, and 19 items for the parents. All items with a Likert-type scale were calculated to determine a mean score as an overall index of the participants’ response. The maximum possible mean score varied between 4.0 and 5.0 depending on the specific question as demonstrated in Appendices A, B and F. Mean scores and their corresponding standard error of mean were calculated for all participants who completed the questionnaires between the first year and third year of the study. These mean scores indicated the level of use of laptops. ‘Independent Sample T-tests’, (comparison of two mean values), and the similar ‘One-Way ANOVA contrasts’, (for comparison of three or more mean values) were used to determine whether certain differences between mean values were statistically significant at the p < 0.05 level or not.

3.7.2 Qualitative data

All interviews were audio recorded and transcribed into a word processing package. These transcriptions, together with the written responses were imported into the NVivo software. Data was coded into specific nodes at the conclusion of each of the data collection periods. Nodes were created with specific categories relating to student laptop use, teacher use of laptops for learning, impacts on learning and implementation differences between the two cohorts. Coding by the researcher followed the coding considerations identified by Lofland and Lofland (1995, p. 186) including: (1) Of what topic, unit, or aspect is this an instance? (2) What question about a topic does this item of data suggest? (3) What sort of answer to a question about a topic does this item of data suggest? Student, teacher, parent and leadership
team transcripts were all coded by allotting portions of the data to one of the 351 branches within nine tree nodes.

### 3.7.3 Integrity of data analysis

Ackroyd and Hughes (1992) argue that whatever the stand on the issues involved in the research, the underlying point is that the research instruments and techniques used for collecting and creating data should be sensitive to the nature of the phenomena of the research. The following approaches demonstrate the integrity of the data analysis:

#### 3.7.3.1 Auditability

All qualitative and quantitative data collected has an audit footprint, which enables it to be traced back to the source. All interviews were transcribed using ‘Dragon Speech’ recognition software and rightfully capture the response of the interviewees. All transcripts and audio files were tagged with an individual code enabling for rapid and easy retrieval. Questionnaire data were also tagged with a unique code ensuring the full identity of the response and details of time and location are distinguishable.

#### 3.7.3.2 Member checks

Verifying data by the use of member checks is another useful way of improving credibility of the research (Guba & Lincoln, 1981). As each interview was audio recorded and subsequently transcribed, each participant was given a copy of the interview transcript. Participants were asked to read the transcript and provide feedback to validate the accuracy of the transcript. Prior to the commencement of the annual interview, all interview participants were given a copy of their previous interview as a Word document to prepare them for the ensuing interview.

#### 3.7.3.3 Peer debriefing

Robson (1993) elicits the worth of having a colleague or other peers to expose the research and findings. Regular discussion with academic members of The University of Notre Dame Australia enabled the interpretation, analysis and
conclusions to be examined on a continuous basis throughout the study. Peer debriefing helped minimise research bias and upheld data analysis integrity.

3.7.3.4 Triangulation

One of the main advantages of employing mixed methods is that it allows for triangulation through the use of multiple and different sources (Denzin, 1988). Firstly, the research used a variety of instruments (Punch, 2009) to verify the qualitative and quantitative data. Questionnaires (students, teachers, parents), interviews (student, teachers, parents and key leadership members) observations (students), parent and staff forums, and the collection of artifacts. Secondly, with a three year longitudinal focus, the collection, analysis and interpretation of the data added to the credibility of the research as a reliable understanding was based on evidence collected by repeatable procedures (Clark, 1983). Thirdly, qualitative data was coded and attributed to specific themes, which again occurred on an annual basis. This database of information was used to clarify any queries related to the research topic and more importantly helped reveal patterns or anomalies found in the interpretations. Finally, by comparing the data of the students, teachers and parents, it was possible for the study to examine the research questions from three angles, adding to the overall trustworthiness of the study (Barbour, 2001).

3.7.3.5 Acknowledgement of bias

The researcher was fully aware of the need to minimise any bias which accrued from his affiliation to the School (Freeman & Sherwood, 1970). As the researcher conducted the inquiry with his organisation, it was of the utmost importance to test for possible bias. To minimise the risk of bias, five colleagues critically evaluated the research questions, methodology and findings. These colleagues were two university lecturers in the Schools of Education and Medicine at The University of Notre Dame Australia, an independent researcher with research student experience, and two colleagues at the School with experience in leadership and ICT. These colleagues offered alternative explanations and suggestions for the data collection which in turn strengthened the validity of the research (Yin, 2009).
3.8 Limitations of the Research

This research had a specific focus on 1:1 laptop programs and boys’ education. Since this research conducted was with a sample of boys only and teachers and parents from one school for boys, it is acknowledged that it is a small representation of all the boys’ schools that exist locally, nationally or globally. Conversely, the high response rate of participants and the diversity of the sample suggests possible advantages with the provision of a suitable data set about junior and middle school experiences about laptop use. Although, due to the size of the study, interpretations of the data and subsequently the findings compared to other 1:1 laptop research should be undertaken with caution.

Some of the other limitations to be considered may be researcher bias, as the study was conducted by one researcher about the implementation of a 1:1 laptop program in a single gender school. It is acknowledged that the time relevance of the study could be considered as a short timeframe to fully evaluate the effectiveness of such implementations. Secondly the study pre-dated moves towards Bring Your Own Device (BYOD) in schools. It had a focus on an Apple MacBook product with no other comparative computer or mobile devices used. Thirdly, there was a variability of teachers’ skills with the use of ICT and more specifically how laptops were used for learning. Therefore, another possible limitation was how teachers’ ICT skills might contribute to a poor implementation. Finally, 1:1 laptops have been overtaken by other mobile technologies and implementation approaches (e.g., BYOD). This could be considered as a possible limitation in that the research pre-dated newer technologies and approaches.

As discussed earlier to minimise these limitations, the research applied both qualitative and quantitative techniques. This approach allowed the study to answer the research questions not essentially answerable by either a qualitative or quantitative approach, but rather bringing together the strengths of the two methods (Creswell & Clark, 2007).
3.9 Role of the Researcher

The researcher was known to the sample group due to the leadership position held at the case study school, a leadership position of responsibility within the junior school. However, the researcher was relatively unknown with the middle school sample as a large proportion of the group (58.8%) were new to the School. The researcher did not have a classroom teaching position and did not have daily contact with the participants, due to the nature of the size of the sample for both cohorts. Relationships with the research participants formed over the three years of the study, and this helped in developing an understanding of the research routines that were carried out each year; these being questionnaires, interviews, observations and focus groups. The following strategies were used to limit researcher bias: frequent debriefing sessions took place between the researcher and supervisors; peer scrutiny of the research project; the use of standardised measures such as NAPLAN; co-observations took place and results were compared; and another university academic collected data from participants. One of the prime counters to the risk of bias was frequent recourse to the published literature, which encompassed a wide range of perspectives and contexts. All these strategies enabled regular triangulation of the data.

3.10 Ethical Considerations

The research remained consistent with expected standards of professional conduct in accordance with the guidelines of The University of Notre Dame Australia. To abide by these standards, the following specific procedures were put in place:

3.10.1 Human research ethics

The University of Notre Dame Australia’s Human Research Ethics Committee approved ethical clearance for this research in October 2009. Written approval was also obtained from the Executive Director of Edmund Rice Education Australia, the Executive Director of Catholic Education in the Archdiocese of Perth and the Headmaster of the School.
3.10.2 Special consideration for participants

Participants were given the utmost respect in relation to anonymity, privacy and confidentiality throughout the research and post-research. At the study commencement, each participant was provided with documentation explaining the study’s research procedures and a guarantee for information confidentiality. All personal information was separated from responses and pseudonyms given to participants. In reference to safe keeping, Holmes (2004, p. 349) gives four crucial steps all of which were followed:

- participant names, addresses and letter correspondence were not stored on hard drives;
- identifier codes used on data files and the list of participants together with their identifier codes were stored separately in a locked cabinet;
- transcripts did not include participant names; and
- copies of transcripts in a locked cabinet kept in the School administration office. Electronic and hard copy formats have also been securely stored in the university supervisor’s office and will be available for a five-year period.

These steps were followed and clearly articulated to the participants to reinforce the research had a high regard for confidentiality and data protection, and is deemed of utmost importance.

3.10.3 Informed consent

All participants were given a form notifying them their participation was voluntary, in answering questions they were offered a choice to refuse. Participants were able to withdraw from an interview at any time and could withdraw their data within a one-week timeframe of a particular interview. Participants were required prior to the research to complete the consent forms given. Parents acted on behalf of all students, as they were children under the age of legal consent. Consent forms were completed and returned at the laptop deployment in the beginning of the 1:1 initiative in the first year by the parents of the students. All parents and teachers were given participant information and consent forms to participate in the study.
3.10.4 **Research responsibility**

The researcher understood the ethical requirement to provide information to all participants regarding the research and the roles of all participants. Fundamentally, “no participant will be harmed in any way, real or possible. Respect and concern for the researcher integrity and for the participants dignity and welfare are the bottom lines of ethical research” (Gay & Airasian, 2003). Results from the research were presented to the participants in a range of forums across the research.

3.10.5 **Dependent relationships**

The researcher was known to the participants due to his positions he held as Head of the Junior School and as Acting-Deputy Headmaster. Steps to minimise dependent relationships between students, teachers and parents included:

- having another researcher not known to the group conduct interviews with teachers known to the researcher;
- involving another colleague in the student and parent forums; and
- using a colleague in lesson observations.

3.11 **Summary**

This chapter has detailed the pragmatic paradigm and mixed methods approach underpinning this research. As described in the explanatory approach, data collection was then followed by analysis. This enabled the research to build on existing understanding and contribute new knowledge through the elaboration of credible principles in the key issues, methods and process of social science.

Chapter Three has explained how this research was conducted and determines the effects on boys’ education with the implementation of a 1:1 laptop program. It has extrapolated the longitudinal research design and the mixed methods approach engaged to collect and analyse data. It has covered the specific areas of the role of the researcher, the limitations of the research and the various ethical considerations. Chapter Four will focus on the findings that have been generated from this research.